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KEY TO PRONUNCIATION.

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

' (prime), " (secondary) accents, to indicate syllabic stress

THE ENCYCLOPEDIA AMERICANA

Hamilton Stage, the upper division of the Hamilton series of rocks, consists chiefly of shaly sandstone and fine shales with a few thin seams of limestone. In Ulster, Albany, and Green counties, N. Y., the thick-bedded shales are known as North River flagstone, and are quarried on the Hudson River near Kingston, Saugerties, and Coxsackie. Some of the thicker layers of these flagstones are known as bluestone, and are used not only for flags and curbing but for architectural purposes.

Hamirpur, or **Humeerpoor,** a former district of the Northwestern Provinces, British India, now a part of the United Provinces of Agra and Oudh, and the name of its former capital; south of the Jumna and east of the Betwa and Dhasan rivers, and part of the great plain of Bundelkhand. From the 9th to the 14th century its chief city, Mahoba, was one of the most important in India.

Hamites, hăm'īts (decendants of Ham), the name given to several races in North Africa, who are regarded as of kindred origin and speak allied tongues. They include the ancient Egyptians and their modern descendants, the Copts, the Berbers, Tauregs, Kabyles, the Gallas, Falashas, Somali, Dankali, etc.

Hamlet, the hero of Shakespeare's most famous tragedy, a personage who appears in history, yet is half mythological, but has been transformed by the genius of the English poet into one of the most dominating figures of literature. It is allowed that Shakespeare's Hamlet was suggested by the Hamleth, or Amleth, of Saxo Grammaticus. The latter's 'History of Denmark' had been published in Paris (1514). François de Belleforest included the tale of Hamlet in his 'Tragic Histories' (1570), an English translation of which appeared in 1608. Shakespeare's drama was written earlier than this last date and must have derived its plot either from de Belleforest's work, or a translation executed before the end of the 16th century, unless the poet, who, we know, was a great reader of histories, took the incident direct from Saxo Grammaticus. According to the Danish historian Hamleth was Prince of Jutland; his father, the King of Jutland, had been murdered by his own brother Fengo, who took the throne and queen of the dead man. Hamleth feigned madness to save his own life. He stabbed one of Fengo's courtiers sent to spy upon him, and had for this purpose concealed himself under a truss of straw. He reproached his mother with her shameful second marriage to such effect that she promised to help him in avenging his father by putting Fengo to death; a promise which she kept. These are the very incidents Shakespeare has selected for his play, sometimes emphasizing the points of the narrative, sometimes softening them or changing them in harmony with his own vivid conception of dramatic requirements. Shakespeare's 'Hamlet' was first played in 1600 or 1601, and first printed in 1603. The second quarto is dated 1604; the third, which is merely a reprint of the second, appeared in 1605, and the fourth in 1611. There is a fifth quarto, undated, which was also printed in the poet's lifetime.

Hamlet Case, the designation of the first recorded action in 1850 under the Fugitive Slave Law (q.v.) of that year. It is named after Hamlet, a free negro with a family, who was surrendered after a cursory examination, as a fugitive slave of Mary Brown of Baltimore. He had been arrested by a deputy United States marshal in New York, and the whole circumstances of the case so aroused public opinion that Hamlet was finally redeemed.

Ham'ley, Sir **Edward Bruce,** English general: b. Bodmin, Cornwall, 27 April 1824; d. London 12 Aug. 1893. Entering the army in 1843, he served through the Crimean war; was professor of military history at Sandhurst 1858–64, and commandant there 1870–77; and division commander in the Egyptian war of 1882. His 'Operations of War' (1866) is a recognized text-book for military examinations. Among his other publications are: 'The Story of the Campaign' (1855), a narrative of the Crimean War; 'Wellington's Career' (1860); 'Voltaire' (1877); 'The War in the Crimea' (1890). He was also the author of a popular novel, 'Lady Lee's Widowhood,' and the admirable sketch entitled 'Shakespeare's Funeral.'

Ham'lin, Alfred Dwight Foster, American architect: b. Constantinople, Turkey, 5 Sept. 1855. He is a son of Cyrus Hamlin (q.v.). He was graduated from Amherst in 1875, studied architecture in the Massachusetts Institute of Technology in 1876–7 and at the Beaux Arts of Paris in 1878–81, and in 1883 became special assistant in Columbia University. In 1889 he became assistant professor of architecture at Columbia, and in 1891 adjunct professor. His published works include: 'A History of Architecture' (1896); and a 'Handbook of the History of Ornament.'

Hamlin, Augustus Choate, American surgeon: b. Columbia, Maine, 28 Aug. 1829: d. Bangor, Me., 19 Nov. 1905. He was graduated from Bowdoin in 1851, from the Harvard Medical School in 1855, was appointed assistant surgeon to the 2d Maine infantry in 1861, and from 1863 until mustered out in 1865, lieutenant-colonel and medical inspector, United States army. Subsequent to the War he practised in Bangor, of which he was twice mayor, and in 1882–6 was surgeon-general of Maine. Among his works are: 'Martyria' (1866); 'The Tourmaline' (1873); 'Leisure Hours among the Gems' (1884); and treatises on 'Transfusion' (1868); 'Tetanus' (1868); and 'The Transmission of Disease' (1870).

Hamlin, Cyrus, American missionary: b. Waterford, Maine, 5 Jan. 1811; d. 8 Aug. 1900. He was graduated from Bowdoin College in 1834 and from Bangor Theological Seminary in 1837; and was missionary of the American Board of Missions in Turkey 1837–59. From 1860 to 1876 he was president of Robert College, established after long controversy with the Turkish government. In this position he did much in molding the character of modern Bulgarian leaders, and producing autonomy for Bulgaria. Returning to the United States in 1877 he became a professor in the Theological Seminary in Bangor; and was president of Middlebury College, Vermont, 1880–5. Some of his works are in the Armenian language; those in English include 'Among the Turks' (1877); and 'My Life and Times' (1893).

Hamlin, Hannibal, American statesman: b. Paris Hill, Oxford County, Maine, 27 Aug. 1809; d. Bangor, Maine, 4 July 1891. Though prepared for college, he did not enter, but became the editor of 'The Jeffersonian,' a weekly of Paris, Maine; studied law, was admitted to the bar in 1833, and began practice at Hampden, Maine. He was active in Democratic politics, was elected to the lower branch of the State legislature in 1835, served by re-election until 1840, and was speaker in 1837, 1839, and 1840. Nominated for Congress in 1840, he was defeated by the Whig candidate, but in 1842 was elected, and in 1844 re-elected. Chosen to the Senate in 1848 to fill a vacancy, he was again elected in 1851, but in 1856 resigned his seat to accept the governorship of Maine, to which he had been elected as a Republican. In less than a month, however, he re-entered the Senate for a full term. In 1860 he was elected vice-president on the ticket with Lincoln, and in 1861–5 was president of the Senate. He was thereafter successively collector of the port of Boston (1865–6), United States senator (1869–81), and minister to Spain (1881–3). Hamlin's separation from his party was due to his strong anti-slavery convictions. During the absence from the House of David Wilmot, he introduced the bill now known as the "Wilmot proviso," and obtained its passage in the House by 115 to 106. As vice-president he was a highly valued counsellor of Lincoln. Consult: C. E. Hamlin, 'Life and Times of Hannibal Hamlin' (1899).

Ham'line, Leonidas Lent, American Methodist bishop: b. Burlington, Conn., 10 May 1797; d. Mount Pleasant, Iowa, 23 March 1865. He was educated for the ministry, but afterward studied law, was admitted to the bar at Lancaster, Ohio, was licensed to preach by the Methodist Church, and was a traveling minister in the Ohio conference. When in 1844 the Methodist Church divided on the slavery question, he was one of the members of the general conference, and drafted the plan for the separation of the northern and southern branches. He was a bishop from 1844 to 1852, when he was retired at his own request. His 'Works' were edited by F. G. Hibbard (1869). Hamline University of Minnesota (q.v.) was named in his honor.

Hamline University, a coeducational institution at Hamline, Minn., between Minneapolis and Saint Paul. The school was established, under the auspices of the Methodist Episcopal Church, at Redwig, Minn., but it was closed in 1869. In 1880 it was reopened at Hamline. In 1903 there were connected with the school 21 professors and instructors in the college of liberal arts and 50 in the medical department. In the preparatory school there were about 125 students, in the college of liberal arts about 210, and in the medical department 161 students. There were 6,500 volumes in the library, and the endowment was $200,000.

Hammer, a tool for driving nails or wedges and for beating malleable materials. (See MALLET.) There are hand hammers, steam hammers and electric hammers. The ordinary hammer of to-day is essentially an American product. Exactly when the hammer came into use is not told in history, but it is certain that some rude form of the instrument must have been used in the earliest days of handicraft. Of the hammers made in America to-day there is no end. There is the little tack hammer which weighs only a few ounces, and is indispensable in house, store or factory. Then there is the twenty and thirty ton hammer, driven by steam and used for making immense forgings. The numberless effects which are due to its remarkable force of impact have made the hammer a necessity in all trades. Immense manufactories, employing thousands of men, are grinding year in and year out making hammers, while ten times as many wholesale houses are busy putting the product on the market. The industry has advanced to such a stage that many general hardware firms in the United States have thrown out the hammer, leaving it to the houses that deal in tools exclusively.

Hammers are made in a variety of shapes, the most in demand being the claw hammer. This and the shoemaker's hammer have retained their shapes for hundreds of years. One gold beating firm relies on them entirely. The sheets or leaves of gold are hammered to such exceeding thinness that two hundred and fifty thousand are required to make up the thickness of an inch.

Another odd product of the hammer factory is the butcher's hammer, used for killing cattle. It is capable when properly wielded of carrying a very heavy blow. Then there are the stone-cutter's hammer, the carpet layer's hammer, the wood carver's mallet and the plumber's odd implement. All of these have a good sale in the markets of the world, because they possess a "something" which users cannot find duplicated in the output of other countries.

The modern hammer is made to fit every requirement of a driving tool. One individual of the family, the magnet hammer, has a loadstone in its head, and every little tack jumps at it. The magnet hammer is very useful where canvas is being tacked on the walls. It saves the user the trouble of holding the tack and taking chances at smashing his fingers. The magnet hammer is much in use in tacking tin signs on trees. It is necessary to secure the advertisement at a height beyond the reach of the small boy and the magnet hammer answers the requirement. A clip on the side holds the card or sheet of tin while the tack is retained in position by the magnetized head. One firm blow drives the tack through the tin into the fence or tree trunk and secures the sign. A great variety of power hammers are used. These, for the most part, are masses of iron raised by steam or electricity, and then allowed to fall by their own gravity on the work. The "helve" or "shingling" hammer, used for compressing the mass of iron drawn from the puddling-furnace, and the "tilt" hammer, used in the manufacture of shear-steel, are important examples of such hammers. The first is a heavy bar of cast iron about 10 feet long, weighing 3 or 4 tons or more, to which is attached a head of wrought iron faced with steel, weighing nearly half a ton additional. It works on an axis at the end of the bar farthest from the head, and is raised by cams attached to a heavy wheel set in motion by steam or water power. These cams strike or "lick" a projection extending beyond the head, and thus raise it about 18 or 20 inches at the rate of 70 to 100 times per minute. The tilt hammer is similar, but much lighter, and is adapted for striking more than 300 blows per minute.

Hammer-head Sharks, sharks of the genus *Zygæna*, in which the head is produced on either side into a broad lobe, so that the whole has somewhat the appearance of a double-headed hammer; the eyes on the outer ends of the lobes. Five species are known, two of which (*Z. tiburo and Z. malleus*) occur in the warm American seas, and the latter reaches a length of 15 feet or more.

Hammer-toe, a deformity most frequently affecting the second toe, in which the first bone is sharply extended or pulled back and the other two are flexed at a right angle with the first. It is usually due to the long continued pressure of short shoes, particularly in early life. Amputation of the toe may be necessary in severe cases, as the discomfort becomes unbearable.

Hammer-Purgstall, Joseph, yō'zĕf häm'mĕr-poorg'stäl, Freiherr von, Austrian Orientalist: b. Gratz, Styria, 9 June 1774; d. Vienna 24 Nov. 1856. In 1799 he accompanied as interpreter to Constantinople the internuncio Freiherr von Herbert, who afterward entrusted him with a mission to Egypt, where he collected various antiquities and manuscripts for the Imperial Library. In 1810, on the occasion of the marriage of Napoleon with Maria Louisa of Austria, he accompanied the latter to Paris, where he became intimate with Sylvestre de Sacy and other Orientalists. In 1817 he was appointed imperial councillor at the court of Austria, where he also held the post of interpreter. In 1835 he received the title of Freiherr. Among his numerous literary works may be mentioned: 'Constitution and Administration of the Ottoman Empire' (1815–16); 'Constantinople and the Bosporus' (1821); 'History of the Ottoman Empire' (1835–6); 'History of the Assassins'; 'History of the Golden Horde in the Kiptshak'; 'History of the Ilkhans'; 'History of Persian Eloquence'; 'History of Turkish Poetry' (1836–8); 'History of Arabic Literature' (1850–7); besides numerous translations from Oriental authors, and contributions to various periodicals.

Hammock, from the Spanish, *hamaca*, originally used in Peru to denote a couch or bed of canvas or grass-netting, suspended from the branches of a tree. A sailor's hammock, common on ship-board, is generally made of hempen cloth or cotton canvas, six feet long and about three feet in width. It is gathered together at each end by means of a cord and a clew, and fastened to hooks in the ceiling of the cabin or deck. On a ship-of-war hammocks are hung about three feet apart and in the morning are taken down and stowed away in the hammock netting. The man-of-warsmen use the hammocks for their clothing and bedding during the day time. In former times when a warship entered battle the hammocks were taken on deck to form a barricade against musket balls. In recent times the hammock has become very popular for domestic use, especially in the United States, being hung on verandas and balconies and under the trees on the lawns of private estates during the summer months. These hammocks for home use are made of various materials, but usually of cotton card or manila hemp. They are dyed in bright colors and are made very attractive and picturesque.

Ham'mond, Edward Payson, American evangelist: b. Ellington, Conn., 1 Sept. 1831. He was graduated at Williams College in 1858; studied theology at Union Seminary, New York, and afterward at the Free Church Seminary, Scotland. He was ordained to the Presbyterian ministry in 1862, and was long prominent as an evangelist in Great Britain and the United States. He wrote: 'Children and Jesus'; 'Jesus the Way'; 'Golden Gleanings'; 'Early Conversion'; etc.

Hammond, Henry, English prelate: b. Chertsey, Surrey, England, 18 Aug. 1605; d. Westwood, Worcestershire, 25 April 1660. He was educated at Eton and Oxford, took orders in 1629, and in 1633 was rector of Penshurst in Kent, in 1643 archdeacon of Chichester. He was an adherent of Charles I., and took part in the unsuccessful rising of Tonbridge. He served as chaplain to the king 1645–7, and was in 1648 made sub-dean of Christ Church. In 1649 he removed to Westwood. Among his works are: 'A Practical Catechism' (1644); 'Paraphrase and Annotations upon the New

Testament' (1653). His 'Miscellaneous Theological Works' were published at Oxford, together with the 'Life' by Fell (1847–50, 3 vols.).

Hammond, James Henry, American politician: b. Newberry, S. C., 15 Nov. 1807; d. Beach Island, S. C., 13 Nov. 1864. He studied law, was admitted to the bar in 1828, and in 1830 became the editor of a political journal in Columbia, which maintained the doctrine of state rights and advocated nullification in respect to the tariff act of Congress. He entered zealously into the nullification contest which then divided the State, and took an active part in organizing the military force which South Carolina raised in 1833 to resist the Federal government. He was elected to Congress, and took his seat in 1835, but declined a re-election on account of ill health. In 1841 he was elected general of brigade, and in 1842 governor of South Carolina. While governor he published in 1844 a letter to the Free Church of Glasgow on slavery in the United States, and in 1845 two others in reply to an anti-slavery circular issued by Thomas Clarkson, the English abolitionist. These, in connection with other essays on the same subject, were published in 1853, in a volume entitled 'The Pro-Slavery Argument.' In November 1857 he was elected to the United States Senate, remaining there till 1860.

Hammond, John Hays, American mining engineer: b. San Francisco, 31 March 1855. He was graduated from the Sheffield Scientific School of Yale in 1876, studied at the Royal School of Mines, Freiburg, Saxony, and became an expert on the United States Geological Survey and mineral census, with the duty of examining gold mines in California. In 1882 he was appointed superintendent of silver mines in Sonora, Mexico, but later was again in California as consulting engineer at mines in Grass Valley, and as consulting engineer to the Union Iron Works at San Francisco, and to the Southern and Central Pacific railway companies. In the capacity of consulting engineer he visited many portions of North and South America and Mexico. In 1893 he went to South Africa as consulting engineer to the mining companies operated there by Barnato Bros. of London. He was associated with Cecil Rhodes in the latter's numerous mining interests, and consulting engineer to the Randsfontein Estates Gold Mining Co., the British South African Co. (chartered), and the Consolidated Gold Fields Co. He was one of the four leaders in the reform movement in the Transvaal and for his connection with the well-known Jameson raid, with which, however, he did not sympathize, was sentenced to death by the Boers. This sentence was later commuted to 15 years' imprisonment, and then to the payment of a fine of $125,000. He resides in New York, with offices there and in London, and is general manager and consulting engineer of the Guggenheim Exploration Co., one of the largest mining companies in the world. His reputation as a mining expert is world wide.

Hammond, Samuel, American soldier: b. Richmond County, Va., 21 Sept. 1757; d. Horse Creek, near Augusta, Ga., 11 Sept. 1842. His impulses led him, while a mere boy, to volunteer in the wars of the Virginia frontier with the Indians, where he is said to have greatly distinguished himself, and to have acquired that skill in stratagem which marked his subsequent military performances. In 1775 he raised a company, and took part in the battle of Longbridge; and in 1779 he was at the battle of Stono Ferry, S. C. After the fall of Charleston he kept the field with a small cavalry force, pursuing the active partisan warfare which alone maintained the revolutionary cause in South Carolina. He subsequently settled in Georgia; in 1802 was elected to Congress from Georgia; in 1805 was appointed by Jefferson to the civil and military command of upper Louisiana; and in 1824 removed to South Carolina, where he became surveyor-general of the State in 1827, and secretary of state in 1831.

Hammond, William Alexander, American surgeon: b. Annapolis, Md., 28 Aug. 1828; d. Washington, D. C., 5 Jan. 1900. He was graduated from the University of the City of New York in 1848; and entering the United States army in 1849 as assistant surgeon, became surgeon-general in April 1862. After the Civil War he practised his profession in New York for some years and in his later life took to writing fiction. Among his publications are included: 'Military Hygiene' (1863); 'Sleep and Its Nervous Derangements' (1869); 'Diseases of the Nervous System' (1871); 'Neurological Contributions'; etc., and the novels, 'Robert Severne'; 'A Strong-Minded Woman'; 'A Son of Perdition'; 'Doctor Grattan' (1884); 'Mr. Oldmixon'; etc.

Hammond, Ind., city in Lake County; on the Grand Calumet River, on the Baltimore & O., the Erie and the Michigan Central, and other R.R.'s; about 19 miles southeast of Chicago. It was settled in 1869 and incorporated in 1883. It is situated in an agricultural region, and its railroad facilities make it of considerable commercial importance. It has a number of manufactories, the principal of which are chemical works, steel-spring, starch, glue, carriage, nail, and flour-mills. It has a large distillery, a slaughtering and meat-packing plant, brick-yards, tanneries, and foundries. The city owns and operates the waterworks. The government is under the charter of 1883. The officers are a mayor, who holds office for four years, a city council, and administrative officials elected by the city council. The industrial growth of Hammond has been rapid, and the population has more than doubled in the last decade. Pop. (1890) 5,428; (1900) 12,376.

Ham'mondsport, N. Y., town in Steuben County, on the Erie, and the New York, O. & W. R.R.'s; about 55 miles southeast of Rochester and 50 miles southwest of Auburn. The town is in a fertile agricultural section, noted especially for the large number of vineyards. The chief manufactures are wine, fruit-boxes, flour, cigars, barrels, wire hoods, and baskets. Hammondsport has a large trade in wine, and in grapes and other fruits. It contains a high school, and several other good public buildings. Pop. 1,230.

Ham'monton, N. J., town in Atlantic County; on the Philadelphia & R. and the Camden & A. R.R.'s; about 27 miles southeast of Camden and 28 miles northwest of Atlantic City. It is situated in a region noted for its rich farms and abundance of fruit. The chief manufactures

are shoes and cigars; but it is the trade centre for the northeastern part of the county, and from Hammonton a large amount of small fruits are shipped to New York and other cities. Pop. (1900) 3,481.

Hammurabi, hăm-moo-rä'bē, The Code of, a recently discovered code, instituted by Hammurabi, king of Babylon, about 2200 B.C. The code is a thousand years older than the Mosaic age; older than the laws of either Manu, or Moses. It is engraved on a pillar of black diorite, eight feet high, which was finally unearthed, January 1902, in the acropolis mound at Susa. The obverse of the column is surmounted by a bas-relief which represents the god Bel, the lawgiver, before whom the king stands to receive the law. The inscription which covers this stately monolith is the longest Babylonian record ever discovered. It contained originally about three thousand lines of writing, divided into forty-nine columns; but five columns on the front have been erased by some Elamite king, probably Sutruk Naknunti, who served the stele of Naram-Sin in a similar manner. The writing is a very beautiful type of the best archaic script, a kind of black-letter cuneiform, long used by kings for royal inscriptions. The code is divided into about 280 clauses, and opens with the words, "Law and justice I established in the land, I made happy the human race in those days."

Character of the Code.— The code shows a most careful and systematic order, beginning with witchcraft, which connects it with a religious code; it passes through all grades of social and domestic life, ending with a scale of official wages for all classes of workmen, even the lowest in the scale. Hammurabi's laws of witchcraft preserve the "ordeal of water."

"If a man has placed an enchantment upon a man, and has not justified himself, he upon whom the enchantment is placed to the Holy River (Euphrates) shall go; into the Holy River he shall plunge. If the Holy River holds (drowns) him he who enchanted him shall take his house. If on the contrary, the man is safe and thus is innocent, the wizard loses his life and his house."

The same ordeal was applied to a wife for unfaithfulness or extravagance, or to a wine-seller who sold drink too cheap.

The three essential features of the code may be clearly defined. First it is based on personal responsibility and the *jus talionis.* Thus: "If any one destroys another's eye, his own eye shall be destroyed. If any one breaks another's bone, his own bone shall be broken. If any one knocks out the tooth of his equal, his own tooth shall be knocked out." Next the belief in the sanctity of the oath before God, as in the Hebrew code, and also the absolute necessity of written evidence in all legal matters, as became a nation of scribes. Judgments in the law courts required a "sealed" document; an agent must take and give receipts for all money or goods entrusted to him; bonded goods required a deposit note. One of the most interesting series of clauses relates to officers or constables employed on active service; the estate of such a person could be entrusted to management, must not be sold or mortgaged, but he must depute a representative, or three years' absence and neglect forfeited fief. Substituted service was not allowed. As might be expected in a land so rich in cultivation, the agricultural laws are most explicit. Land must be cultivated, and if neglected the owner had to pay the same as neighboring land. Damage to crop by storm excused the payment of interest on loan. There are very stringent laws as to the tending of the irrigation canals and ditches, and any damage to adjacent land by neglect had to be made good. The commercial laws are extremely important, as showing a highly developed system. Noticeable are the clauses relating to agents or peddlers, commercial travelers of the period.

"If on the road on his business, the enemy have caused him to lose the property he bore, the agent by the name of God shall swear and he shall be quit. If a merchant gives goods to an agent to trade with, the agent shall write down the money, and to the merchant he shall render; the agent a sealed (receipt) for the money he gave to the merchant shall take."

Monetary Transactions.— Money for which no receipt was taken was not to be included in the accounts. In case of dispute all witnesses and documents must be produced. Among the commercial laws are some of much interest at the present time relating to licensed premises. It is curious to note that all wine merchants were females.

"If riotous persons assemble in the house of a wine merchant and those riotous persons she seizes not and drives to the palace that wine merchant shall be put to death."

Curious, too, is the following, which seems to reflect the Hebrew Nazarite law: "No votary or woman residing in the cloister may open a wine shop or enter one for drink on pain of being burned."

In the code's domestic legislation, the most striking feature is the high position and legal protection extended to women. If a man causes a votary or the wife of a man "to have the finger (of scorn) pointed at her and has not justified himself" he is to be branded on the forehead.

To justify herself from scandal a woman could claim the ordeal of plunging in the sacred river. The mere formula of marriage "taking to wife" was not sufficient, for "if a man married a woman and executed not her deeds that woman is no wife." Divorce law is most fully given — a childless woman could be divorced. If divorced without cause the husband must allow alimony and custody of her children, and a portion of the estate equal to a son, and the woman was free to marry. The woman could get a divorce, but must justify her right to do so. Thus we read:

"If the wife of a man who dwells in the house of that man has set her face to go forth, and has acted the fool, and wasted his house, and impoverished his house, they shall call her to account. If the husband shall say, I put her away, he shall put her away. She shall go her way; for her divorce he shall give her nothing."

If the husband insisted, such a wife could be drowned. There is, however, a kindlier tone in the law as to a sick wife. "If a man has married a wife, and sickness has seized her, he may take a second wife, but the sick wife he shall not put away; in the home she shall dwell; as long as she lives he shall sustain her."

Laws of Property.— The laws of property

are most full and based on a most equitable system, one clause relates to the remarriage of a widow with young children, and might be present-day law:

«If a widow whose children are young has set her face to enter into the house of another, without the consent of the judge she shall not enter. When she enters into the house of another, the judge shall inquire regarding the house of her former husband. The house of her former husband to that woman and her future husband he shall entrust and cause them to deposit a deed. They shall keep the house and rear the little ones, but furniture for money they shall not sell. A purchaser that has bought any furniture from the children of the widow shall forfeit his money and return the property to its owner.»

Here we have all the essential features of the modern ward in chancery. In the conclusion of this code Hammurabi repeatedly calls himself «King of Righteousness,» as did his contemporary Melchisedek of Jerusalem, and enjoins upon all of his successors upon the throne to observe this code and its laws.

Hamon, Jean Louis, zhŏñ loo-ē ä-môñ, French genre artist: b. Plouha, Cotes-du-Nord, France, 8 May 1821; d. St. Raphael, Var, France, 29 May 1874. His work though not strong exhibits grace in drawing and has been popular. His most important work in the United States is 'Among the Flowers,' to be seen in the New York Metropolitan Museum.

Hamp'den, John, English statesman: b. London 1594; d. Thame, Oxfordshire, 24 June 1643. He was educated at Oxford and possessing an ample estate, led for several years the usual career of country gentlemen. He was cousin-german, by the mother's side, to Oliver Cromwell. He entered Parliament in the beginning of Charles I.'s reign as member for Grampound, and continued to sit in the House of Commons three times in succession as member for Wendover, and finally for Bucks. In 1636 his resistance to Charles' demand for ship-money made him the argument of all tongues, especially as it was after the decision of the judges in favor of the king's right to levy ship-money, that Hampden refused to pay it. Being prosecuted in the Court of Exchequer, he himself, aided by counsel, argued the case against the crown lawyers for twelve days before the twelve judges; and although it was decided against him by seven of them to five, the victory, as far as regarded public opinion, was his. From this time he received the title of the "patriot Hampden." In the following year (1637) he was one of those who meditated emigration to America, which they were prevented from carrying out by an order in council detaining them. Henceforward he took a prominent part in the great contest between the crown and the Parliament, and was one of the five members whom the king, in 1642, attempted, in person, to seize in the House of Commons. When civil war broke out Hampden acted with his usual decision, took command of a regiment in the parliamentary army, under the Earl of Essex. Prince Rupert having appeared near Thame, in Oxfordshire, Hampden joined a few cavalry that were rallied in haste, and in the skirmish that followed on Chalgrove Field, received a wound which proved fatal six days after its infliction. His death was a great subject of rejoicing to the royal party, and of grief to his own. His character and conduct, from first to last, evince his conscientiousness, and he has taken his rank by acclamation on the one side, and tacitly on the other, high in the list of English patriots. Consult: Nugent, 'Memorials of John Hampden' (1831); Forster, 'Life of Hampden' (1837); Gardiner, 'History of the Great Civil War,' Vol. I. (1880).

Hampden, Renn Dickson, English Anglican bishop: b. Barbadoes, W. I., 29 March 1793; d. London, England, 23 April 1868. Although a man of moderate abilities both as philosopher and theologian, it was his fortune to precipitate one of the most notable controversies in the English Church. As Bampton lecturer for 1832 he lectured on 'The Scholastic Philosophy Considered in its Relation to Christian Theology,' which brought upon him the charge of Arianism, and when he became regius professor of divinity at Oxford, in 1836, opposition to the appointment was very bitter and widespread. He was accused of heresy and all the leading men in the Anglican Church took sides in this theological war of words. In 1847 he was nominated by Lord John Russell for the see of Hereford and the strife of ten years previous was renewed in organized fashion, many bishops uniting in remonstrance and the dean of Hereford openly resisting. He was nevertheless consecrated in March 1848, and his episcopate of 20 years was quiet and uneventful, the echoes of the great controversy having ceased long before his death.

Hampden, Maine, town in Penobscot County; on the Penobscot River; about five miles southwest of Bangor. The chief manufactures are flour and lumber. There is an extensive river trade, chiefly in lumber and food products. The town is one of the oldest in the State, but recently it has grown steadily in industries and population. Pop. 2,484.

Hampden-Sidney College, in Hampden Sidney, a village near Farmville, in Prince Edward County, Va. The school was founded by the Presbyterian Church of Hanover, in 1776, and in 1783 was incorporated by the legislature of Virginia. The land was donated by Peter Johnston, but the acreage has been increased by gifts and purchases, and the college now owns 250 acres. Among the incorporators were Patrick Henry, James Madison, Nathaniel Venable, Paul Carrington, William Cabell, Sr., and many other famous Virginians. Rev. John Blair Smith, the first president of Union College, New York, had previously been president of Hampden-Sidney, also Rev. Archibald Alexander, a founder of Princeton Theological Seminary. It grants the degrees of bachelor of arts, bachelor of science, and bachelor of literature. In 1902 there were in attendance 107 students. The library contained 15,000 volumes.

Hampton, Wade, American general: b. South Carolina 1754; d. Columbia, S. C., 4 Feb. 1835. During the Revolutionary War he served under Sumter and Marion. He was a Democratic representative in Congress from South Carolina 1795–97, and again from 1803 to 1805. In 1809, he was promoted to be brigadier-general, subsequently was stationed in command at New Orleans, was superseded; in 1813 he was raised to the rank of major-general and ap-

pointed to command the force stationed at Norfolk, whence he was shortly afterward ordered to the northern frontier and placed in command of the army on Lake Champlain, with directions to threaten Montreal. The attack on Montreal, for which 12,000 men had been concentrated near Lake Champlain, was frustrated by Hampton's unwillingness to co-operate with his colleague General Wilkinson, with whom he had been long at enmity. Hampton resigned his commission 6 April 1814, and passed the rest of his life in agricultural pursuits. He was considered the wealthiest planter in the United States, and was reputed to be the owner of 3,000 slaves.

Hampton, Wade, American soldier: b. Columbia, S. C., 28 March 1818; d. there 11 April 1902. He was graduated from the University of South Carolina, studied law but never practised, managed extensive plantations in South Carolina and Mississippi, served in both houses of the State legislature, but, as a Union Democrat, was not popular among South Carolinians. At the beginning of the Civil War, he formed and equipped at his own expense the command of cavalry, infantry, and artillery known as 'Hampton's legion.' With this he won distinction at the first Bull Run and at Seven Pines, where half his troops were killed and himself severely wounded. Having been made brigadier-general of cavalry and assigned to J. E. B. Stuart's command, he took part in Lee's advance northward (1863), was prominent at Gettysburg, and later brilliantly opposed Sheridan's progress in the Shenandoah valley. He attained the rank of lieutenant-general in 1864, and was placed in command of Lee's entire cavalry forces. In 1865 he commanded J. E. Johnston's cavalry, and endeavored to prevent Sherman's northward advance from Savannah. After the war he was an active reconstructionist; in 1876 was nominated as the Democratic candidate for governor, and, after a contest regarding the election with D. H. Chamberlain, the Republican nominee, served until 1878, when he entered the United States Senate. He was in the Senate until 1891, and in 1893–7 was United States commissioner of railroads.

Hampton, Iowa, city, county-seat of Franklin County; on the Chicago G. W., and the Iowa C. R.R.'s; about 29 miles by rail south of Mason City and 60 miles north by west of Marshalltown. It is situated in an agricultural and stock-raising region. The chief industrial establishments are cigar factories and aluminum works; and its principal trade, in addition to the manufactured articles, is in grain, tobacco, live stock, and horses. Pop. (1900) 2,727.

Hampton (formerly HAMPTON COURT-HOUSE), S. C., village, county-seat of Hampton County; on a branch of the Atlantic C. L., and the Hampton & Branchville R.R.'s; about 67 miles southeast of Augusta. The village is in the yellow pine section, but cotton, sweet potatoes, and Indian corn are the staple products of the surrounding farm lands. Its chief manufactured article is lumber. Pop. 320.

Hampton, Va., town, county-seat of Elizabeth City County; on the north shore of Hampton Roads, on the Chesapeake & O. R.R.; about two and a half miles from Fortress Monroe and 15 miles north by west from Norfolk. In the last of the 16th and first of the 17th centuries the Indian village Kiquotan occupied the site of the present town of Hampton. John Smith and Lord Delaware mention (1608–10) the peaceful friendly Indians of Kiquotan, the hunters and fishermen; but before 1610 there were whites living along the shore and in this Indian village which retained its Indian name for some time after it became a white settlement. In the first session of the Virginia House of Burgesses or Colonial Legislature (1619), the borough of Hampton was represented. In the war of 1812 the town was attacked by the British and a large part was burned. In 1861 it was again burned by the Confederates. The Church of Saint John, Protestant Episcopal, built 1660, is still in good repair. Hampton contains a National Soldiers' Home, which has 2,000 resident veterans; a National Cemetery which contains 3,323 graves of soldiers, 600 of them of unknown dead. It is the seat of Hampton Normal and Agricultural Institute (q.v.). It has some manufactures; brick, fish-oil, and canned crabs. It has considerable trade in fish, especially oysters, and in fruits and vegetables. It has excellent bathing facilities and is a popular resort. Pop. (1890) 2,513; (1900) 3,521.

Hampton Court, England, a royal palace situated near Hampton, a village of Middlesex, 15 miles southwest of London. The palace is about one mile from the village. The original edifice consisted of five quadrangles, of which two remain; it was built by Cardinal Wolsey in 1525, and presented in 1526 to Henry VIII., by whom it was subsequently enlarged, and who formed around it a royal park or chase, which he enclosed and stocked with deer. A third quadrangle was added by Sir C. Wren for William III., who laid out the gardens and park in Dutch style. Hampton Court contains many valuable pictures by Holbein, Lely, Kneller, West, etc. The gardens comprise about 44 acres, and contain a famous "maze" and "wilderness." Hampton Court was inhabited by successive monarchs and their families until the reign of George II. Suites of apartments in Hampton Court palace are now set apart for persons of rank in reduced circumstances. The state apartments, picture gallery, gardens, and home park are open to the public. In 1886 the palace suffered considerable damage by fire.

Hampton Court Conference, a meeting at Hampton Court (q.v.), on the 14th, 15th, and 16th of January 1604, which was convened on the petition of the Puritan ministers to King James I. for moderation and tolerance on religious questions. By the composition of the conference,—on the episcopal side being the Archbishop of Canterbury, eight bishops, five deans, and two doctors, and on the Puritan side only four representatives,—the king sufficiently indicated his attitude toward the aims of the Puritans, and the proceedings consisted chiefly of adulation of James on the part of the episcopal party, and lecturing of the Puritan members by King James. A few alterations were made in the Prayer Book, and a new version of the Bible was agreed upon, the result being the authorized version of 1611.

Hampton Normal and Agricultural Institute, a school for negroes and Indians,

opened in 1868, in Hampton, Va., under the auspices of the American Missionary Association. It was chartered by the State in 1870. The school is owned and controlled by a private corporation, administered by 17 trustees. The charter gives the trustees power to choose their own successors, and to hold property without taxation to the amount of $800,000. In 1875 the General Assembly of Virginia passed an act giving the Institute one third of the agricultural college land-grant of Virginia (see COLLEGES, LAND-GRANT) amounting to 100,000 acres, which was sold for $95,000 and which pays regular annual interest. The school was first opened in an old barracks (used during the Civil War), with two teachers and 15 pupils. It now (1903) owns 185 acres on Hampton River, upon which have been erected dormitories, a library, class-room buildings, a church, gymnasium, saw and planing-mill, shops, hospital, domestic-science school, trade school,— in all numbering 55 buildings. The Institute owns also a stock farm of 600 acres, about five miles from the school. The farm land, and the workshops where trades are taught, furnish occupation for the boys and young men. The girls are instructed and employed in sewing and cooking classes, in all the domestic work of the school, and wherever possible learning trades side by side with the boys. In 1896 the Armstrong and Slater Memorial Trade School was opened. (See NEGRO, EDUCATION OF THE.) In this school is taught the theory and practice of blacksmithing, carpentry, house painting, tailoring, and general repairing. The pupils are taught also, mechanical, civil, electrical, and mining engineering. On the farms they are taught how to care for stock, how to raise different crops, and the theory and practice of farming in general. The students are charged $10 a month for board, which is largely paid in labor. They are expected to provide their own books and clothing, and for the tuitions, buildings, furniture, and the implements used on the farms and in the shops, the school is dependent on the charity of the country. In 1878, 15 Indians, who had been prisoners of war at Saint Augustine, Fla., and in charge of Capt. R. H. Pratt, were admitted as students. Since then the Indian department has increased steadily, the pupils being chiefly from the Sioux tribe, of whom two thirds make a fair or good record. The young men of the school are organized into six military companies, all forming one battalion. This places the young men under military discipline. The 'Southern Workmen,' a monthly school periodical, is edited, printed, and managed by the pupils with only a general supervision by one of the teachers. The vacation is from June to October for all except the pupils in the industrial departments, which continue work all the year. During the regular long vacation a large number of the colored teachers of the South assemble here for a summer school. For the past ten years the average attendance at these summer schools has been nearly 500. The graduates number about 1,000, more than half of whom are teaching in the colored schools of the South. In 1902 the number of pupils in the Hampton Institute was 1,161, about 90 per cent of whom were in the industrial and preparatory departments, the remainder in the college department. The same year there were 82 instructors in the school. The library contains about 12,000 volumes. Many of the graduates are engaged in farming or working at trades; some are teaching. Booker T. Washington (q.v.), of the class of 1875, is the most noted graduate. Hampton's endowments amount to about $1,100,000. The annual income is about $170,000, and comes from the Government Indian Funds, the Slater and Peabody Funds, the State land-grant and agricultural funds, and from private donations.

Hampton Roads, Va., a broad deep channel which connects the estuary of the James River with Chesapeake Bay; really a part of the estuary which is at the mouths of the James, Elizabeth, and Nansemond rivers. Some of the good harbors along the shore are Norfolk and Portsmouth on the south; Hampton, on the Hampton Creek, an arm of the Hampton Roads, on the north. At the entrance are Forts Monroe and Wool. On the north side of the entrance is Thimble Shoal light, at lat. 37° 42′ N. and lon. 76° 14′ 5″ W. A large number of railroads have terminals on Hampton Roads, especially at Norfolk. This estuary, or channel, is considered of great military importance. During the Civil War its advantages as a military station were demonstrated. On Hampton Roads occurred the battle of Hampton Roads (q.v.), the first engagement between ironclads.

Hampton Roads, Battle of. Hampton Roads was the rendezvous of several important naval and military expeditions during the war, and the scene of two memorable encounters. On 8 March 1862 the Confederate ram Merrimac (or Virginia) left her anchorage at Norfolk, 12 miles from Fort Monroe, steamed down Elizabeth River and, with her consorts, five in number, attacked the Union fleet of five vessels in the roads, destroying the Congress and Cumberland, which lost over 250 men, and then retired to the mouth of Elizabeth River. Next morning the Merrimac returned to the roads to complete the destruction of the Union fleet, but was met by the Monitor, which had arrived the night before from New York, and a novel naval battle ensued, resulting in the return of the Merrimac to Norfolk and the saving of the remainder of the Union fleet. See MONITOR AND MERRIMAC.

E. A. CARMAN.

Hampton Roads Conference, an informal conference held 3 Feb. 1865, between President Lincoln and Secretary of State Seward, representing the United States government, and Vice-President Alexander H. Stephens, Senator Robert M. T. Hunter, and Assistant Secretary of War John A. Campbell, representing the Confederate States. The meeting took place on board the River Queen, near Fort Monroe, and its object was the arrangement of a peace between the North and South. The originator of this conference was Francis P. Blair (q.v.) who thought a combination of North and South against Maximilian in Mexico, in enforcement of the Monroe doctrine, would bring in peace by a diversion. President Lincoln refused to join the conference excepting with a view to the restoration of union, and on the understanding that the Emancipation Proclamation was to

stand without qualification. He disapproved of a joint action against the French in Mexico. The conference lasted for four hours, but broke up without reaching any definite conclusion.

Hamstring. See ANATOMY; MUSCLES.

Han-yang, hän-yäng'. See HANKOW.

Han'aford, Phebe Ann Coffin, American Universalist minister: b. Nantucket, Mass., 6 May 1829. In 1849 she was married to J. H. Hanaford, a teacher. She was the first woman ordained to the ministry in New England and since her ordination in 1868 has held pastorates in Hingham and Waltham, Mass., New Haven, Conn., and Jersey City. She has been industrious as a writer, among her many published works being 'Life of Abraham Lincoln'; 'Life of George Peabody'; 'Lucretia the Quakeress'; 'Leonette, or Truth Sought and Found'; 'The Best of Books and its History'; 'Frank Nelson, the Runaway Boy'; 'The Soldier's Daughter'; 'Field, Gunboat, and Hospital'; 'Women of the Century'; 'From Shore to Shore, and Other Poems'; etc.

Han'cock, John, American statesman: b. Braintree, Mass., 23 Jan. 1737; d. Quincy, Mass., 8 Oct. 1793. He was graduated at Harvard College in 1754, but shortly after entered the counting house of an uncle, on whose death in 1764 he received a fortune of £80,000. After 1766 he was several times elected to the Massachusetts General Court. It was the seizure of his sloop, the Liberty, that occasioned the riot in 1768, when the royal commissioners of customs narrowly escaped with their lives. After the so-called "Boston massacre," in 1770, he was a member of the committee to demand of the royal governor the removal of the troops from the city, and at the funeral of the slain delivered an address which greatly offended the governor, who now endeavored to seize the persons of Hancock and Samuel Adams. Both were members of the Provincial Congress at Concord and later of that at Cambridge, and Hancock was president of each. This arrest is said to have been one of the objects of the expedition to Concord which led to the first battle of the revolution after which Gage offered pardon to all the rebels except these two, "whose offences," he added "are of too flagitious a nature to admit of any other consideration but that of condign punishment." In 1775 Hancock was chosen president of the Continental Congress, and in 1776 signed the Declaration of Independence. He resigned from the presidency in 1777, but was a member of the Congress until 1780, and again in 1785–6. With rank of major-general, he commanded the Massachusetts forces in the Rhode Island expedition, in 1780 was a member of the Massachusetts constitutional convention, and under that constitution was in 1780 chosen first governor. To this office, with an interval of two years (1785–7) he was annually re-elected till his death. Hancock was a man of strong common sense and great decision of character, of polished manners, easy address, affable, liberal, and charitable. His personal vanity, and his jealousy were at times conspicuous, but he was a sincere patriot, and of much ability. John Adams said of him: "He was by no means a contemptible scholar or orator. Compared with Washington, General Lincoln, or Knox, he was learned." See A. E. Brown, 'John Hancock: his Book' (1898).

Hancock, Winfield Scott, American soldier: b. Montgomery Square, Pa., 14 Feb. 1824; d. Governor's Island, New York harbor, 9 Feb. 1886. He was graduated from the United States military academy in 1844, and after frontier service in the Sixth infantry fought with credit in the Mexican war, was successively regimental adjutant and quartermaster in 1848–55, and briefly assistant adjutant-general to the Department of the West. Appointed assistant-quartermaster with rank of captain in 1855, he was stationed at Fort Myers, Fla., during the Seminole disturbances, and in 1857–8 was in Kansas, whence, after service, in the border troubles, he was ordered successively to Utah and California. In 1859–61 he was chief quartermaster of the southern district of California, with headquarters at Los Angeles. At the beginning of the Civil War, he was commissioned brigadier-general of volunteers, and assigned to the command of a brigade in Smith's division, Fourth corps, Army of the Potomac. He distinguished himself at Williamsburg and during the second day's fight at Antietam (17 Sept. 1862) was placed in command of the 1st division, Second army corps. Promoted major-general, U. S. V. (November 1862), he commanded his division at Fredericksburg in the attack on Marye's Heights, on which occasion he lost 2,013 from a total of 5,006 troops. He largely saved the day at Chancellorsville (2–4 May 1863), and shortly afterward was assigned to the command of the Second corps. In July 1863, he was ordered by Meade to proceed to the field of Gettysburg, take command, and report whether battle should be given at that point. He reported Gettysburg as the suitable place for the ensuing battle, reorganized the Federal lines, on 2 July commanded the left wing, and on the next day the left centre, against which was directed a Confederate charge in the course of which the Second corps lost about 4,000 killed and wounded out of less than 10,000 troops and Hancock was shot from his horse. In 1866 he was appointed major-general, U. S. A., in 1866–8 commanded successively the departments of Missouri, and of Texas and Louisiana, in 1868–9 the military division of the Atlantic, in 1869–72 the department of Dakota. He was again assigned to the division of the Atlantic in 1872. In 1880 he was Democratic candidate for the presidency, but was defeated by Garfield by a vote of 4,454,416 to 4,444,952. He was a brilliant leader, known as "Hancock the Superb," — "the most conspicuous figure," says Grant, "of all the general officers who did not exercise a separate command." Consult the 'Life' by Walker (1894).

Hancock, Mich., village in Houghton County; on Lake Portage, and on the Duluth, S. S. & A. railroad; opposite Houghton (q.v.). Although the northern part of Michigan and this region had been explored by missionaries in the 17th century, the first permanent settlement was made in Hancock in 1859, and the village was incorporated in 1863. It is situated in a section rich in minerals, the Lake Superior copper belt. The Calumet and the Hecla copper mines are nearby, and the village has foundries, machine-shops, smelters, stamp-mills, lumber and brick yards. A ship-canal to Lake Superior brings a large portion of the lake traffic to and

from Duluth and Superior through the "short cut," by way of Hancock. It is the seat of a Finnish college. The government is vested in a president, whose term of office is one year, and a village council who are elected by the people. The village owns and operates the waterworks. Pop. (1890) 1,772; (1900) 4,050.

Hancock, N. Y., village in Delaware County: at the junction of the two branches of the Delaware River, on the Erie and the New Y., O. & W. R.R.'s. Nearby are bluestone quarries, which add to the industrial wealth of the village. Hancock has flour-mills, tanneries, a wood alcohol factory, and large lumber-yards. It is a trade centre for an extensive agricultural region. Pop. (1900) 1,283.

Hancock, Mount, a peak of the Big Game Range, in the southern part of the Yellowstone National Park, on the boundary between the Park and Wyoming. It is on the western border of Two Ocean Plateau, a portion of the continental divide. The Snake River (q.v.) has its rise on the east side of Mount Hancock, flows north by west, then south by west around and almost circling the mountain. Mount Hancock is 10,235 feet in height.

Hand, Edward, American revolutionary soldier: b. Clyduff, King's County, Ireland, 31 Dec. 1744; d. Rockford, Lancaster County, Pa., 3 Sept. 1802. In 1774 he came to America as surgeon's mate in the 18th Royal Irish regiment, but he later resigned and entered medical practice in Pennsylvania. At the outbreak of the Revolutionary War, he became a lieutenant-colonel in Gen. William Thompson's brigade, participated in the siege of Boston, and in 1777 was appointed brigadier-general. In 1778 he succeeded General Stark in the command at Albany, and later took part in General Sullivan's expedition against the Iroquois. He sat in Congress in 1784–5, and signed the Pennsylvania constitution in 1790.

Hand. The human hand is composed of 27 bones, namely eight bones of the carpus or wrist arranged in two rows of four each, the row next the fore-arm containing the scaphoid, the semilunar, the cuneiform, and the pisiform, and that next the metacarpus, the trapezium, the trapezoid, the os magnum, and the unciform. The metacarpus consists of the five bones which form the palm, the first being that of the thumb, the others that of the fingers in succession. Lastly, the fingers proper contain 14 bones called phalanges, of which the thumb has but two, all the other digits having three each. These bones are jointed so as to admit of a variety of movements, the more characteristic being those by which the hand is flexed backward, forward, and sideways, and by which the thumb and fingers are moved in different ways.

The chief muscles which determine these movements are the "flexors," which pass down the fore-arm, are attached by tendons to the phalanges of the fingers, and serve to flex or bend the fingers; and the "extensors" for extending the fingers. There are two muscles which flex all the fingers except the thumb. The thumb has a separate long and short flexor. There is a common extensor for the fingers which passes down the back of the fore-arm and divides at the wrist into four tendons, one for each finger, each being attached to all three phalanges. The fore-finger and little finger have, in addition, each an extensor of its own, and the thumb has both a short and a long extensor. The tendons of the muscles of the hand are interlaced and bound together by bands and aponeurotic fibres, and from this results a more or less complete unity of action. It is sometimes difficult to make a movement with a single finger without the others taking part in it, as in executing instrumental music, for instance; but practice gives to these movements perfect independence.

Of all the movements of the hand the opposition of the thumb to the other fingers, alone or united, especially characterizes the human hand. This action of the thumb results from its length, from the first metacarpal bone not being placed on the same plane as the other four, as is the case in the monkey, and from the action of a muscle — the long flexor of the thumb — peculiar to the human hand. This muscle completes the action of the other motor of the thumb and permits man to hold a pen, a graver, or a needle; it gives to his hand the dexterity necessary in the execution of the most delicate work. Properly speaking then, the hand, with its highly specialized muscles, belongs to man alone. It cannot be considered, as in the ape, as a normal organ of locomotion. It is essentially the organ of touch and prehension. It molds itself to a body to ascertain its form; it comes to the aid of the eye in completing or rectifying its impressions. The functions of touch devolve principally on its anterior or palmar face, the nervous papillæ abounding specially at the ends of the fingers. A layer of adipose tissue very close in texture protects, without lessening its power or its delicacy, the network of muscles, vessels, and nerves with which this remarkable organ is equipped.

Hand'ball, a popular game of ball, the bare hand only being used. The game is indigenous to Ireland, but has been transplanted to America, where are the most expert players. Two or four men can play, one or two on a side. As far as is known the game of handball came to the United States about 1840, and has since become one of the sports under the regulations of the Amateur Athletic Union. The game consists of scoring the ball against a single back wall, with a lined-out space of 60 feet in front. The ball coming from the wall must fall between these two lines to be in play. The game is simply to strike the ball on the rebound with the hand.

Han'del, George Frederick, (properly Georg Friedrich Haendel), English composer: b. Halle, Saxony, 23 Feb. 1685; d. London 20 April 1759. His father, intending him for the law, discouraged the strong passion which he evinced early in life for the science of music. But although forbidden the use of musical instruments, the young musician contrived to hide a small clavichord in a garret, where he amused himself during great part of the night after the rest of the family had retired, and made such progress that, when at seven he accompanied his father to the court of Saxe-Weissenfels, he played on the church organ with such power and effect that the duke, who accidentally witnessed his performance, used his influence successfully with his father to permit him to follow his inclination. He was accordingly placed under

Zachau, organist of the cathedral, and was soon so far advanced in the practical part of the science as to officiate occasionally as deputy to his instructor. At 14 (1698) he went to Berlin, where at that time the opera under the direction of Buononcini and Attilio was in a very flourishing condition. Attilio became his teacher and friend. In 1703 he went to Hamburg, and procured an engagement in the orchestra at the opera there. On 30 Dec. 1704, he brought out his first opera, 'Almira,' in the February following succeeded by his 'Nero,' and subsequently by 'Florindo' and 'Daphne.' He then went to Italy, where he composed the operas 'Rodrigo' and 'Agrippina,' and the first form of the serenade 'Acis and Galatea.' On his return to Germany in 1710 he entered the service of the Elector of Hanover, afterward George I. of England, as chapel-master; but having received invitations to visit London, he set out for England, where he arrived in the latter end of 1710. On the occasion of his first visit to England he composed the opera 'Rinaldo.' He soon returned to Hanover, but at the end of two years again received permission to visit England. At the time of his arrival in London the negotiations for the Peace of Utrecht were just about to be concluded, and Handel was invited by Queen Anne to compose a 'Te Deum' and 'Jubilate' in celebration of the peace. But this act was so distasteful to the Elector of Hanover that Handel did not venture to return, but remained in England on an income of £200 a year allowed him by the queen. He was, in consequence, on the accession of his royal patron to the throne of Great Britain in 1714, in much disgrace, till Baron Kielmannseck restored him to favor. From 1715–18 Handel resided with the Earl of Burlington, and then quitted that nobleman for the service of the Duke of Chandos, who entertained him as chapelmaster to the splendid choir established at his seat at Cannons. For the service of this magnificent chapel Handel produced those anthems and organ fugues which alone would have been sufficient to immortalize him. When the Royal Academy of Music was instituted by some of the leading noblemen of England, Handel, whose fame had now reached its height, was placed at its head; and this, for a short period, may be considered as the most splendid era of music in England. The warmth of his own temper, however, excited by the arrogance and caprice of some of his principal Italian singers, caused many violent quarrels; and public opinion becoming enlisted in favor of his opponents, and especially of his rival, the musician Buononcini, his popularity waned somewhat and the Academy was dissolved (1728). Handel then started a new operatic company. But a rival company to his was afterward started, and the result was that much money was lost by both. The operas which he had composed up to this date (1735), from the institution of the Academy of Music, were 'Radamisto'; 'Ottone'; 'Giulio Cesare'; 'Floridante'; 'Flavio'; 'Tamerlano'; 'Rodelindo'; 'Alessandro'; 'Scipione'; 'Ricardo I.'; 'Tolomeo'; 'Siroe'; 'Lotario'; 'Parthenope'; 'Poro'; 'Orlando'; 'Sosarme'; 'Ariadne'; 'Ezio'; 'Ariodante'; and 'Alcina.' Among other works should be mentioned his first English oratorio, 'Esther', and his delightful pastoral 'Acis and Galatea.' In 1736 his famous setting of Dryden's ode, 'Alexander's Feast,' was performed with brilliant success. His last opera was performed in 1741. Handel had by this time begun to devote himself chiefly to music of a serious nature, especially the oratorio. The approval which his first works of this kind 'Esther,' 'Deborah' (1723), 'Athalia' (1733); had met with encouraged him to new efforts; and he produced in succession 'Saul,' 'Israel in Egypt,' and 'The Messiah.' The last-mentioned, his chief work, was brought out at Dublin in 1742. This sublime composition had been composed the previous year, in the incredibly short period of twenty-three days. When Handel returned to London his oratorios were received at Covent Garden Theatre with the greatest approbation by overflowing audiences — 'The Messiah' in particular increased yearly in reputation. Before it was given, however, a new oratorio, 'Samson,' was produced (1743), and there next followed 'Joseph and his Brethren' (1744), 'Belshazzar' (1745), 'Judas Maccabæus' (1747), 'Joshua' (1748), 'Solomon' (1749), and 'Jephthah' (1752). Some time before his death he was afflicted by nearly total blindness; but he continued not only to perform in public but even to compose. His own air, however, 'Total Eclipse,' from the oratorio of 'Samson,' is said always to have affected and agitated him extremely after the loss of his sight.

Handel's habits of life were regular; his appetites were coarse, his person large and ungainly, his manners rough, and his temper even violent; but his heart was humane, and his disposition liberal. His musical powers can hardly be estimated too highly. In boldness and strength of style, and in the combination of vigor, spirit, and invention in his instrumental compositions he has never been surpassed. His choruses have a grandeur and sublimity which have never been equaled. Yet a singular fact in regard to him as a musician is that in some of his works he shows himself as an unscrupulous plagiarist — a fact of which various explanations and palliations have been attempted. He was buried in Westminster Abbey, where a monument by Roubillac was erected to his memory. See 'Lives by Chrysander' (1858–67); and Rockstro (1883); Whittingham, 'Life and Works of Handel' (1882); the articles in the 'Dictionary of National Biography' and Grove's 'Dictionary of Music.'

Han'dicap, Brooklyn. See HORSE-RACING.

Handicapping, a term used in racing: The allowance of time, distance, or weight made to the inferior competitors in a race with the object of bringing all as nearly as possible to an equality; the extra weight imposed on a superior horse in order to reduce his chance of winning to an equality with that of an inferior animal. The handicap is framed in accordance with the known previous performances of the competitors, and in horse-racing also with regard to the sex and age of the animals engaged. The principle is the same in other contests, as in billiards a superior player is handicapped by having to allow his inferior competitor a start of a certain number of points.

Handies (hăn'dĭz) **Peak,** in the southeastern part of Colorado, in the San Juan Range; about 12 miles northeast of Silverton. Rich

deposits of silver ore are found in all the mountains of this vicinity; the range is known as the 'Silver San Juan.' The altitude of Handies Peak is about 14,000 feet.

Handwriting, Expert Analysis of. A mental image may be made either consciously and with attention to every detail, or with varying degrees of consciousness amounting in some cases to almost complete automatism, but it must in any case be largely influenced by the machine which produces it. No matter what care may be employed to make two objects alike, a sufficiently minute inspection will always discern differences between them. It is from this fact we are able to distinguish a particular tone of a bell, a particular face, etc. All things, and notably those which owe their existence to organic life, are resultants of very complex forces acting simultaneously or in sequence, and in comparing similar resultants it is ever found that quantitative or qualitative differences of the constituent forces employed in fashioning them have occasioned differences in the objects themselves. These differences may be indiscernible to the casual view, but will never fail to reveal themselves to an examination sufficiently searching.

The factors employed in making marks may be roughly divided into: A, the model in the mind which it is the intention to reproduce; and B, the mechanism by which the act is to be accomplished. Under the latter head there is to consider not only the permanent structure of the individual, which necessarily limits his performance, but also the manner of employing this structure, which becomes a habit, and the fluctuations, due to disease, drugs, variations of mood, increasing age, etc., in the motor impulses controlling it.

The basis of any sound judgment on the authorship of designs such as pictures or handwriting, depends upon the recognition of sorts of differences; which it is essential to distinguish from each other. In general, designs by different authors differ in kind, while those of the same author differ in degree. The methods for distinguishing these two sorts of differences will be more particularly treated hereafter.

The general subject of the study of those characteristics which distinguish each handwriting from every other has been called *Grammapheny;* the study of methods for detecting frauds relating to handwriting either in imitating, altering, or suppressing a record, is called *Plassopheny;* and the general study of the records of human thought including their forms, their purport, and the tools and materials by means of which they are produced is called *Bibliotics.*

Ever since the more or less permanent records of human thought have had a value they have been the objects of falsification. It is not known to how great an extent this may have been practised in the hieroglyphic and ideographic carvings on stone, but doubtless interpolations were frequent in recording the deeds of their kings, and the sculptors imitated each other's style with a view of bettering their own; or each other's peculiarities to convey false impressions as to the narrator.

But with the introduction of writing in pigments on parchment and papyrus the greater facility with which alterations and erasures could be made immediately attracted the attention of the unscrupulous. According to historians the Greeks, Romans, Egyptians, Assyrians, and others practised garbling and forgery by erasing, resurfacing, and bleaching manuscripts to change their purport, or give false impressions of their age and authorship. These depredations, then as now, were chiefly made upon manuscripts of persons absent or, more commonly, deceased; whole compositions which they never saw being ascribed to them. As an example may be cited the interpolation in the text of Josephus with which Eusebius has been charged. A host of epistles, papal decrees, productions of the Fathers, and dogmatical treatises were in early times altered, erased in part, and falsified from the original text, sometimes by learned and reverend scholars for the greater glory of the Church, and sometimes by obscure copyists from ignorance, or trifling incentives. Erasmus declared he knew not a single important old manuscript which was not tainted by this kind of fraud. The methods of effacing the writing of a parchment multiplied in proportion to the increase of manuscripts and the cost of parchment. The practice of using such effaced parchments for other writings was common in the time of Cicero, as a letter from him to Trebatius testifies. Such writings were called palimpsests; and the custom of producing them gave dangerous experience to perpetrators of fraud in the art of effacing written characters by mechanical and chemical means. Plutarch speaks of this practice as one well known. As the price of parchment rose it began to be the habit in the early libraries to efface the letters from parchments "of little value" in order to replace them by more valuable compositions. Dangerous as was such a rule at any time it became fatal to learning when the choice was in the hands of ignorant monks inflamed against their adversaries in controversy, and against all "pagans," in which class almost all the great authors of our classics were included, and willing to sacrifice the choicest thoughts of the Greeks and Romans in favor of the fanatical dissertations of those they were pleased to call the "faithful."

When the Caliph Omar put an end to the manufacture and sale of papyrus he caused a wholesale destruction of the writings in the libraries throughout the world. Michelet states that "the fatal patience of the monks" accomplished more ruin than the conflagrations of Omar, of the hundred Spanish libraries, and of the Inquisition. (Consult Gustave Itasse, 'Le Faux devant l'histoire,' etc., from which much of the preceding is taken.) According to Adolphe Bertillon ('Revue Scien.' 25; 4 Ser. Vol. VIII. 18 Dec. 1897) the first recorded student of bibliotics was François Demelle in 1609, and the first writer on the subject one Raveneau (1656). In his treatise the latter deplores the lack of science of his colleagues, which however did not prevent their landing him in jail for forgery.

The methods employed in judging the authorship of handwriting by these and almost all later writers on the subject are the same as those relied upon by connoisseurs of painting. They deal exclusively with the pictorial and apparent peculiarities, and the undefined effect these produce upon the mind. The most daring of these methods is the so-called

"Graphology," described in a pamphlet of the Abbé Michon in 1880, which has many conscientious supporters and partial government recognition in Germany and France. This curious study has for its object the revelation of the character and peculiarities of a writer by his handwriting. It would lead to too long a digression should the various claims of the advocates of graphology be reviewed. It must suffice here to say that some of these not content with finding in the manuscript of an unknown writer personal peculiarities which he already possesses, have imagined they could detect the lurking tendencies to virtuous or vicious deeds such as self-sacrifice, kleptomania, murder, etc., which he has never developed. These are deduced from the pen habits which they think they detect in the writing: such as deliberation, precipitancy, economy of paper, or of effect, etc., etc. M. Bertillon thinks "To the public no proof is so decisive as that of personal identification of individuality, yet how many mistakes are made?" He believes with the exception of the advance in photography the art of handwriting judgment is just where Raveneau left it in the reign of Louis XIV. He forgets the aid he himself has rendered to the art of differentiating and identifying handwriting by the application of his anthropometrical measures for the identification of criminals. The former art without such methods is in precisely the state in which Bertillon found the latter before his demonstration that exact measurements of different parts of the body and the relation to each other of the results of such measurements entirely removed the chance of error in identification, whereas there have been many instances of mistaken identity, or denial of identity by a wife or other near relative of the person in question. The history of this minute branch of research resembles that of other and larger branches. Subjective impressions such as those supplied by the feelings, indicating supposed relative amounts or intensities of emotions or sensibility, which were the only guides to the pioneers of inductive research, gave way to exact methods by employment of instruments of precision recording facts in intelligible units, in estimating, for example, degrees of acidity, pitch of sounds, height of temperatures, intensity of lights. One after the other the old subjects of research were furnished with these unequivocal means of recording phenomena, and all the new subjects were required to find such means or forfeit recognition. Thus through mathematics astronomy, already in the van of exact sciences, was enabled to make enormous enlargements of our view of the universe in the last two centuries, and even those objects of research which seemed to defy such treatment were provided with mathematical methods. Psychology became a science admitting experimentation of which the results can be expressed in units, and chemistry is becoming as loyal a subject of that science of relation — mathematics — as its sisters, physics and mechanics.

The purpose of the investigation of a handwriting will determine the kind of examination that is made. If the object be to ascertain whether a particular signature has been legitimately placed as an authentification of a writing, it is necessary to scrutinize the paper on which it is written for evidence of scratching, erasing, or other tampering; the ink for peculiarities of constitution which may be inconsistent with its use at that time and in that place. The question of superposition of lines may show that the writing it validates was made after the signature. In numerous criminal trials each of these and of many other unmentioned demonstrable facts have at once stamped documents as fraudulent and obviated the necessity of the more particular study of the character of the writing. (Thus a water-mark in a paper on which was written a statement bearing date 1868 represented the German Eagle which was not adopted till after 1870, and this of course showed the whole instrument to be a fraud. A similar conclusion is forced in the case of traced characters purporting to have been written before Hofmann's discovery of the aniline colors yet demonstrably produced by aniline ink.) The value of a signature as authenticating a contract is forfeited if it is clear that parts of the body of the document were written after the signature was written. These and other problems in the domain of plassopheny are too numerous to treat in this place and attention will be directed exclusively to the grounds for deciding two specimens of writing to be by the same or by different hands.

The first and most obvious method is to compare their respective features; large or fine writing; perfect or imperfect shaping of the letters; slant or angle of the stems and tails of letters with the line of writing; peculiarities (of which there are always a number) in the forms of individual letters or in the manner of connecting or grouping them; alterations in pressure producing shading in certain directions, and many other similar details. These peculiarities are pictorial. In all genuine writing they arise from the limitations of the writer, first in forming a mental picture of what he wants to produce, and secondly in producing it. Any one of these peculiarities can be easily imitated by another, and indeed all the visible details together can be drawn or traced by a skilful artist, yet in the latter case not without revealing to one using a magnifying glass that the lines have been slowly and carefully drawn and not dashed off with ease. Even if words are photographed or traced from an original and afterward inked, an ordinary magnifying glass will show a difference in the pen marks from the current facility of the original writer. The careful study of such details constituted the entire basis of judgment of the expert till within recent years, and usually they will suffice; for though the forger should know all the minute peculiarities which are disclosed to the patient study of a handwriting, yet he could not reproduce many of them without betraying in the result a painstaking, labored use of the pen which would excite suspicion. Where the same word or signature occurs twice or more in a document the forger must avoid exact repetition of all the minutiæ and at the same time not make such deviations as are inconsistent with the habits of the writer. The most important of these habits for purposes of identification are not pictorial nor immediately apparent to the eye.

Proportions.— Among the most important kinds of characteristics which insensibly influence the judgment in forming a conclusion as to identity of authorship of two specimens of

handwriting are the proportions between certain parts of a letter, or word, or group of these, which often occur together. Especially is this the case with a signature, which is written so frequently that the act becomes almost automatic and therefore one in which the peculiarities due to the hand and arm making it, and to the brain furnishing the pattern, are most prominent because without the interference of voluntary effort. The result in fact resembles typewriting where the defects in the levers and type-faces of a type-writing machine can be detected; but with this difference that in handwriting they are still recognizable even when from lack of space or other causes the signature is written smaller or larger than usual. In such cases there is found a greater conformity to the established relations of parts of the signature than any foreign hand could make without a pantograph or other artificial aid. These proportions of parts may be detected either individually by carefully noted measurements, or by composite photographs of genuine signatures. Each method has some advantages over the other. In employing composite photography one attains to an ideal signature because all the possible characteristics of relation in every signature have been introduced, but on the other hand by this means only a form has been evolved — a graphic average — which must then be made the standard for comparison.

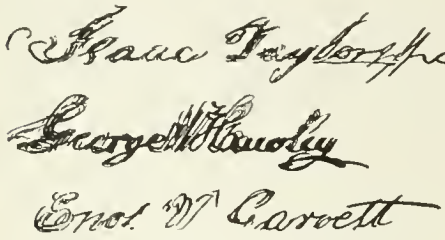

FIG. 1.— Composites of genuine signatures.

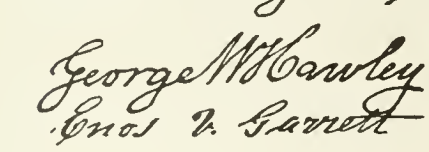

FIG. 2.— Forgeries of the above signatures.

In the case of the method by actual measurements although only a small fraction of the total number of relations is noted, yet these are in numerical form and can be averaged and the results compared directly.

The principle on which the method by investigation of proportions of parts rests is that the spaces between various distinctive points of a signature bear numerical relations to each other, and to the heights of certain letters, which are constant within comparatively narrow limits whether the signature be written small or large.

The following illustration (Fig. 3) represents a small part of a letter written with pen and ink and photographed at an enlargement of 30 diameters:

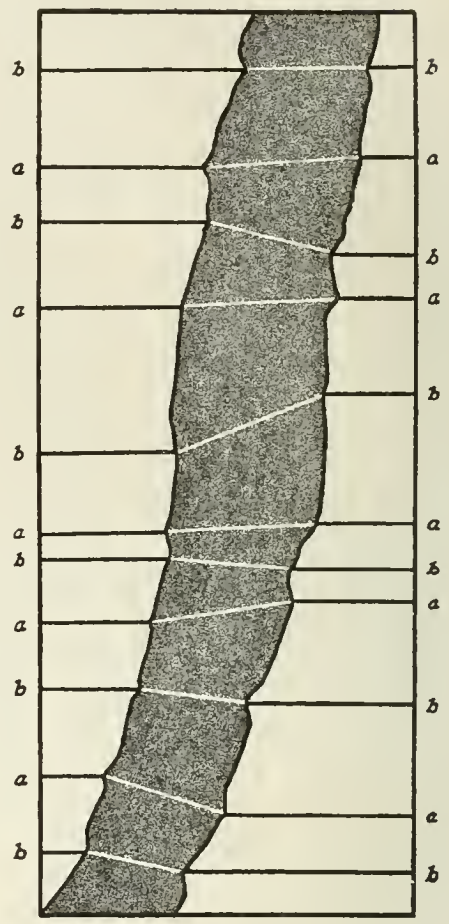

FIG. 3.— The points *a* show the widest and *b* the narrowest parts of the ink lines. It is to be noted that the maxima and minima of the two margins are not always opposite to each other, but show a tendency to oscillate about a horizontal line so that the *a*'s and *b*'s of one margin will be observed alternately above and below such line in following the ink mark downward, while those of the other margin will be found in opposite phase. This is made clearer by the white lines uniting the *a*'s and *b*'s of the opposite margins. This can be accounted for by the simultaneous operation of lateral and vertical movements which are not coincident in period.

Tremograms.— Another valuable individuality in writings executed by means of pen and ink are the irregularities observed in the margins of the lines when examined under a sufficiently high power of the microscope (about 120 diameters). How far this examination will enable one to identify an individual is not yet known, but it has been established that there are characters in the general disposition, number, arrangement, and position of these serrations, which remain comparatively constant in the writings of the same individual with different pens, ink, and paper, and under different mental and physical conditions, and which therefore cannot have other source than peculiar motions imparted to the writing instrument and writing fluid by the writer.

Fig. 1.

Photomicrograph of part of a hand-drawn ink line. Magnified 120 diameters.

Fig. 2.

Photomicrograph of a small part of a machine-drawn ink line made with an ordinary steel pen, the nibs pressing equally on the paper and being drawn downward. The paucity and minuteness of the serrations and the absence of curvature on the margins distinguish this from ink lines made by hand. Magnified 180 diameters.

Inks.—Tables for the determination of the characters of inks by qualitative chemical tests have been published by Robertson, Hofmann and others. To the same end special devices have been made to solve questions relating to the composition of inks without affecting the document or writing fluid: Doremus by means of the spectroscope, Frazer through absorption of light admitted to and reflected by the ink through colored prisms. Sharples has shown that an otherwise invisible record may be made visible through shorter or longer exposure to the sensitive plate of the photographic camera, etc.

FIG. 4.—A tracing by camera lucida of the margins of an ink line drawn by a pen fixed to a ruling machine. It is enlarged 60 diameters. There is an absence of the irregularities always found in the margins of ink lines made by the human hand.

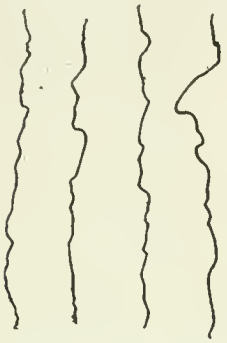

FIG. 5.—Camera lucida tracings of the margins of two ink lines by the same hand made at an interval of fifty-two days. The similarity of character of the serrations in both is noticeable.

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PERSIFOR FRAZER,
Docteur ès-Sciences Naturelles Univ. de France.

Handy Andy, a novel by Samuel Lover, published in 1842. It is a broadly humorous tale of life among the Irish gentry and peasantry in the first half of the 19th century, by an accomplished author who not only could illustrate his own narrative, but could write songs for it and furnish music for them as well.

Han'ford, Cal., city and county-seat of Kings County; on the Southern Pac. and Santa Fe R.R.'s, about 30 miles southeast of Fresno, and 250 miles south of San Francisco. It was first settled in 1871 and was made a city in 1891. Its chief industries are agriculture, fruits, raisins, and livestock. It has also flour and planing mills, milk condensing factory, butter and cheese factories, etc., and is a distributing centre for food products and clothing sent to mining sections in the vicinity. The city government is by a Board of Trustees, the board choosing its own chairman. The city has six banks, and a Carnegie Library. Pop. (1903) 3,000.

FRED A. DODGE,
Editor 'The Hanford Sentinel.'

Hanfstängl, Franz, fränts hänf'stengl, German lithographer: b. Rain, Germany, 1804; d. 1877. He studied art at the Munich Academy, and in 1826 went to Dresden where he began his series of lithographic copies of pictures in the Dresden Gallery, which he completed in 1852. During the latter part of his life he devoted himself to photography and kindred processes.

Hang-Chow, häng'chow, China, the capital of the province of Che-kiang, on a plain at the southern terminus of the Imperial Canal, and within two miles of the head of the estuary of the Tsien-tang River, about 40 or 50 miles from its mouth, nearly 100 miles southwest of Shanghai. It is a strongly fortified city of oblong form, surrounded with high well-built walls about eight miles in circuit, enclosing many large vacant spaces. The streets are well paved and clean, and there are numerous triumphal arches, monuments to great men, and gorgeous Buddhist temples. The stores and warehouses are noted for their size and the quantity and quality of the goods displayed. More than 100,000 persons are employed in silk manufactures, and among other industries are the weaving of cotton, manufacture of tapestries, carving in ivory, the making of lacquered ware, fans and screens, etc. The houses generally are one story high. A large portion of the inhabitants reside in the suburbs, and in boats on the waters around them. The governor-general of Che-kiang and Fe-kien resides in this city, and also the governor of the province. With their courts and troops, in addition to the great trade passing through, and its activity as a centre of literary and ecclesiastical life, Hang-Chow is one of the most important and richest cities in China. The river, opposite the city, is about four miles broad at high-water, and is crowded with vessels of all descriptions, being the channel by which vast quantities of merchandise are received from and exported to the southern provinces. The extensive Lake of Si-hou, "West Lake," close by the city, is celebrated for its natural and artificial beauties. Chapu, the seaport of Hang-Chow, is 20 miles down the river. Hang-Chow is the celebrated "Kinsai" of Marco Polo—the capital, in his time, of Southern China. It was captured by the Taiping rebels in 1861, and deserted by all its rich or respect-

able inhabitants. A disciplined force of Chinese, under the command of French officers, united with the Imperialist troops, recaptured the city on 31 March 1864. By the Treaty of Shimonoseki (1895) it was opened to foreign trade, and a district platted for a foreign settlement. Pop. estimated at 700,000.

Hanging, a form of capital punishment inflicted under the common law; also a mode of death sometimes lawlessly visited upon a person, or occurring from accident, or by suicide. In cases of hanging, death seldom results from pure asphyxia, but is usually in some degree owing to apoplexy and injury to the spinal cord. In attempted suicide, bleeding from the jugular vein and artificial respiration may be tried for resuscitation. In difficulty of inducing artificial respiration, laryngotomy and tracheotomy should be performed, and the lungs inflated through the opening in the neck. In judicial hanging, the noose ought to be so adjusted as to produce immediate dislocation of the spinal column, death in that case being instantaneous. In New York State electrocution as capital punishment is substituted for death by hanging, and it has to some extent been tried in other States. (See ELECTRICITY, CAUSE OF DEATH BY.) In several American States infliction of the death penalty is forbidden by law. Hanging, drawing, and quartering were once the punishment of treason in England. See CAPITAL PUNISHMENT.

Hanging Rock, Battle of, fought 6 Aug. 1780. It occurred on Hanging Rock Creek, S. C., between Col. Sumter's Americans, some 800 in number, and about as many Loyalists commanded by Maj. Carden. After driving back the Loyalists, the Americans, becoming disorganized while plundering the enemy's camp, were in turn put to flight. The American loss is unknown; that of the Loyalists, in killed, wounded, and missing, is recorded as 269. Consult Lossing, 'Field-Book of the American Revolution.'

Hankow, hän-kow' ("Mouth of the Han"), China, a town and river-port in the province of Hu-peh, at the junction of the Han with the Yang-tse-kiang, 688 miles above the mouth of the Yang-tse, which is navigable for large vessels up to the town. On the opposite bank of the Han is Hanyang, on the other side of the Yang-tse is Wuchang, the three together forming one immense city. In addition there is a large floating population, the Han being densely crowded with junks for about half a mile above its mouth. In 1857 the city was almost totally destroyed by the Taipings. The port was opened to foreign trade by the Treaty of Tientsin, ratified in 1860; and soon became the chief emporium for the tea trade of the central provinces. A concession of about 90 acres of land apart from Chinese jurisdiction is laid out like an English town. The residents of the British concession are formed into a municipality, with a council empowered to levy taxes. There are also German, French, and Russian settlements. The foreign trade of this port is one of the most important in China. The imports are brought almost exclusively from Chinese ports (about one half from Shanghai), and consist partly of foreign produce, such as cottons, woolens, and opium; partly of native produce, such as tea, silk, cotton, etc. Pop. about 850,000.

Han'na, Marcus Alonzo, American politician: b. New Lisbon, O., 24 Sept. 1837; d. 15 Feb. 1904. In 1852 his family moved to Cleveland, where he was educated in the public schools and he also took a year's course of study in Western Reserve University. He left college to enter the grocery trade with his father, and later had entire control of the business. In 1867 he became a partner with his father-in-law in the firm of Rhodes & Co., engaged in handling coal and iron; he soon mastered the details of the business, greatly extended the work of his firm, and was the first to build steel steamships for the lake trade. In 1877 he became the controlling partner of the firm, the name of which was changed to M. A. Hanna & Co., and acquired large interests in lake navigation. He also was for a time manager of a theatre, and president of the Union National Bank of Cleveland, and of the Cleveland City Railway Co. In 1880 he organized a business men's political club, and from that time was active in politics. In 1884 he was sent as a delegate to the Republican National Convention, and in the next convention (1888) was John Sherman's political manager. He first gained a national reputation, when he obtained the nomination of McKinley for President at the Convention of 1896, and as chairman of the Republican national committee, conducted the Presidential campaign, which resulted in a large plurality for McKinley. In this campaign he adopted the methods which had made him successful in business, studying the situation and its needs, and carefully attending to details. In 1897 he was appointed United States Senator to succeed Sherman, who resigned before the completion of his term of six years. In 1898 he was elected to a full term, and in 1904 re-elected, but died before taking his seat. In 1900 he again conducted the Presidential campaign. As a large employer of labor, Senator Hanna had a number of questions to settle with his own employees, and as a rule won their respect and confidence by his fairness and willingness to listen to their claims. He was a firm believer in arbitration between labor and capital, and was active in the organization, in 1901, of the National Civic Federation, a non-partisan organization formed to consider such topics as trusts, tariffs, taxation, etc., becoming its president, and a member of a permanent committee appointed to consider and settle labor disputes.

Han'nay, James, Canadian historian and journalist: b. Richibucto, N. B., 22 April 1842. After many years of editorial work upon influential Canadian journals, he was chief editorial writer on the Brooklyn, N. Y., *Daily Eagle* (1885–7), and editor of the St. John, N. B., *Daily Gazette* (1888–92), and St. John *Daily Telegraph* (1892–1900). Since 1902 he has been official reporter of the New Brunswick Provincial Parliament. Besides reports of the New Brunswick Supreme Court, he has published 'Nine Years a Captive' (1875); 'History of Acadia' (1879); 'The History of the Loyalists' (1893); 'The Story of the Queen's Rangers in the American Revolution' (1883); 'Life and Times of Sir Leonard Tilley' (q.v.) (1897); 'The History of the War of 1812'; 'New Brunswick: its Resources and Advantages' (1902).

Han'nibal, Carthaginian soldier: b. 247 B.C.; d. probably 183 B.C. He was the son of Hamilcar Barca (q.v.) and at the age of nine his father made him swear at the altar eternal hatred to the Romans. He was a witness of his father's achievements in Spain; but Hamilcar having fallen in battle in Lusitania, in 228 B.C., and his son-in-law Hasdrubal having been appointed to succeed him, Hannibal returned home. At 22 he returned to the army at the request of Hasdrubal. The soldiers perceived in him the spirit of Hamilcar, and in three campaigns his talents and his courage were so conspicuous that the army, on the murder of Hasdrubal in 221, conferred on him the chief command by acclamation. In 219 B.C. he laid siege to Saguntum, a town which had concluded an alliance with Rome. In eight months Saguntum fell. The Romans, alarmed by this, sent ambassadors to Carthage to demand that Hannibal should be delivered up. The demand being refused, they declared war. Hannibal raised a powerful force, and conceived the design of attacking the Romans in Italy. After providing for the security of Africa, and having left his brother Hasdrubal with an army in Spain, he began his march with 90,000 foot-soldiers, forty elephants, and 12,000 horsemen, traversed Gaul in the depth of winter with incredible rapidity, and reached the foot of the Alps. In nine days he crossed these mountains, probably by the pass leading over the Little St. Bernard. The conquest of the Taurinians and the capture of their chief city encouraged the people of Cisalpine Gaul to join him. These auxiliaries would have been still more numerous had not Publius Scipio approached at the head of a Roman army, which had landed at Pisa. On the banks of the Ticinus the armies engaged, and a charge of the Numidian horse left Hannibal master of the field (218 B.C.) Scipio avoided a second battle, and retreated beyond the Trebia, leaving the strong town of Clastidium in the enemy's hands. Meanwhile Sempronius arrived with a second army, but Hannibal soon provoked his impetuous adversary to an engagement, disposed an ambuscade near the Trebia, and surrounded and destroyed the Roman forces. The Romans lost their camp and 26,000 men. Hannibal now retired to winter quarters among his allies in Cisalpine Gaul; and at the opening of the next campaign (217) found two new armies awaiting his approach in the passes of the Apennines. He determined to engage them separately, and destroy Flaminius before the arrival of his colleague. He deceived him, therefore, by feigned marches, crossed the Apennines, and traversed the Clusian marsh. He then employed every means to compel Flaminius to a battle. He wasted the whole country; feigned a march to Rome; but suddenly formed an ambush in a narrow pass surrounded by almost inaccessible rocks. Flaminius, who followed him, was immediately attacked. A bloody engagement took place near the Lake Trasimenus. Assailed on every side, the Roman legions were cut in pieces. Hannibal now armed his soldiers in the Roman manner, and marched into Apulia, spreading terror wherever he approached. Rome, in consternation, entrusted her safety to Fabius Maximus, the dictator, who determined to exhaust by delay the strength of the Carthaginians. He attacked Hannibal with his own weapons, and hung upon him everywhere without attempting to overtake him, convinced that the Carthaginians could not long hold a desolated territory. Hannibal marched into the plains of Capua, with the design of separating the terrified cities from their alliance with the Romans, and drawing down Fabius from the mountains. But suddenly he found himself in the same toils in which Flaminius had perished. Shut up between the rocks of Formiæ, the sands of Liternum, and impassable marshes, he was indebted for his safety to a stratagem. Having collected a thousand oxen, and fastened burning torches to their horns, he drove the animals at midnight into the defiles guarded by the Romans. Panic-struck at the terrible sight, the Romans abandoned the heights, and Hannibal forced his way through their ranks. Minutius Felix, master of the horse, was then made colleague of Fabius in the dictatorship. Eager for combat, he fell into an ambush at Geronium, and would have perished but for the aid of Fabius. After this campaign the other Roman generals seemed unwilling to trust anything to chance, and imitated the delay of Fabius. Hannibal saw his army slowly wasting away, when the new consul Terentius Varro, an inexperienced and presumptuous man, took the command of the legions. Hannibal had occupied Cannæ, and reduced the Romans to the necessity of risking an engagement (216), Æmilius Paulus, the colleague of Varro, wished to put off the battle, but Varro chose the day of his command, and directed the attack. The Roman army was destroyed, and Hannibal now marched to Capua, which immediately opened its gates. In 215 Hannibal sustained, at the hands of Marcellus, a repulse before Nola — the first check which he had received in the open field — but in 212 B.C. made an important acquisition in the capture of Tarentum. Capua, however, was invested by two consular armies, and was on the point of surrendering. Hannibal marched to Rome, and encamped in sight of the capitol, 211 B.C.; but the Romans were not thus to be discouraged; Capua fell. This success gave the Romans a decided superiority, and nearly all the people of Italy declared in their favor. Held in check by the consul, Claudius Nero, Hannibal could not effect a union with his brother Hasdrubal, who had set out from Spain with reinforcements, but after having passed the Apennines was attacked and defeated by Nero on the Metaurus in 207. Hasdrubal himself fell, and his bloody head was thrown into the camp of Hannibal. The latter then retired to Bruttium, where, surrounded with difficulties, he yet maintained the contest with inferior forces against victorious armies. But Scipio now carried the war into Africa, and Hannibal was recalled to defend his country. He reluctantly embarked his troops, and in 203 left the country which for 16 years he had held in spite of all the efforts of Rome. He landed at Leptis, gained over a part of the Numidians, and encamped at Adrumetum. Scipio took several cities, and reduced the inhabitants to slavery. Pressed by his countrymen to come to a decisive engagement, Hannibal met Scipio at Zama, and was defeated with 20,000 loss. Peace was concluded in 201 B.C. Hannibal, accused by his enemies of stirring up Antiochus the Great to war against the Romans, went to Ephesus, to the court of Antiochus. In the ensuing struggle with Rome, Antiochus was signally defeated, and obliged to

conclude a peace, one of the terms of which was that Hannibal should be delivered up. Hannibal, again obliged to flee, went to the court of Prusias, king of Bithynia. Prusias, to whom the senate had sent ambassadors to demand the person of Hannibal, was on the point of complying with the requisition, when Hannibal prevented the disgrace by swallowing poison, which he always carried about in his ring.

Hannibal, Mo., city in Marion County, on the Mississippi River, and on the Missouri, K. & T., the Chicago, B. & Q., the Wabash, and the Saint Louis, K. & N. W. R.R.'s: about 90 miles northwest of St. Louis and 15 miles south of Quincy, Ill. Hannibal was settled in 1819 and incorporated in 1839. It is situated in an agricultural region. The chief manufactures are foundry and machine-shop products, flour, lumber, cigars, lime, cement, stoves, car-wheels, shoes, and furniture. It is an important trade centre, as it has the advantages of several railroads and steamboat connection with the cities and towns on the Mississippi. A steel bridge for railroad cars and wagons crosses the river from Hannibal to East Hannibal, Ill. The trade is principally in tobacco, lumber, flour, potatoes, ready-made clothing, dairy products, and the city manufactures. It has a free circulating library, public and parish high schools, the Douglas colored high school, and a number of fine public buildings. The city charter of 1845, revised in 1873, provides for the annual election, by the people, of a mayor and a certain number of the members of the school board. The officials of the administrative departments are under the control of the mayor. The electric-light plant is owned and controlled by the city. Pop. (1900) 12,780.

Hanno, hăn'ō, or **Anno**, German mediæval prelate: b. not earlier than 1000; d. Siegberg, near Bonn, 1075. The emperor, Henry III., made him his chancellor, and presented him to the archbishopric of Cologne, to which he was consecrated in 1056. After the death of Henry III., Hanno made himself master of the person of Henry III.'s young son Henry IV., and secured for himself the administration of the empire (1062). His energetic government and his holy life, his paternal care for his see, his zealous reformation of monasteries and foundation of churches, gained him the character of a saint. The hymn in his praise is by some thought to have been written soon after his death; by others about 1183. It is one of the most important monuments of the early German national literature. The best version of it is to be found in Müllenhoff and Scherer's 'Denkmäler deutscher Poesie und Prosa' (1864).

Hanotaux, Albert Auguste Gabriel, äl-bār ō-güst gä-brē-ĕl ä-nō-tō, French politician: b. Beaurevoir, Aisne, 18 Nov. 1853. He chose for himself the profession of the law, took a scientific course in the Ecole des Chartes, and afterward became a teacher in the Ecole des Hautes Etudes. In 1879 he received an appointment in the French foreign office; in 1881 became a member of the cabinet, and was sent to Constantinople as ambassador in 1885. From 1886 to 1889 he was republican deputy; and in May 1894 received a portfolio in the second Dupuy cabinet. He has published: 'Les Villes Retrouvées' (1880); 'Origines de l'Institution des Intendants des Provinces' (1884); 'Henri Martin, Sa Vie, Ses Œuvres, Son Temps' (1885); 'Etudes Historiques sur le XVIe. et le XVIIe. Siècle en France' (1886); 'Histoire du Cardinal de Richelieu' (1893).

Han'over, Germany, the northwesternmost province of Prussia, prior to 1866 an independent kingdom. It borders on the North Sea, and has an area of 14,870 square miles. In the south the Harz mountains attain an altitude of over 3,000 feet; the rest of the country is an alluvial plain with a gentle slope to the sea. The Elbe on the northeast boundary, the Ems, and the Weser, with its tributaries, the Leine and Aller, are the principal rivers. Coal and lignite, rock salt, iron, copper, zinc, silver, and gold, are found in the mountainous districts, and there are large peat beds in the north. Over one fourth of the area is arable land, producing large quantities of grain and flax. The keeping of bees is generally practised on the moors, and a breed of superior cattle is raised along the marshy coast land. Forests of hardwood and pine, extensively used in smelting, occupy one sixth of the surface. The manufactures are extensive, and include iron goods, machinery, woolens, linens, cottons, leather, paper, beet-root sugar, beer, spirits, and numerous domestic commodities. Hanover has over 1,500 miles of railroads, numerous canals, and an extensive traffic is carried on at its several ports, among which are Geestemünde, Emden, and Harburg, although practically its chief port is the free city and port of Bremen (q.v.). The capital is Hanover (q.v.). For administrative purposes, the province is divided into the six districts of Hanover, Hildesheim, Lüneburg, Stade, Osnabrück and Aurich. The highest court is in Celle. The province sends 36 members to the Prussian Chamber of Deputies, 10 to the Upper House, and 10 to the German Reichstag. Education is compulsory and free: chief of the higher institutions of learning is Göttingen University. The majority of the inhabitants are Lutheran Protestants. Roman Catholics inhabiting Hildesheim and Osnabrück constitute about one seventh of the population. Hanover was long connected with the Brunswick family, a scion of which, Ernest Augustus, in 1692, became the first Elector of Hanover. He married the daughter of the Elector Palatine, granddaughter of James I., and niece of Charles I. of England. He was succeeded in 1698 by his son George Louis, who in accordance with the Act of Settlement (q.v.), became George I., king of England, at the death of Queen Anne in 1714. The connection with England continued during four reigns, and in 1814 the Congress of Vienna raised Hanover to the rank of a kingdom, George IV. and William IV. thus being kings of Great Britain and of Hanover. On the accession of Queen Victoria, however, by the Salic law, the Hanoverian crown passed to the nearest male heir, Ernest Augustus, Duke of Cumberland, and at his death in 1851 to his son George V. In 1866 Hanover sided with Austria in the Austro-Prussian contest; the capital was occupied by Prussian troops; the king lost his throne, his estates were sequestrated, and Hanover was annexed to the Prussian dominions. Pop (1900) 2,590,336.

Hanover, Mass. (1) Village in the town of Hanover in Plymouth County; on a branch of the New York, N. H. & H. railroad; about

10 miles east by north from Brockton and 25 miles southeast of Boston. It is the seat of Hanover Academy. It is situated in an agricultural region, and the chief industries are connected with agricultural products. Its chief manufactures are tacks and nails. (2) The town of Hanover contains several villages, and the chief manufactures are shoes, nails, tacks, and dairy products. Pop. of the village is about 420; of the town 2,200.

Hanover, N. H., town in Grafton County; on the Connecticut River, and on the Boston & M. railroad, about 72 miles northwest of Concord. It is situated in an agricultural region and its industries are connected chiefly with farm products and lumbering. It is a summer resort, but is known principally as a college town, being the seat of Dartmouth College (q.v.). It contains also the Mary Hitchcock Memorial Hospital. Pop. (1900) 1,884.

Hanover, Pa., borough in York County; on the Western Maryland and the Pennsylvania R.R.'s; about 32 miles south of Harrisburg. It was settled about 1729 and incorporated in 1813. It is in a rich agricultural section of the State, and nearby are iron-ore mines. The chief manufactures are shoes, machine-shop products, cigars, carriages and wagons, gloves, and leather. Hanover is the commercial centre of a considerable part of York County; the trade is largely in agricultural and dairy products, the manufactures of the borough, and in live stock. The government is vested in a burgess and borough council. Pop. (1890) 3,746; (1900) 5,302.

Hanover, Prussia, the capital of a province, and formerly of the kingdom of Hanover, in an extensive plain northeast of and dominated by Mount Linden, at the confluence of the Ihme with the Leine, 44 miles by rail west by north of Brunswick. It consists of an old town, intersected by the Leine, and of various modern suburbs. The old town is unattractive, but the new quarters are regular and well built. The principal features are the Markt church, of antique appearance; the Kreuz church; Schloss church, a handsome structure, with an altar-piece by Cranach, and some curious relics collected by Henry the Lion; several handsome modern churches; the palace (1636–40, rebuilt since 1817), now a royal Prussian residence; the former palace of King Ernest Augustus (in government occupancy); the royal library; the museum of art and science; the restored townhouse (1439–55); the new town-house (formerly palace of George V.); the Kestner museum of antiquities; the provincial assembly house; the Franco-German war monument; the Waterloo monument; various schools, among which is the technical high-school, a remodeled building of great extent, formerly the Welfenschloss (palace of the Guelfs), and the Schloss-Herrenhausen, formerly a royal residence. Trade and industries are important, the latter including railway works, machinery, iron castings, cotton, linen, tobacco, lacquered wares, lamps, glass, chemicals, etc.; breweries and distilleries. The city has electric street railroads.

Hanover is first mentioned in 1163. It joined the Hanseatic League in 1481, and received the Reformation in 1533. It became the residence of the Dukes of Brunswick-Lüneburg, and the capital of the principality in 1636. In 1866 the kingdom was absorbed by Prussia, and since 1890 the city has held the position of a royal residence and capital. Sir William Herschel, the two Schlegels, and Iffland were born here. Pop. (1900) 235,649, with suburbs, 302,054.

Hanover, Pa., Cavalry Action at. During the Gettysburg campaign Gen. Stuart, commanding the Confederate cavalry, was ordered by Gen. Lee to observe the movements of the Army of the Potomac and harass its rear should it attempt to follow the Confederate army and pass into Maryland. Leaving two brigades south of the Potomac, to guard the passes of the Blue Ridge, Stuart, with the rest of his command, crossed the Potomac at Seneca Creek, 20 miles north of Washington, on the night of 27 June 1863 and, learning that Hooker had crossed the river, marched north by way of Rockville, captured a train of 125 wagons and 400 prisoners between Rockville and Washington, struck the Baltimore & Ohio Railroad at Sykesville and Hood's Mills, and, ascertaining that the Union army was marching from Frederick northward, endeavored to get ahead of it, reaching Westminster at 5 P.M. of the 29th, where he struck a squadron of the First Delaware cavalry, which offered a stubborn resistance, but was finally dispersed, and Stuart, continuing his march, bivouacked at Union Mills, about midway between Westminster and Littlestown. Hearing that Union cavalry was at Littlestown, and that Early was on the Susquehanna, he marched by crossroads for Hanover, on the morning of the 30th and, at 10 o'clock, his head of column reached that place, 16 miles east of Gettysburg, and attacked the rear and flank of Kilpatrick's cavalry division, as it was passing through the town from Frederick and Littlestown, in advance of Meade's central column. His first attack threw the rear of Farnsworth's brigade into confusion, but Farnsworth rallied his men, Custer's brigade was recalled and thrown into action and, after two hours' fighting in and around the town, Stuart was driven back on the Littlestown road, having lost nearly 100 men. Kilpatrick reports his own loss as 59 killed and wounded, and 123 missing.

Stuart was now in a perilous position; he had thrust himself unwittingly between Kilpatrick's cavalry and Meade's main body; Gregg's cavalry division was moving north on his right, but he extricated himself by marching all night over a circuitous route through Jefferson to join Early at York. The latter, however, was on his way to Gettysburg, and Stuart passed almost within sight of him, without knowing it. Finding that Early was not at York, Stuart continued his march to Carlisle, hoping to find Lee's main body there, but found the place occupied by Union troops, and heard that Lee was concentrating at Gettysburg, where by marching night and day, he joined him in the afternoon of 2 July. See GETTYSBURG, CAMPAIGN AND BATTLE OF.

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Hanover College, at Hanover, Ind.; founded in 1828, under the auspices of the Presbyterian Church, as Hanover Academy. It was chartered as a college in 1833. Women have been admitted since 1880. The regular departments are letters, arts, science, law, philosophy, and divinity; also a course for teachers. No charges are made for tuition. In 1903 the college

reported 14 instructors, 160 students, and about 17,000 volumes in the library. The endowment fund is over $200,000, and the annual income is about $15,000.

Hanover Court House, Engagement Near. On 21 May 1862 Gen. McClellan had marched the Army of the Potomac up the York peninsula to the banks of the Chickahominy, 7 to 12 miles distant from Richmond. On the 26th he heard that R. H. Anderson's Confederate brigade and Stuart's cavalry were near Fredericksburg, and that another body, Branch's brigade, was in the vicinity of Hanover Court House, 17 miles north of Richmond, to his right and rear. These bodies threatened his communications, and were in position to reinforce Jackson, in the Shenandoah valley, or to oppose McDowell, whose advance was then eight miles south of Fredericksburg. Gen. Fitz-John Porter was ordered to clear the enemy from these positions and destroy the bridges over the South Anna and Pamunkey rivers. Warren's small brigade had been already detailed to destroy the bridges, had destroyed all means of communication over the Pamunkey as far as Hanover Court House, and was then posted at Old Church. On the morning of the 27th Warren moved toward the court house, on a road running parallel to the Pamunkey. Porter left New Bridge at 7 A.M. with Morell's division and Emory's cavalry brigade and, marching by way of Mechanicsville northward toward the court-house, about noon his cavalry and the Twenty-fifth New York infantry, encountered a portion of Branch's brigade, supporting two pieces of artillery, attempting to hold the road leading to the court-house. A Union battery was brought up and Butterfield's brigade deployed, which charged and drove the Confederates from the field, capturing one gun. A part of the Twenty-fifth New York was captured by the Confederates. Supposing that the Confederates had all retreated in the direction of Hanover Court House, Porter pursued, the cavalry, under Emory, and the Seventeenth New York, overtaking and capturing a large number of the Twenty-eighth North Carolina. Upon nearing the junction of the Ashland and the Court House roads, a part of Martindale's brigade was sent toward Ashland to guard that flank against an approach from Richmond and to destroy the railroad running to that city. Near Peake's station Martindale ran into Branch's brigade, was immediately attacked, and was driven back some distance. When Porter, whose advance had reached Hanover Court House, heard that Martindale had been attacked, he faced about his entire column, reached Martindale, struck Branch on his left and rear, and routed him. Branch retreated to Ashland and formed a junction with Anderson's brigade, which had fallen back from McDowell's front. After destroying the railroad in several places and opening the way for McDowell's advance from Fredericksburg, Porter returned to his old camps on the night of the 29th. The Union loss in the engagement of the 27th, was 62 killed, 223 wounded, and 70 missing. The Confederate loss was 73 killed, 192 wounded, and 730 prisoners, of whom about 150 were also wounded. Consult: 'Official Records,' Vol. XI.; Webb, 'The Peninsula'; 'McClellan's Own Story'; Allan, 'The Army of Northern Virginia'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

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Hanover, Treaty of, an alliance between England, France, and Prussia, made in September 1725, for the purpose of mutual assistance, in opposition to that between Austria and Spain.

Hansa, or **Hanse.** See HANSEATIC LEAGUE.

Hanseatic (hăn-sē-at'ĭk) **League, Hansa,** or **Hanse,** a confederacy of certain cities of northern Germany for mutual protection, especially in matters of commerce; for the extension of trade, and of rights and immunities received from sovereigns, and which had suffered curtailment. The union was formed in the 13th century, at a time when sea and land swarmed with pirates and robbers, and German trade, no longer guarded by the privileges of armed attendants, was exposed to many dangers, while government had degenerated into a power for extorting taxes without giving protection.

The first alliances known to have been concluded are those between Hamburg and Lübeck (1241 and 1255) to keep open the road across Holstein connecting the North Sea with the Baltic, and between Lübeck, Rostock, and Weimar in 1259 for defending themselves against the pirates. About the same time a similar league was concluded between the Westphalian towns, Münster, Dortmund, Soest, and Lippstadt. When a wider union came to be formed for like purposes, the name of *Hansa,* signifying a league, which was at first applied to any such confederacy, survived exclusively as the name of that influential league. During its most flourishing period it embraced 90 towns, scattered over the whole length and breadth of Germany, including Holland. Its organization was very loose, the towns of which it was made up being at first divided into three and, after the 16th century, into four provinces, each with a chief town. These divisions had, however, little more than a geographical significance. The town of Lübeck, which already held an important rank, from the fact that it was the highest court of appeal for all those towns which were governed by the Lübeck law, was recognized as the chief town of the league. Here assembled the deputies of the other Hanse towns to deliberate on the affairs of the confederacy; the decrees of the diet had no effect unless they received the sanction of the separate towns.

In the 14th century the league everywhere attained a high political importance, and gave rise to the development of that commercial policy which has since become intimately connected with all political relations, but of which the sovereigns of that time had little idea. Kings and princes were, in reality, more dependent on the league than it was on them. The extensive carrying trade of the Hanseatic League was a great source of wealth and at length there was no mart in Europe which was not gradually drawn within the circle of its influence. England, Denmark, and Flanders concluded treaties with the league for the extension of their commerce. It undertook to provide for the security of commerce on the Baltic and North seas. In the country under its immediate influence it constructed canals, and introduced a uniform system of weights and measures.

But the prosperity of the Hanse towns was naturally dependent on the continuance of the circumstances which gave rise to it, and when circumstances changed, the league was destined to decline. When the routes by land and sea were no longer insecure; when princes learned the advantages of trade to their own states, and turned their attention to the formation of a naval force of their own, and the encouragement of navigation; when the inland members of the confederation perceived that the great seaport towns had a separate interest of their own, and used them principally to promote their own ends; then the dissolution of the Hanseatic League was evidently approaching. There remained at last as active members of it only Hamburg, Lüneburg, Lübeck, and the towns in the neighborhood (Wismar, Rostock, Greifswald, Stralsund, whose interests were identified with those of Lübeck. The league existed no longer as a political power, but merely as a loose association of towns for commercial purposes.

In England, during the reign of Queen Elizabeth, the league lost its privileges by its refusal to grant complete reciprocity. About 1614 there remained only 14 towns which contributed to the support of the league, and had a voice in the management of its affairs. These were: Lübeck, Wismar, Rostock, Stralsund, Greifswald, Stettin, Danzig, Magdeburg, Brunswick, Hildesheim, Lüneburg, Hamburg, Bremen, and Cologne. The Thirty Years' war, which destroyed the prosperity of the German towns generally, gave the death-blow to the league. At the diet of 1629 it was entrusted to the cities of Lübeck, Bremen, and Hamburg to consult for its general interests, and in 1630 these towns concluded among themselves a closer union, which was renewed in 1641. After the Peace of Westphalia (1648) repeated but vain attempts were made to bring the league together again, and a last diet was held in 1669. Hamburg, Lübeck, and Bremen still retain their independence, and now form separate constituents of the German empire.

Hansen, hän'sĕn, **Gerhard Henrik Armauer,** Norwegian physician: b. Bergen, Norway, 1841. He was educated during boyhood in the cathedral schools of his native city, afterward entered upon the study of medicine, and was eventually appointed resident physician in the Rigs Hospital of Christiania. He was afterward government medical officer for the Lofoten fisheries, but did not reach the field of his fame until he was appointed in 1868 to the post of assistant physician at the Bergen Leper Hospital. From this time forth he devoted himself to the study of leprosy, and following the lines laid down by Virchow, traveled from one to another university of Europe, continuing his investigations. On his return to Norway the Medical Society of Christiania voted a sum of money to pay the expenses of his further researches. He at last was enabled to demonstrate the fact that leprosy was contagious. Continuing his investigations he discovered at last the leprosy bacillus in unstained preparations. Later it was stained and became known as Hansen's bacillus (1873). He was not successful in employing the bacillus for purposes of inoculation with a preventive object; but on the basis of his contagion theory, legislation has been enabled to check to a considerable extent the spread of the disease.

Hansom, or Hansom Cab. See CARRIAGE.

Han'son, Alexander Coutee, American journalist and politician: b. Maryland 1786; d. 1819. After being graduated at St. John's College, Annapolis, he adopted journalism as a profession, and in 1812 his office was wrecked by a mob on account of an article attacking the Madison Administration which appeared in the 'Federal Republican,' of which he was editor. He was elected to the lower house of Congress in 1813, and from 1817 until his death had a seat in the Senate.

Hanus, Paul Henry, American educator: b. Hermsdorf-unter-dem-Kynast, Prussia, 14 March 1855. He came to the United States in childhood, was educated at the University of Michigan and has been professor of the history and art of teaching at Harvard from 1891. He has published 'Elements of •Determinants' (1886); 'Geometry in the Public School' (1893); 'Contemporary Educational Problems' (1899).

Hap'good, Isabella Florence, American author and translator: b. Boston, Mass., 21 Nov. 1851. She has written 'The Epic Songs of Russia'; 'Russian Rambles,' etc., and is widely known by her translations from the Russian of Tolstoy, Gogol, etc., and she has also made important translations from the French and Spanish.

Hapgood, Norman, American journalist: b. Chicago 28 March 1868. He was graduated from Harvard in 1890, and the Harvard Law School in 1893, and has since become well known as a keen, discriminating essayist and dramatic critic. He has published 'Literary Statesmen and Others' (1897); 'Daniel Webster' (1899); 'Abraham Lincoln' (1899); 'The Stage in America' (1901).

Hapsburg, hăps'bĕrg (Ger. häps'boorg) (properly HABSBURG), the imperial house of Austria-Hungary, so named from the ancestral castle, in the canton of Aargau, Switzerland, on the right bank of the Aar. The castle was built in the 11th century by Bishop Werner, a descendant of Ethico I., a count of Alemannia, in the 7th century. It stands on the Wüpelsberg, a steep rocky situation, whence the name *Habichtsburg* (Hawk's Castle). The proprietors of Hapsburg became at a later period counts of Hapsburg and gradually extended their territories. Werner II., who died in 1096, is said to have been the first to assume the title. After the death, about 1232, of Rudolph II., the fourth in succession from Werner II., the family divided into two branches, the founder of one of which was Albert IV., and that of the other Rudolph III. The latter is known as the Hapsburg-Lauffenburg line, which became extinct in the direct male line in 1408. A younger son of Rudolph, called Eberhard, founded the Kyburg branch of the Hapsburg-Lauffenburg line, which did not become extinct till 1415, and Godfrey, a grandson of Rudolph, who settled in England in the 13th century, there became the founder of the Fielding family, to which the Earls of Denbigh belong, and of which the novelist Fielding was a member. The line descended from Albert IV. is that to which the historical celeb-

rity of the house is almost entirely due. In 1273 Rudolph, the son of Albert IV., was chosen emperor of Germany or Holy Roman Emperor. He is the founder of the reigning house of Austria, which is of the line of Hapsburg-Lorraine. From Rudolph to Charles VI. the Austrian monarchs were of the Hapsburg male line. Maria Theresa, who succeeded Charles VI., married Francis Stephen of Lorraine, who in 1745 was chosen Emperor of Germany. Francis II., the third emperor of Germany of the line of Hapsburg-Lorraine, was the last who bore that title till the establishment of the new empire, the last of the so-called "Holy Roman Emperors." He changed it in 1806 for that of Emperor of Austria, and the present imperial house of Austria continues to represent that line. From the Emperor Rudolph was also descended a Spanish dynasty which began with the Emperor Charles V. (Charles I. of Spain), and terminated with Charles II. in 1700.

Haraforas, or **Alfures,** names applied in Celebes, the Moluccas, Mindinao, and the adjacent islands to certain native tribes, particularly of the interior, which differ from the Malays, and have been thought to be perhaps pre-Malayan aborigines.

Hara-kiri, hăr'a-kĭr'ē, or **Seppuku,** a mode of inflicting death upon themselves allowed in Japan to criminals of the Samurai or two-sworded class as more honorable than public execution. It consists in cutting open the body so as to disembowel it, by means of a wound made with one sword perpendicularly down the front and another with the other sword horizontally. Till recent times Japanese of the two-sworded class who had been guilty of any crime frequently resorted to this mode of killing themselves before their guilt had been proved, and it was regarded as honorable in them to do so, indicating a strong sense of shame. Sometimes they were commanded to put themselves to death in this manner. Consult: Mitford, 'Tales of Old Japan' (3d ed. 1876); and Chamberlain, 'Things Japanese' (1891).

Harald. See HAROLD.

Haran (Assyrian *Kharranu,* road), the name of a district of northern Mesopotamia and of a town situated therein, on the stream called Jullab, southeast of Edessa. The name is probably derived from the fact that at this town the trade-routes from Media, Assyria, and Babylonia met to proceed along the same highway to the coast of Cilicia. Haran is mentioned in the Old Testament in Gen. xi. 31–32, and Ezekiel xxvii. 23. To the Assyrians it was a strategic post of great importance. In the inscriptions references to it appear as early as the reign of Tiglath-pileser I. (about 1100 B.C.). An extensive commerce centred here. To the Greeks and Romans it was known as Carræ (Gk. κάρραι or Χάρα). Crassus, the Roman commander, was here defeated and slain by the Parthians during his eastern expedition (53 B.C.), and Caracalla assassinated by the soldiery of Macrinus (217 A.D.). It was of importance even in the time of Arab supremacy, but the geographer and historian Abulfeda (d. 1331) speaks of it as in ruins in his day. It was the seat of an episcopal see in the 4th century. Consult Metz, 'Geschichte der Stadt Harran' (1892).

Harar, or **Adari,** a Semitic dialect spoken in the Abyssinian province of Harar (q.v.). It includes some Hamitic words. For an account of it, consult an article by Prätorius in the 'Zeitschrift der Deutschen Morgenländischen Gesellschaft,' Vol. XXIII. (1869).

Harar, Harrar, or **Adari,** capital of the province of Harrar in eastern Abyssinia, south of the Gulf of Aden, about 180 miles from the coast. It is situated at an elevation of 5,500 feet above the level of the sea. The surrounding district is very fertile and produces chiefly coffee. Cotton is also a large crop, and excellent in quality. There is a brisk trade in gums, ivory, and fruits. Harar was formerly the capital of a small, independent country, ruled by an emir. In 1876 it became a dependency of Egypt, and later was under Italian protectorate. After the Italian defeat at Adowa in 1896, it passed with the province to Abyssinia. Its first European visitor was Sir Richard F. Burton, who obtained admission there as an Arab in 1855, and described it in his 'First Footsteps in East Africa, or An Exploration of Harar' (1856). Pop. (1900) 40,000. Consult further the 'Bulletin de l'Etat Major-Général de l'Armeé Egyptienne' (1876), and Paulitschke, 'Harar, Forschungsreise nach den Somal- und Gallaländern' (1888).

Harar, Harrari, or **Harrur,** the most easterly of the Abyssinian provinces; bounded on the east and north by British and French Somaliland, and on the south and southeast by British East Africa and Italian Somaliland. The country is a table-land, with a maximum elevation of nearly 11,000 feet. Previous to the insurrection of the Mad Mullah (q.v.) it was a part of the Egyptian Sudan. It was captured by Italy in 1891, but after the severe defeat of the Italian forces by the Abyssinians at Adowa 1 March 1896 it passed to Abyssinia. The foreign trade of Abyssinia is conducted largely through Harar.

Haraucourt, Edmond, French poet and novelist: b. Bourmont (Haute-Marne) 1857. His first work appeared in 1883 and was entitled 'La légende des sexes, poèms hysteriques.' A collection of his verses was published in 1891. He also published 'Amis' (1887); 'Shylock' (1889); 'Don Juan' (1894); 'Elizabeth' (1894). He was awarded the Academy prize for his poem 'Les Vikings' (1890).

Harbaugh, Henry, American clergyman of the German Reformed Church in America: b. near Waynesborough, Pa., 24 Oct. 1817; d. Mercersburg, Pa., 28 Dec. 1867. He studied at Franklin and Marshall College (Mercersburg) and at the Mercersburg Seminary, was ordained in 1843, and in 1843–64 held pastorates successively at Lewisburg, Lancaster, and Lebanon, Pa. In 1864 he was appointed professor of theology in the Mercersburg Seminary. He was one of the leading exponents of the "Mercersburg theology" (q.v.), and belonged to the high-church school of his denomination. From 1850 to 1866 he was editor of the 'Guardian,' and in 1866–7 of the Mercersburg 'Review.' Besides a collection of poems in the "Pennsylvania Dutch" dialect, he published: 'Heaven' (1843–53); a 'Life of Michael Schlatter' (1857); 'Christological Theology' (1864), and other works.

Harben, William Nathaniel, American novelist: b. Dalton, Ga., 5 July 1858. He has contributed many short stories to magazines, and his published novels include: 'White Marie' (1891); 'Almost Persuaded' (1890); 'A Mute Confessor' (1891); 'The Land of the Changing Sun' (1894); 'From Clue to Climax' (1896); 'The Caruthers Affair' (1898); 'The North Walk Mystery' (1899); 'The Woman Who Trusted' (1901); 'Westerfelt' (1901); 'Abner Daniel' (1902); 'The Substitute' (1903). He is also the author of 'Northern Georgia Sketches' (1900).

Harbin, Manchuria, a city on the Sungari River at the point where the Manchurian branch of the Trans-Siberian railway crosses that stream. The Chinese eastern branch of the railway, running to Dalny (Talienwan) (q.v.) and Port Arthur (q.v.) begins here. Prior to the Russian occupation in 1900 (see MANCHURIA), Harbin was a small Chinese village. On account of its geographical and strategical position it was chosen as a military centre, and very quickly it became also headquarters for railway and governmental affairs. Commerce and manufacture have also greatly developed, although not originally considered in the promotion of Harbin; and here more than elsewhere Russia gradually asserted its intention of becoming an active industrial force in the Orient. Every system of protection that could be devised has been employed by the government to advance its commercial prestige. Harbin consists of the old town, three miles distant from the central dépôt; Prestin, the river town, the present commercial portion; and the administration town, about the railway. Only Russians and Chinese are allowed to hold land, construct buildings, or enter any permanent enterprise. The territory for many miles surrounding has been secured so as to make it impossible for any foreign interest or influence to obtain a foothold or profit near to the city. The principal railway engineer is the chief administrative official. A census of 1903 showed a population of 60,000 exclusive of soldiery; of these all but 700 were Russians.

Harbor, a recess or inlet of the sea, a lake, or other large body of water, either landlocked or protected from winds and waves by artificial means, so as to be a secure haven for vessels in all weathers. In selecting or constructing a harbor regard is also had to convenience in loading and unloading vessels. The two chief classes are harbors of refuge and commercial harbors. Often the latter are merely tidal, only to be entered by vessels as the tide serves, and where with the tide they rise and fall. Harbors of refuge or shelter are accessible in all conditions of tide. Sometimes there is a combination of the harbor or haven with a capacious protected roadstead outside of it, as at Cherbourg, France, and other places.

Construction.—In the construction of harbors the great desiderata are sufficient depth of water and perfect security for the vessels likely to frequent them, together with the greatest possible facilities for ingress during any weather, while the chief obstacles to be surmounted are the action of the waves upon the protecting piers and breakwaters, and the formation of sand-banks and bars, which diminish the depth of water at the entrance and also within. All good harbors should possess the following characteristics: A deep, broad entrance-channel, which can be kept by ships of all kinds in all sorts of weather; an ample anchorage, free from rocks and shoals, with good holding-ground, and protected from winds and waves. Commercial harbors should also be supplied with adequate constructions and appliances for loading and discharging vessels.

Ground-plan.—In designing the ground-plan of harbors, some rules should be kept in view: (1) the entrance should always be kept seawards of the works of masonry, care being taken that the direction of the piers does not throw the sea across the entrance; (2) there should be a good "loose," or point of departure free of rocks or a lee shore; (3) spending-beaches inside should be provided to allow the waves that pass in to break and spend themselves (a harbor-basin surrounded with vertical quay-walls becomes a "boiling pot"), but this is a point frequently overlooked by engineers; (4) the relation of the width of entrance to the area of a harbor should be a matter of careful study, as upon this depends the tranquillity of the interior.

Anchorage.— The anchorage of a harbor should be large enough to afford shelter to the maximum number of vessels seeking it. The space required by a vessel at anchor is, roughly, a circle whose radius is six times the depth of water plus the vessel's length. First-class harbors should have a depth of at least 40 feet, to admit and give secure anchorage to the largest ships now existing. An available depth of 25 feet is sufficient for ordinary transatlantic freight and passenger steamers. Coasting vessels rarely have a draft of more than 20 feet.

Natural Harbors.—Some of the best known natural harbors are those of Queenstown, Ireland; Rio de Janeiro, Brazil; Portland, Me.; Boston, Mass.; Narragansett Bay, R. I.; New York, N. Y.; Old Point Comfort (Norfolk), Va.; Port Royal, S. C.; Havana, Cuba; San Francisco, Cal.; Puget Sound, Wash.; King George's Sound, and Princess Royal Harbor, in southwestern Australia.

Artificial Harbors.—These are as old as naval warfare, and may almost be said to date from the birth of commerce. The Phœnicians protected their little strip of the Levant coast. Tyre and Sidon were well provided with harbors, having effectual breakwaters, mainly built of loose rubble. Carthage, Greece, and Rome, each in its own way, utilized their harbors for commercial and warlike purposes. That of Carthage was artificial, those of Greece but slightly so, nature having provided so many navigable inlets that little remained to be done by man. The great harbors of Rome, constructed in the solid and workmanlike manner of her practical race, may still be studied with profit, for the coasts of Italy yet show how well the Romans understood both the principles and the practice of this branch of marine engineering. One of their finest and most complete constructions of this nature was the port of Ostia, at the mouth of the Tiber, now more than two miles inland. The Romans were distinguished in harbor-making by the open or

arched mole or enclosing work, which gave full play to the currents, preventing the deposit of sand or mud. "The foundations of Nero's port," says Addison, "are still to be seen. It was altogether artificial, and composed of huge moles running round it, in a kind of circular figure, except where the ships were to enter." Harbor-making came to an end with the decay of commerce and civilization consequent upon the fall of the empire, to be revived by the Italian republics of the Middle Ages. The rich traffic of Venice and Genoa soon led to the construction of suitable ports at those places, and the moles of the latter city and the works in the lagoons of Venice remain to this day. France was next in the field, embanking, protecting, and deepening the mouths of the rivers along her northwestern shores, as at Havre, Dieppe, Dunkirk, etc. In 1627, during the siege of Rochelle, Metezeau constructed jetties of loose rubblestone, to prevent access to the city.

British Harbors.— Great Britain, whose ocean commerce is of comparatively recent date, lagged far behind her Continental rivals. With few exceptions her ports were absolutely unprotected, or rather uncreated; and this state of things continued until late in the 18th century. Two of the few exceptions were Hartlepool, where a harbor was formed about 1250, and Arbroath in 1394; in the 17th century at Whitby and Scarborough rough piers were thrown out, protecting the mouth of the port; at Yarmouth a north jetty, and subsequently a south one, were formed; an ancient mole existed at Lyme Regis; but the chief efforts of the early English engineers were directed against the shoals and waves of Dover. When, however, John Smeaton (q.v.) rose to vindicate the engineering talent of England, things took a different turn, and now few countries surpass Great Britain in the number of artificially improved commercial harbors. In Great Britain the construction and regulation of harbors is primarily under authority of the crown, but Parliament now usually names commissioners and boards with powers of ownership or management specially conferred by that body. All individual owners are required to manage harbors subject to the rights of public use, while final government control of them is practically absolute.

Harbors in the United States.— In this country all harbor-making in a public sense has been done since the beginning of the 19th century. The date of its first undertaking is 1802, when the project of building public piers in Philadelphia received government aid by an appropriation of $30,000. Twenty years later, for a harbor of refuge in Delaware Bay, $22,700 was appropriated; and in 1826 appropriations aggregating about $150,000 were made for river and harbor improvements at many places. From this time river and harbor bills have steadily increased the Congressional appropriations, which now amount in the aggregate to hundreds of millions.

Federal control over the ports of the United States, including all the important harbors, is exercised under the constitutional power of the government to regulate commerce; but in most of the details of harbor management — such as ownership and use of wharves, docks, warehouses, and the provision and disposal of facilities generally — management is left to the States. Pilot laws, the appointment of harbor-commissioners, harbor-masters, etc., and all other harbor regulations are made and enforced by the States, subject in certain things — as, for example, quarantine rules — to the jurisdiction of the Federal government. Consult: Rennie, 'Harbors'; Stevenson, 'Design and Construction of Harbors'; Moore, 'History of the Foreshore and the Law Relating Thereto'; Harcourt, 'Harbors and Docks'; Birdseye, 'Laws of the State of New York' (Navigation Law and New York Harbor); United States Revised Statutes, Secs. 5,244–5,255. See BREAKWATER; DOCKS AND DOCK YARDS; JETTIES; LIGHTHOUSES.

Harbor Grace, Newfoundland, a port of entry on Conception Bay, 27 miles west by north of St. John's, 84 miles by rail. It has a large but exposed harbor, with an inner secure port, a patent slip, and a lighthouse with a revolving light. It is the see of a Roman Catholic diocese with a handsome cathedral and convent. Its commerce is second to that of St. John's. Pop. (1901) 5,184.

Harbor Seal, or **Hair-seal,** the common small seal (*Phoca vitulina*), once common on both sides of the North Atlantic, down to Virginia in the United States, but now only occasionally seen south of Cape Cod. See SEAL.

Harbor Springs, Mich., village, county-seat of Emmet County; on Little Traverse Bay, an arm of Lake Michigan, and on the Grand Rapids & I. R.R. The landlocked harbor is much used by lumber vessels. The village is in a part of the State where the large forests make lumbering the chief industry. The chief manufactures are flour and lumber. The cool climate in summer makes Harbor Springs a favorite resort during July and August. Pop. (1900) 1,643.

Harby, Isaac, American dramatist and journalist: b. Charleston, S. C., 1788; d. New York 14 Nov. 1828. In 1822 he conducted the Charleston *City Gazette* and later the *Mercury*. His plays were 'The Gordian Knot'; 'Alexander Severus'; and 'Alberti.' He was vice-president of the Hebrew Orphan Asylum of Charleston and leader of the reformed movement among the Jews of that city — the first of its kind in the United States. In 1828 he removed to New York and engaged in journalism, until his death the same year.

Harby, Levi Charles, American naval officer; b. Georgetown, S. C., 21 Sept. 1793; d. Galveston, Tex., 3 Dec. 1870. While a midshipman in the United States navy in 1812, he was taken prisoner and confined in Dartmoor Prison, England, until the end of the war. He served under Gen. Jackson in the Creek war, and participated in the Texas struggle for independence and the conflict with Mexico. Subsequently he fought in South America under Bolivar. On the secession of South Carolina, he resigned his commission in the United States service and joined the Confederate forces as commander of the fleet at Sabine Pass.

Harcourt, här'koort, SIR **William George Granville Venables Vernon,** English statesman: b. 14 Oct. 1827; d. Malwood, Hampshire, 1 Oct. 1904. He began his education in a private school at Salisbury, and then studied at Trinity College, Cambridge, whence he was

graduated with high honors in 1851, receiving the degree of M.A. He then studied law, being called to the bar in 1854, and in 1866 he became queen's counsel. In 1858 he made an attempt to enter Parliament as an Independent Liberal, but was defeated. During these years he wrote largely for the 'Saturday Review' and other journals, and in 1860 attracted considerable attention by a series of letters on international law and kindred subjects contributed to *The Times* over the signature of "Historicus," and which he continued throughout the American Civil War. In 1868 he entered Parliament as Liberal member for Oxford, serving his constituents at that post till 1880, when he was defeated for re-election. He was, however, selected to represent Derby and continued in that position until 1895, when, having been defeated at the general election, he found a seat in West Monmouthshire. In 1869 he was elected Whewell professor of international law at Cambridge; at the same time he was appointed a member of the royal commissions for amending neutrality laws and for amending the naturalization laws. He was appointed solicitor-general in 1873, but held the office only three months, and in the same year was knighted by the queen. Although he had not supported Mr. Gladstone during his retirement from power, yet upon that statesman's return to the office of prime minister in 1880, he was appointed secretary of state for the home department, continuing in that capacity until the Liberal party went out of power in 1885. At that time his name became famous through his connection with the 'Ground Game Act' (1880), the 'Arms (Ireland) Act' (1881), and the 'Explosives Act' (1883), the last one being pushed through all its stages in the shortest time on record. In 1884, his bill for unifying the municipal administration of London was introduced. Upon the return of the Liberals to power in 1886, he was made chancellor of the exchequer, holding that position only a short time, as the fortunes of politics again took him from office. During the years 1880 to 1892 he was Gladstone's lieutenant in political life, and his services were of immense value, especially on account of his brilliant oratorical powers. Again in 1892 he was made chancellor of the exchequer, acting as such until 1895. It was during this term, in 1894, that he introduced and carried his famous tax budget, in which the income tax became more graduated and the "death duties" on real and personal property were equalized, thereby giving the government much aid in solving their financial problems. Upon Gladstone's retirement in 1894, Harcourt was looked upon as his successor, but his title was ignored and Lord Rosebery appointed in his stead. Sir William then became leader of the Liberals in the House of Commons, and it became evident that he and the new prime minister did not agree as to party policy, and, though their differences were from time to time patched up, it was clear in his defeat at Derby in 1895 that the party was divided on many issues, and the effect was then seen of Sir William's Local Veto Bill, not only in the utter rout of the Liberals, but in the setback given to temperance legislation. From 1895 to 1900 he represented West Monmouthshire in the House of Commons, but the task of leadership of the Liberal party became particularly onerous because of the tendency of the various sections to break away from control. In the session of 1896, against the overwhelming Unionist majority, he scored several successes, but was severely criticised by his own party for concurring in the majority report of the special committee, of which he was a member, appointed in 1897 to investigate the Jamieson Raid and the British South Africa Company. The internal dissensions in the Cabinet became more marked as time went on, and the divided counsels manifest among the leaders of the Liberals led to his decision to retire from the leadership of the party on the floor of the House of Commons, and in 1898 with John Morley he retired from active work and thereafter sat as a private member. As a private member, he no longer restrained his attacks on the government, paying not the least deference to Liberal imperialism. He actively opposed the government's policy with regard to the sinking fund, their attitude in the negotiations with the Transvaal, and the financing of the South African war, and throughout the war he lost no opportunity in criticising the South African developments. In 1898–1900 he became prominent, both on the platform and in his letters to *The Times*, in advocating active measures against ritualistic practices in the Established Church. The general election of 1900 found him full of fight, favoring the official Liberal programme as distinct from that of the imperialistic section which favored the return of Lord Rosebery to the leadership, and when the new Parliament met his attitude signified that his former claims would not be dropped. Sir William had refused twice to enter the peerage, and in a speech delivered at the National Liberal Club on 28 July, after announcing his determination to retire at the close of the session, said: "It is not because I am weary of the fight or am lukewarm in the cause that I intend to retire. It is because I do not think it for the public advantage that persons should attempt to fulfil duties that they are unable to perform." And yet after this announcement he vigorously attacked Joseph Chamberlain, whose weightiest political antagonist he was, for his fiscal proposals, in a lengthy speech, delivered in his familiar Homeric style. It has been written of him: "Sir William Vernon-Harcourt is one of the few public men whose addresses out of Parliament are printed in full by the London journals. His reputation has steadily improved while his party has been in the minority, and his caustic wit, polished satire, and brilliant epigrams have stung and irritated the conservative peers time and again. He has Lord Beaconsfield's trick of giving phrases the stamp of his own originality, so that there is no one on the Liberal side whose speeches are quoted more frequently. It has been aptly said that Sir William's distinguishing characteristic is his cleverness. His platform speeches are not only rattling and rollicking, but are generally brimful of witty and happy phrases. He has a great gift of lucid exposition and on rare occasions, when he condescends to be serious, commands a flexible and sinuous prose." Sir William Harcourt was married in 1859 to Lady Thérèse Lewis, widow of Sir George Cornwall Lewis, and daughter of T. H. Lister, and again in 1876 to Mrs. Elizabeth Ives, widow of J. P. Ives, and daughter of John Lothrop Mot-

ley, the historian, and at one time United States minister in London.

Hard Labor, in law, compulsory work, mechanical or other, sometimes judicially imposed upon criminals in addition to imprisonment or other punishment. It is a provision of statute law both in this country and Great Britain. Its first English adoption was secured through the demand for some adequate penalty in cases where penal servitude and transportation were for any reason inexpedient. In the United States the punishment of hard labor (which, however, is generally looked upon by humanitarians and sanitarians as being rather a healthful and merciful privilege) can only be imposed by a court on the authority of statute, the mode of applying the punishment being in some cases prescribed by State or Federal laws, and in others left to prison regulation.

Hardecanute, härˈdē-ka-nūtʹ, **Harthacnut,** or **Hardacnut,** king of England and Denmark; son of Canute: b. about 1019; d. 8 June 1042. At the time of his father's death in 1035 he was in Denmark, where he was immediately recognized as king. His half-brother, Harold, however, who happened to be in England at the time, laid claim to the throne of that part of their father's dominions. For a time the mother of Hardecanute succeeded in holding Wessex in his name, while Mercia and Northumbria were held by Harold, such an allotment having been made by a witenagemote held at Oxford. Hardecanute was about to make an armed descent upon England, when Harold died (1040), and his brother peacefully succeeded him. He reigned till 1042, but his reign was not marked by any important event. He left the government almost entirely in the hands of his mother and the powerful Earl Godwin (q.v.), while he gave himself up to feasts and carousals.

Harʹdee, William Joseph, military officer: b. Savannah, Ga., 10 Oct. 1815; d. Wytheville, Va., 6 Nov. 1873. He was graduated at West Point in 1838; served with distinction in the Mexican War; and in the Civil War entered the Confederate army with the rank of colonel. He commanded a corps at Shiloh; and was promoted lieutenant-general in 1862. At Perryville he commanded the left wing of the Confederate army and in December 1864 defended Savannah against General Sherman.

Harden, William, American historian: b. Savannah, Ga., 11 Nov. 1844. He left his studies in the schools of Savannah to join the Confederate army, serving throughout the Civil War in the 54th Georgia infantry and in the signal corps. After the war he studied law and was admitted to the bar in the early 70's. He was assistant librarian of the Georgia Historical Society from 1866 to 1869, when on 5 August he was appointed librarian, a position he still occupies. He has been a member of the board of managers of Telfair Academy of Arts and Sciences since 1882, and custodian since 1894; organizer and secretary of the Georgia Society of the Sons of the Revolution since 1891; and was a Democratic member of the Georgia House of Representatives from 1900–4. Has written much on historical subjects in magazines and journals.

Hardenberg, Georg Friedrich Philipp von, gā-ōrg frēdʹriH fēʹlēp fōn härʹdĕn-bĕrg, "Novalis," German poet: b. Wiedenstadt, Prussia, 2 May 1772; d. Wessenfels, Prussia, 25 March 1801. He made himself well acquainted with law, natural philosophy, mathematics and philosophy, but was most eminent for his poetical talents. In the works of "Novalis" there is a singular mixture of imagination, sensibility, religion and mysticism. He was the gentlest and most amiable of enthusiasts. His novel, 'Heinrich von Ofterdingen', was left unfinished. His 'Hymns to Night' and the 'Geistliche Lieder' are greatly admired. With the Schlegels and Tieck he assisted in founding the romantic school in Germany. Consult: Schubart, 'Novalis Leben' (1887); Bing, 'Friedrich von Hardenberg' (1893).

Hardʹhack, or **Steeple-bush,** an erect species of American *Spiræa* (*S. tomentosa*), common in pastures and low grounds, and celebrated for its astringent properties, which cause it to be used medicinally. It is distinguishable by the dense woolly tomentum, which covers its stem and the underside of its leaves; and bears in late summer "a compact, steeple-shaped panicle of peach-blow pink."

Harʹdie, James Allen, American soldier: b. New York 5 May 1823; d. Washington, D. C., 14 Dec. 1876. He was graduated from the United States Military Academy in 1843, entered the artillery, during the Civil War served on the staffs successively of Generals McClellan and Burnside, was judge-advocate-general of the Army of the Potomac on Hooker's staff, became brigadier-general of volunteers in 1862, and inspector-general with rank of colonel in 1864. He was brevetted major-general, United States army, in 1865. His writings are largely confined to military reports.

Hardie, James Keir, English labor leader: b. Lanarkshire 15 Aug. 1856. He worked in the coal mines until 1879, when he was blacklisted on account of his activity in organizing the miners; he was then appointed paid secretary of the miners' union. In 1886 he organized the Ayrshire miners, and in 1887 attended his first Trade Union Congress. He was one of the founders of the Independent Labor Party, and was elected member of Parliament in 1888, 1892, and 1900. He is proprietor and editor of a weekly paper, the 'Labour Leader.'

Hardie, Robert Gordon, American portrait painter: b. Brattleboro, Vt., 29 March 1854; d. Brattleboro, Vt., 9 Jan. 1904. He studied drawing at the Cooper Union Institute, the Academy of Design, and the Art Students' League, N. Y., and at Paris became a pupil of Gérôme. He exhibited at the Salon in 1880 and following years, and in 1882 studied under Cabanel. A picture of his appeared at the Exhibition of the National Academy of Design in 1888, and he exhibited a portrait of his wife at the World's Columbian Exposition in 1893.

Harding, Chester, American portrait painter: b. Conway, Mass., 1 Sept. 1792; d. Boston 1 April 1866. As an artist he was self-taught, his trade being that of a turner. He fought as a soldier in the War of 1812, and found employment on his discharge as a sign-painter in Pittsburg, Pa. Crossing the ocean he became a favorite portrait painter in London and found

patronage among the royal family. His 'Portrait of Daniel Webster' is owned by the New York Bar Association, while his 'Portrait of John Randolph' is in the Corcoran Gallery, Washington.

Harding, Karl Ludwig, German astronomer: b. Lauenburg 29 Sept. 1765; d. Göttingen 31 Aug. 1834. Called to be a tutor to the son of the illustrious Schröter, he became inspector and observer in Schröter's observatory. In 1805 he was appointed professor of astronomy in the University of Göttingen, and remained in this position till his death. He discovered the asteroid Juno, the third of the planetoids, in 1804, and independently, the second comet of 1813 credited to Pons. His 'Atlas Novus Cœlestis' (1808–23; new ed. 1856) was for years the best of its sort.

Hardness, the quality of bodies which enables them to resist abrasion of their surfaces. It depends on the cohesive forces with which the minute particles of the body are joined together. The hardness of bodies is compared by observing which of two scratches the other when they are rubbed together; sometimes a scale is used in which a set of standard bodies is arranged and numbered, and other bodies are referred to this scale with respect to hardness.

Hardness, Scale of. In mineralogy, the hardness of a mineral is estimated by observing which of certain standard minerals will scratch a smooth surface of the given mineral, and which will not. On Mohs' scale (which is usually adopted), ten such standard minerals are selected for the establishment of the scale, their hardnesses being arbitrarily defined as 1, 2, 3, etc., up to 10. The minerals that are commonly used for this purpose are as follows:

1. Talc.
2. Gypsum.
3. Calcite.
4. Fluorite.
5. Apatite.
6. Feldspar.
7. Quartz.
8. Topaz.
9. Sapphire.
10. Diamond.

A mineral which will neither scratch apatite nor be scratched by it, for example, has a hardness of precisely 5; and the same may be said of one which will both scratch apatite and be scratched by it. A mineral which feldspar will scratch but apatite will not, has a hardness intermediate between 5 and 6. The decimal expressing the precise degree of hardness in such a case must be assigned by guess; but there is little use in attempting to determine a hardness more closely than to the nearest half-degree on the scale given above.

Hards, the designation of a faction of the Democratic party in the political history of New York from 1852 to 1860. They were distinguished from the "softs" in their favoring alliance with the pro-slavery Democracy throughout the States. They were also called "hardshells" and were identical with the "hunkers" or conservative Democrats of 1845.

Hard'tack, a cracker or biscuit, large, hard, and coarse, much used by soldiers and sailors. About 20 of these crackers are served daily to each man. When the United States soldiers were about to be shipped from Tampa to Cuba, during the Spanish-American War, two factories in Atlanta furnished the government in two days with 80,000 pounds (1,120,000) of hardtack.

Hardware Trade in America. Hardware is essentially a business that belongs to a new section of country, and it can readily be seen that the larger distributing centres for the hardware business would naturally be in the central West, where growth began about 1850, and new communities required new household furnishings. At the present time it is safe to say that there are larger distributers of hardware in Chicago and St. Louis than anywhere else in the world. A distinctly American branch, there is no other line upon which Yankee ingenuity so distinctly impresses itself, which is so entirely free from imitation of the ideas of the Old World; and which has so quickly turned the universal import trade into a great and constantly increasing export business. All this has been done within the brief period of the last half century, during which this industry had to struggle against the flood of cheap and ill-constructed foreign goods.

Hardware is very comprehensive. Indeed it embraces almost everything that is not, strictly speaking, assignable to any other specific line of trade. It used to mean chiefly mechanics' tools and builders' hardware, whereas at this time it includes so vast a variety of goods as to make it difficult to enumerate them correctly. Comprising, as it does, almost all the small articles made of metal that are patented and used in the construction of houses or for household purposes, as well as tools for all classes of mechanics or professional men, it covers house furnishing-goods for kitchen and dining-room service, the product of the tin-shop and of stamped-ware manufactories, tin-plate, sheet-iron, barbed wire, and such sporting goods as guns, rifles, pistols, ammunition, baseball supplies, and bicycles. An idea of its vast range is conveyed by the fact that one hardware house in this country alone has in its catalogue about 45,000 kinds and sizes of articles, all of which it carries regularly in stock.

Before the first commercial treaty with England, in 1795, all of our supplies in this line, substantially speaking, came from England and Germany. Immigrants could frequently be seen bringing with them their hoes, rakes, and forks, upon which were strung their bundles of clothing. Afterward German goods made great gain over the English. These goods were, as a rule, very crude, poorly made, and not at all to be compared even with the articles that were first manufactured in this country. The genesis of hardware in the United States was undoubtedly in Connecticut, where the village blacksmith was the manufacturer of such implements and tools as were wanted. Very little progress was made in this line of manufacture until 1850, when the manufacture of hardware, speaking generally, was commenced in the United States. Until that time perhaps four fifths of all hardware used in this country was imported. In general both English and German goods as imported into the United States were shipped in awkward and unprepossessing packages, files, saws, and horseshoe nails being so poorly wrapped that they usually broke through their covers. So, too, small goods, such as padlocks, door-locks, screw-drivers, scissors, rules, etc., were all put up in rough but strong English paper, which, while substantial, was very clumsy and inconvenient. Such goods have long since

ceased to be imported, and the manufacturers of this country particularly excel in their method of packing; for example, files are put in wooden boxes, with dovetailed corners and slide-lids, hand-saws in compact pasteboard boxes, and horse-nails in wooden boxes, and all small goods, even screws and tacks, in boxes of most convenient form and shape for the small dealer. Particularly striking is the convenient and neat boxing of tacks, a product, by the way, now manufactured more largely in the central West than in New England, although there are still several important factories in Massachusetts.

All this time the introduction of labor-saving machinery was continued, so that the foreign article could compete with ours neither in price nor in quality. It has come to pass that our imports of hardware have almost entirely ceased, although there is yet some cutlery imported, and each year our export business in hardware shows a considerable and substantial gain. As will be noted in the detailed items which follow, we send our hardware all over the world; and in London, and even Sheffield itself, the birthplace of mechanical ingenuity, our American edge-tools are advertised as special attractions.

The experience of the last few years has thoroughly demonstrated the fact that the hardware business and its kindred lines is the pulse of the country's prosperity or depression; for so closely is it allied with iron-producing and railway interests, that it shows more quickly than any other branch the first approach of depression, and recovers sooner from the effects of it.

It is a fact worthy of attention that of all the goods that are sold by the hardware jobbers of the United States to-day fully 35 per cent have been invented or originated within the past 20 years. In door-locks, latches, padlocks, and small builders' hardware, Americans have been particularly successful. In point of fact, their goods possess so many advantages over those made abroad as to defy comparison. England, France, and Germany still use a large, weighty wrought-iron door-lock, with its heavy brass key 8 or 10 inches long, clumsy and awkward, a great contrast to the compact and convenient American lock and key. Door-lock manufacture was first begun in Connecticut, in New Haven and New Britain, about 1834. The first goods manufactured were the cheaper grades, chiefly plate and wood stock locks. Then English patterns in wrought iron were copied, and very soon thereafter, and not later than 1840, door-locks were made successfully from cast iron, and these immediately supplanted the old and clumsy wrought-iron locks. Owing to European conservatism, the use of cast iron has never become common in Europe, where a prejudice in favor of wrought metal still exists. These conditions long stood in the way of the introduction of American hardware into Europe, but this prejudice is gradually growing less.

American builders' hardware has in recent years advanced from the stage where each new article was originated by the pattern-maker or the lock-maker, working with sheet-metal and file, so that now the work of designing is done by skilled draftsmen working at the drawing-board. There is no reasonable doubt that there will be a very large export trade in door-locks and builders' hardware in the near future, because of increasing appreciation of the merit of the American goods abroad.

There is probably nothing in the hardware line in which the American dealer takes more pride than saws, and especially hand-saws and such other small saws as are used by the carpenter and cabinet-maker. It is believed that the first saws of any kind manufactured in the United States were made by William Rowland in the year 1806, in Philadelphia. In 1823 a small plant was started by Aaron Nichols in the same place. In 1828 or 1829, in New York, the firm of R. Hoe & Co. began to make circular saws from English steel, which were about the first manufactured in this country. In 1835 Noah Worrall started in New York the manufacture of small circular saws. The following year William & Charles Johnson commenced the manufacture of saws in Philadelphia; and it was with this firm that Henry Disston, who afterward achieved a world-wide reputation for his wonderful success, learned his trade. In 1840 the firm of William & Charles Johnson failed, and Henry Disston accepted from them some tools, steel, and such material as he could get in the saw line, on account of wages that were due him, and with these he began to manufacture saws in his own name. After this there were several small industries started — by Jonathan Paul 1840, J. Bringhaust 1842, James Turner 1843, and Walter Cresson 1845. These four were each in turn bought out by Henry Disston. Prior to 1863 all of the steel used in this country in the manufacture of saws was brought from England, but in that year Henry Disston built and operated the first crucible-steel melting plant for saw-steel in the United States, and from that time on used nothing but steel of his own production. Practically all improvements in quality, style, methods of manufacture, etc., have been made since 1865, and to Disston is due the credit of placing American saws in their present position. There are about 3,215 persons employed in this industry, with an annual product of about $6,443,000, and there is nothing made in this country that advertises the United States better, more substantially, more practically, or more permanently than American hand-saws, so excellent is their quality, and so beautiful are their design and finish. The capital invested in the manufacture of saws in the United States is $8,508,487.

The item of small farming-tools is one of the exceedingly interesting manufactures in the hardware line, because they were brought here a century ago by the immigrants. Immediately thereafter the village blacksmith began to make them, forging the goods by hand. The goods were very clumsy, unshapely, awkward to use, and heavy. But in the decade of 1820–30 the introduction of the trip-hammer revolutionized the entire business. At the present time there are more than 25 manufacturing works in the United States engaged on "hand agricultural tools," employing perhaps 1,500 people, with a capital of $1,500,000, and an annual product of over $2,000,000. The steel consumed in these productions is more than 4,000 tons annually. Of this product of $2,000,000 at least $250,000, and perhaps twice as much, is exported to foreign countries, leaving about $1,500,000 for home consumption. In this one class of goods foreigners have improved in their quality by reason of our competition.

The cutlery business of the United States has an interesting history. While the American

manufacturer of table cutlery has to a large extent driven out the foreign goods, by reason of the excellence of quality and the economy of manufacture, the pocket-cutlery makers have not been so successful, for the cost of making pocket-knives is 85 per cent labor and 15 per cent material. So that it can be seen how difficult it is for the manufacturer of pocket-knives in this country to compete with the cheap labor of England and Germany. The origin of pocket-knives in this country is traced back to Connecticut, as is so much in the hardware line, beginning in the year 1842. The first factory was quickly followed by the establishment of five others in the same State. The result was that many of the best English operatives from Sheffield came here, because they could find steady employment and higher wages. After a while some of these operatives formed a new co-operative company in Walden, N. Y., which is to-day the largest concern of the kind in the United States. The pocket-knife industry of this country is unquestionably in New York and Connecticut. Of 55 ventures since 1844 more than 32 have experienced failure, owing chiefly to their short-sighted policy of making goods for price rather than for merit, and attempting to compete with the cheap labor of the old country in price rather than in the excellence of quality and finish. A large majority of these pocket-knife manufactories have been founded on the co-operative plan, locating in small villages where cheap water-power was abundant. During prosperous times the consumption of pocket cutlery in the United States is in the neighborhood of 1,200,000 dozen per annum, representing perhaps $3,000,000. The larger part of this is imported from Germany and England, in the proportion of two to one in favor of Germany. Prior to 1850 the American market was supplied almost entirely from England, but the cheaper German grades are gradually driving out the higher-priced English goods. The home-made product has steadily improved in quality, and while it is not always as absolutely uniform as the English product, yet the best American knives are not surpassed by anything produced in Sheffield, and are far superior to the German in quality, temper, and finish. The genius of American manufacturers is much handicapped by the impossibility of employing any labor-saving machinery worth mentioning, since the quality of the knife depends entirely upon the skill of the mechanic in manipulation and tempering. Although there is no export business in pocket cutlery, the manufacturers, at times, have given evidence of what they can do in the line of cheapness. Recently a single-blade knife with a wood handle, handsomely finished, and of a quality of steel which would take a razor edge, was produced by the manufacturers so cheaply that after the jobber and retailer had each had his profit it passed into the hands of the consumer for 10 cents. The complexity of the business may be gathered from the statement that it is necessary to import mother-of-pearl from the Philippine Islands, tortoise-shell from the Indies, stag-horn from Germany and India, ebony from Ceylon and Madagascar, cocoa-wood from Cuba, and rosewood from South America. American manufacturers of pocket cutlery now employ about 3,000 men and produce about $2,000,000 of goods annually. Table cutlery was first manufactured in this country in 1832, before which period everything in this line came from England. By 1865 the business was pretty much in the hands of the home manufacturers, and in 1893 the entire amount of foreign table cutlery imported into the United States was only $195,000. Attempts have been made by foreigners to copy American patterns of table cutlery, but in no instance were they successful in producing so good an article, and the effort was finally abandoned. The State of Maine was probably the birthplace of the manufacture of table cutlery, the first effort being made at Saccarappa. In the "market of the world" there is no such great middle class as there is in the United States, and there is a demand for medium-grade, well-finished goods in this country which does not exist in others. The amount of table cutlery exported is a mere trifle — probably not more than five per cent of the product of the country. The estimated value of the production of the various table-cutlery manufactories of this country is $3,000,000.

American shear-makers have set the pace for the world in that line of goods. They were the first to solve the problem of welding a high-grade steel blade to an iron backing or soft casting made to fit the hand. This was the invention of Seth Boyden in 1826. The manufacture of shears in this country was started in a crude way the year before, at Elizabethport, N. J. Welding by hand was carried on from that date until early in the sixties, when a drop-hammer was constructed by H. Wendt, the ram of which was raised by the friction of a rope pulled by hand around a revolving wheel or pulley. This rope later gave way to a flat leather strap, which was succeeded by power drop-hammers operated by friction-rolls upon a flat board, under perfect control by the foot of the operator, the hands being free for the proper manipulation of the work. American shears are exported in great quantities, especially to England, South America, and Australia. None of the foreign countries has adopted our method of manufacturing shears, and for that reason their goods do not compare with the American product. There are eight manufacturers engaged in this business in this country with a total capital of about $750,000, employing about 1,000 people, and with a product of about $1,500,000.

In the manufacture of fine mechanics' tools, such as are used by the higher class of machinists, the United States is the peer of any country. To-day one of the foremost concerns in this line, located in Providence, R. I., sends its tools to England, France, and Germany, where they are in great demand because of their great accuracy and almost infallible uniformity of manufacture. An illustration of the esteem in which they are held is shown in the fact that these American tools are used in the manufacture of the new French rifle which is attracting so much attention. Some idea of the exactness of such work may be gathered from the statement that in the production of fine firearms it is necessary that thousands of parts should be interchangeable, and should not vary by 1/1000 of an inch. Some of the micrometer calipers from these works will measure the two-hundred-and-fifty-thousandth part of an inch with accuracy; and this same firm have in their office a tool whereby the difference in

diameter between two steel bars of the ten-thousandth part of an inch is made perceptible to both the eye and the touch.

The manufacture of axes in America has been a particularly successful branch. Exports go to all quarters of the globe, notably to Tasmania, where the American axe is regularly used in the famous tournaments of the Axemen's associations. The annual output is 350,000 dozen, of which more than 20 per cent are exported.

The manufacture of wire cloth, or netting, has become a large industry in this country. It was first introduced from Germany in the year 1870, and it cost at that time to import it from 10 to 12 cents per square foot. In 1873 an improved hand-loom was operated in Cortlandt, N. Y., made by Wickwire; and in 1874 he invented a shuttle motion known as the positive motion, the shuttle being carried through the cloth instead of being thrown, as was the case in former manufacture. With this principle to work upon he succeeded in making a power-loom in 1876, which was the first to make a hard-drawn wire cloth. This principle is now used by all manufacturers of wire cloth. The present price is less than 1½ cents per square foot. In 1876 the consumption in this country was about 10,000,000 square feet. At the present time it is more than 125,000,000. There is a total capital of about $3,500,000 invested in the manufacture of wire cloth in this country, consuming about 7,000 tons of steel. The export trade in wire cloth is chiefly with Canada, Nova Scotia, South America, Mexico, and the West Indies, and although light at present, being about seven per cent of the entire output, is growing steadily. The American product far excels that of foreign manufactories in quality. There is no country that uses screen-cloth in windows and doors so generally as does the United States.

The manufacture of files in this country was begun half a century ago in Providence, R. I. The product at first was entirely hand-cut, with the old-fashioned hammer and chisel; for although machines were invented at an early date, they were not used until about 1858. These first machines, however, were not successful, and it was not until 1865 that machine-made files can be said to have been fairly under way. The first year's output was only about 90,000 dozen, whereas now it is something like 4,000,000 dozen. At present about 15 per cent of the product is exported. Up to 1870 the importation of files from England and from Switzerland was very large; but in that year imports began to fall off rapidly, and have now practically ceased, with the exception of a few fine Swiss files which are still brought over for special purposes. On the other hand, the exports are steadily growing. American files now being used in China, Japan, India, Africa, in many of the European centres, and in Great Britain itself. The merits of the American files are so pronounced, both as to wearing qualities, handsome appearance, and cheapness of price, that the preference is given them over files made in other countries. The manufacture is extremely intricate and involves the most careful inspection. It is a well-recognized fact in this country that machine-made files are more evenly cut than hand-made files can possibly be; and as nearly all the foreign files are still made by hand, the American product has a great advantage. In addition to this, Americans put up their files in better, more convenient, and more attractive packages than any manufactured in foreign countries. This particularly appeals to the trade of Australia, South America, and the West Indies. A very large percentage of the files manufactured in the United States is made by the Nicholson File Company of Providence, R. I., and Henry Disston & Sons of Philadelphia, in the various factories which they own or control. The American file manufacturers employ 3,160 hands. The estimated capital invested is $3,857,647, and the total value of the annual product about $3,400,000.

There seems to be good evidence, as in the case of many other apparently modern inventions, that the gimlet-pointed screw was made as far back as 1755. The first application of machinery on record for making screws was in France in 1569. The first English patent was obtained in 1760. From 1846 to 1849 came the inventions of Thomas J. Sloan, and these, in connection with the inventions of Harvey, form the basis of the screw-machinery of to-day. Screw-machinery was in operation in this country in 1810 in threading wood-screws, and was known as French machinery, having originated in eastern France. Some of it was in use as far back as 1798 in New York State. In 1835 came the invention of machines for heading, nicking, and shaving screws, and in 1842 the very important invention of the automatic feed for supplying blanks to screw-threading and shaving machines. One of the earliest manufactories in this country was established in 1838, with a capital of only $20,000. About 1841 the first American gimlet-pointed screws were placed on the market. Since that time screw-machinery of this character has been largely exported, and at present there are 20 screw-manufacturing concerns in this country. The machinery itself is among the most perfect ever invented, working with almost human intelligence and precision. Few screws are exported, owing to the severe competition of the great screw-manufactories of Birmingham, but the American article is generally regarded as more perfect than any made abroad. At present $7,931,000 capital is invested and 3,527 operatives employed in screw-manufacture in the United States.

Shovels and spades were manufactured in this country, in Massachusetts, as far back as 1776, in a small way; but since that time the methods of manufacture have improved so rapidly and intelligently that the American product now far outstrips that of the rest of the world. The Ames factory at North Easton, Mass., has a world-wide reputation, and exports its goods in great quantities to almost all parts of the civilized world. There are many other large factories in this country, producing an enormous quantity of these goods annually. The American goods are greatly preferred to the foreign article, being vastly superior in quality and attractiveness, and much lighter. There are about 14 shovel-manufactories in this country, with the total product of about 400,000 dozen shovels and spades.

The progress of horse-nail making in this country was very slow, and it was not until 1872 that much had been done in this line. After that the progress was rapid, and soon thereafter the foreign goods were entirely driven out of the market. Nails in this country are made

by what is called the hot-forging process, and are hammer-pointed. None are made in this manner abroad, and for that reason the American horse-nail is far superior to those made in other countries. There are 12 horseshoe-nail manufacturers in the United States, employing about 1,000 workmen, with a capital of about $2,000,000, having a total product of 1,500,000 kegs, of which 15 per cent are exported.

Wire nails, which have so rapidly superseded the cut nails, were not made in this country until 1886. The total production that year was 600,000 kegs. In 1887 this output was doubled, and continued increase has been shown each year since. The present annual product is about 10,000,000 kegs. In 1901 there were 19 wire-nail mills in operation in the United States, controlled by 10 different companies, with a capital invested of about $8,000,000; the value of the product was $15,000,000, and these mills gave work to 5,000 employees.

Barbed wire was first manufactured in the United States in 1874, at De Kalb, Ill. In that year there were not over 500 to 600 tons produced, and the price was 20 cents for painted wire. The next year the product increased to 3,000 tons, and five years later (1880) it had made such a great gain that the record was 100,000 tons; while for the year ending 1 March 1895, the total product was 190,000 tons, at which time the average price, which was originally 20 cents, was reduced to about 1½ cents per pound. Of all the barbed wire manufactured in the world fully 90 per cent is produced in the United States, and there are annually exported from 20,000 to 30,000 tons. The barbed-wire mills in operation have a capital of $8,350,000, and a total product of more than $15,000,000. In recent years the product of this industry has been greatly displaced by woven wire for use in fences. This latter industry has an annual product of 50,000 tons.

Tin-plate making is among our youngest manufactures, considered in reference to the amount of its product. No industry in the United States has shown such phenomenal growth as has that of the production of tin-plate. It is safe to say that there was substantially none of it prior to 1891. Since that time the American production has grown steadily until it has reached the annual figures of 8,000,000 boxes. Importation has fallen off and now consists of only a few cheap grades of bright plates. An allied industry is the manufacture of sheet steel, the annual product being 650,000 tons of black sheets and 100,000 tons of galvanized sheets. The exports increased nearly 1,000 per cent between 1897 and 1900. The native product is superior to the foreign both as to the quality of steel used for tinning, and again in that advantage which Yankee ingenuity almost invariably brings — labor-saving machinery of every kind. The Welsh tin-plate makers have progressed very little since they began the industry, and the prospects are that a hundred years from this date will find them just where they are now; while the American manufacturers have already made radical changes and introduced a number of marked and valuable improvements.

The great advance in the American hardware trade during the last half dozen years has been due to the steady concentration of business, the aggregation of capital in the steel and iron manufactures being perhaps the most notable of the last few years of trust-building.

EDWARD C. SIMMONS,
Pres't Simmons Hardware Co., St. Louis.

Hard'wick, Mass., village in Worcester County, about 22 miles northwest of the city of Worcester and four miles north of Gilbertville, the nearest railroad station. Hardwick is in a fertile agricultural section, and its chief industries are connected with the products of the surrounding farms. Its beautiful scenery and distance from a railroad make it the summer resort of a large number of health and pleasure seekers. Pop. (1900) 2,655.

Har'dy, Arthur Sherburne, American novelist: b. Andover, Mass., 13 Aug. 1847. After a single year at Amherst College he entered the West Point Military Academy, graduating in 1869. He became a second lieutenant in the 3d Artillery regiment, saw some service during 1869 and 1870, and then resigned to become a professor of civil engineering at Iowa College for a brief time. In 1874 he went to Paris to take a course in scientific bridge-building and road-constructing, returning to take a professorship in that line of instruction at the Chandler Scientific School, connected with Dartmouth College. He assumed a similar professorship in Dartmouth College in 1878. This position (in connection with which he published 'Elements of Quaternions' (1881), followed by his translation of 'Argand's Imaginary Quantities,' by his own 'Analytical Geometry'; and 'Elements of the Calculus'; 'Imaginary Quantities'; and 'Methods in Topographical Surveying') he held until 1893, when he became editor of 'The Cosmopolitan Magazine.' He was United States minister to Persia, 1897–9, and envoy extraordinary and minister plenipotentiary to Greece, Rumania and Servia, 1899–1901. He is, however, best known as a novelist, his works in this field including: 'But Yet a Woman' (1883); 'The Wind of Destiny' (1886); 'Passe Rose' (1889); 'His Daughter First' (1903).

Hardy, Edward John, English author and clergyman: b. Armagh, Ireland, 7 May 1849. He took orders in the English church, became an army chaplain and in 1903 was stationed at Hong Kong. He is known the world over as the author of 'How to be Happy though Married' (1884), which has been translated into many languages. Other works by him, several of which have been extremely popular, as well in the United States as in England, are: 'Manners Makyth Man' (1885); 'Faint yet Pursuing' (1886); 'Uncle John's Talks with his Nephews' (1886); 'The Five Talents of Women' (1888); 'The Love Affairs of Some Famous Men' (1897); 'Mr. Thomas Atkins' (1900); 'Concerning Marriage' (1901); 'Love, Courtship and Marriage' (1902); 'Pen Portraits of our Soldiers' (1902).

Hardy, Iza Duffus, English novelist, daughter of Sir Thomas Hardy, the English historian. Among her numerous novels are: 'Glencairn' (1877); 'Only a Love Story' (1877); 'A Broken Faith' (1878); 'The Love that He Passed By' (1884), an American novel; 'A Woman's Loyalty' (1893); and two volumes of transatlantic reminiscences, 'Between Two Oceans' (1884), and 'Oranges and Alligators: Sketches of South Florida Life' (1886).

Hardy, Thomas, English novelist: b. Dorsetshire, England, 2 June 1840. He was educated as an architect and practised his profession 1862–73. He then turned to literature and is now recognized as the first of living English novelists. His published works include 'Desperate Remedies' (1871); 'Under the Greenwood Tree' (1872); 'A Pair of Blue Eyes' (1873); 'Far from the Madding Crowd,' which first established his fame (1874); 'The Hand of Ethelberta' (1876); 'The Return of the Native' (1878); 'The Trumpet-major' (1880); 'A Laodicean' (1881); 'Two on a Tower' (1882); 'The Mayor of Casterbridge' (1886); 'The Woodlanders' (1887); 'Wessex Tales' (1888); 'A Group of Noble Dames' (1891); 'Tess of the D'Urbervilles' (1891); 'The Three Wayfarers' (1893); 'Life's Little Ironies' (1894); 'Jude the Obscure' (1895); 'Wessex Poems' (1898); 'Poems of the Past and Present' (1901). Consult: Johnson, 'The Art of Thomas Hardy' (1894); Macdonnell, 'Thomas Hardy' (1894); Windle, 'The Wessex of Thomas Hardy' (1901); Sherren, 'The Wessex of Romance' (1902).

Hare, Augustus John Cuthbert, English descriptive writer: b. Rome, Italy, 13 March 1834; d. St. Leonards, Sussex, 22 Jan. 1903. He was a nephew of J. C. Hare (q.v.). His life was spent mainly in travel, on descriptions of which his fame chiefly rests. Among his many works may be cited 'A Winter at Mentone' (1861); 'Walks in Rome' (1870); 'Wanderings in Spain' (1872); 'Memorials of a Quiet Life' (1872); 'Days near Rome' (1874); 'Walks in London' (1877); 'Days near Paris' (1887); 'Sussex'; 'The Story of My Life' (1895); 'Shropshire.'

Hare, John, English actor: b. London 16 May 1844. He made his first appearance in Liverpool, then going to London played at the Prince of Wales theatre, and later was manager of the Court theatre, the Garrick theatre, and the Globe theatre. He became distinguished as a comedian, and visited the United States, playing in the chief cities. The plays he has brought out include 'A Scrap of Paper'; 'Still Waters Run Deep'; 'A Bachelor's Romance'; and 'Gay Lord Quex.'

Hare, John Innes Clarke, American jurist: b. Philadelphia 17 Oct. 1817. Graduated from the University of Pennsylvania in 1834, he was admitted to the bar in 1841, was successively associate and presiding judge of the Philadelphia district court (1851–75), and in 1875–95 presiding judge of the court of common pleas. He was also for a time professor of the institutes of law in the University of Pennsylvania, and published: 'American Leading Cases' (1847; with Wallis), 'The Law of Contracts' (1887), 'American Constitutional Law' (1889), eleven volumes of chancery reports, and other works.

Hare, Julius Charles, English Anglican clergyman and author: b. Valdagno, Italy, 13 Sept. 1795; d. Hurstmonceaux, Sussex, 23 Jan. 1855. He was vicar of Hurstmonceaux from 1832 and published 'Vindication of Luther' and other works, but is much more widely known as co-author with his brother A. W. Hare, of 'Guesses at Truth' (1827), a work which still enjoys popularity.

Hare, Robert, American scientist: b. Philadelphia 17 Jan. 1781; d. there 15 May 1858. He was professor of chemistry in the University of Pennsylvania 1818–47. He will be longest remembered for his discovery of the oxyhydrogen blowpipe to which he gave the name "hydrostatic blowpipe," but he also invented the valve-cock, the calorimeter and a process for denarcolizing laudanum. He wrote 'Brief View of the Resources of the United States' (1810); 'Chemical Apparatus and Manipulations' (1836); 'Memoir on the Explosiveness of Nitre'; etc.

Hare, William Hobart, American Protestant Episcopal bishop: b. Princeton, N. J., 17 May 1838. He studied at the University of Pennsylvania, was ordained priest in 1862, was minister of St. Luke's, St. Paul's (Chestnut Hill) and other churches of Philadelphia, and in 1873 was consecrated missionary bishop of Niobrara. In 1883 his diocese, having been enlarged so that its limits were identical with those of the territory of South Dakota, was renamed that of South Dakota. He became known as an authority on the Indian question, and wrote pamphlets on mission work in the western United States.

Harebell, or **Bluebell,** a familiar species of bell-wort (*Campanula rotundifolia*), common throughout the northerly parts of the whole northern hemisphere (see BLUEBELL; CAMPANULA), growing in dry and hilly pastures, on waysides, and open lands generally. It is, however, rare in America south of Canada, although other species are to be found here. It is perennial, with a slender stem 6 to 14 inches high, bearing a loose raceme of a few drooping flowers, on very slender stalks; the flowers, generally bright blue, but sometimes white, bell-shaped, and about half an inch long, appear in summer and autumn. The juice of the flowers yields a fine blue color, and may be used as ink.

Harel, Paul, pōl ä-rĕl, French innkeeper-poet: b. Echauffour (Orne) 1854. He became landlord of the "Croix Saint-André," an inn at Echauffour, and within a modest range of subject wrote picturesque verses in an excellent lyric style. He was elected to the Caen Academy, and on the recommendation of Sully-Prudhomme received a prize from the Académie Française. Among his works are: 'Sous les Pommiers' (1879); 'Rimes de Broche et d'Epée' (1883); 'Aux Champs' (1886); and 'L'Herbager,' a three-act poetic drama (1891).

Harelip. A fish. See CUTLIPS.

Ha'rem, or **Hareem'** (Ar. "the prohibited"), is used by Mussulmans to signify the women's apartments in a household establishment, forbidden to every man except the husband and near relations. The women of the harem may consist simply of a wife and her attendants, or there may be several wives and an indefinite number of concubines or female slaves, with black eunuchs, etc. The greatest harem is that of the sultan of Turkey. The women of the imperial harem are all slaves, generally Circassians or Georgians. Their life is spent in bathing, dressing, walking in the gardens, witnessing the voluptuous dances performed by their slaves, etc. The women of other Turks enjoy the society of their friends at the baths or in each other's houses, and appear in public accompanied by slaves and eunuchs; but the women of the sultan's harem have none of these privileges.

It is of course only the richer Moslems who can maintain harems; the poorer classes have generally but one wife.

Hares. In the United States the names hare and rabbit are used indiscriminately for various species of rodents of the family *Leporidæ*. Hare is the generic term, while rabbit is applied properly to a single short-legged species of essentially burrowing habits whose naked, blind, and helpless young are nurtured in underground nests (see RABBIT). None of the native American species have these characteristics. The second pair of upper incisors are small, non-functional and placed directly behind the large gnawing teeth, a peculiarity which distinguishes the hares and a few allied forms from all other rodents. The ears are always large, the tail short, bushy, and upturned, the forelimbs short and five-toed, the hind ones long and four-toed, and the soles of the feet densely hairy. Hares are exclusively vegetarian. They are extremely timid, alert and have keen senses. They move with peculiar erratic leaps and with great speed for short distances, and walk with a peculiar shuffling gait by placing the entire sole of the hind foot on the ground. A favorite attitude is that of resting on the haunches with the head erect; but the forelimbs lack altogether the prehensile powers of the squirrels. None of them are arboreal or aquatic. The older catalogues enumerate from 20 to 30 species from all parts of the world except Australasia, but chiefly belonging to the northern hemisphere. With a very few exceptions all the hares are included in the single genus *Lepus*.

The gray rabbit, wood rabbit or cottontail (*L. floridanus* or *L. sylvaticus*) is very plentiful throughout eastern North America north to Ontario. It frequents thickets and brier patches on the borders of woods, multiplying excessively in the more thickly settled regions and replacing the more retiring varying hare. All kinds of succulent herbage, bark, berries, and buds, the latter especially in winter, form the rabbit's food, which it seeks to a large extent along regularly established runways, not infrequently leading to the farmer's truck-patch. Although it does not itself burrow, the cottontail frequently escapes its pursuers by retreating into the holes of woodchucks, skunks, etc., in this respect and some others resembling the true European rabbit more closely than any other American species. Several broods of four to six young are raised each year. At birth they are blind and helpless, and are protected in a nest built in a depression in the ground of dried grass or weeds lined with the rabbit's own fur.

The varying hare or white rabbit (*L. americanus*) is a larger species with longer hind legs, taking its name from the alternating brown and white color of summer and winter respectively, a change which is less complete southward. Much difference of opinion has prevailed regarding the manner in which this change occurs, the latest competent view being that the white coat is due to the growth of new white-tipped hairs among the soft short fur, the brown tint of which again appears with the loss of the white ends of the hairs in the spring. In one or other of its varieties it ranges from Virginia northward to Hudson Bay, and is common in the hemlock forests northward. This is a typical hare, which depends for its safety from foxes, lynxes, weasels, hawks, owls and numerous other enemies solely upon its quick senses and great speed. It never enters burrows, but lives by day and night with no other shelter than that afforded by thickets. Feeding chiefly by night it travels along regular runways used in common by several individuals, a fact which is sometimes taken advantage of by foxes and other enemies to compass their destruction. A favorite winter food is the bark and buds of the birch tree. Scarcely any nest is formed for the young, which are fully active a short time after birth. A somewhat similar species is the polar hare (*L. arcticus*), a pure white species of high northern latitudes.

The jack-rabbit or prairie hare (*L. campestris*) is representative of a group of large, long-legged, big-eared hares which inhabit the western plains, and whose lives are spent mostly "on the jump." For short distances they are perhaps the swiftest quadrupeds known. Their lives are spent among the bushes, upon the twigs of which they feed, and where their young are dropped and within a short time required to shift for themselves. In cultivated districts the jack-rabbits increase enormously and become great pests. As a consequence they are much hunted, not only with dog and gun and snare, as are the eastern species, but by the organization of extensive "drives" which result in the destruction of thousands, the bodies of which are shipped to the markets. Coursing them with greyhounds after the English fashion (see COURSING) is an exciting and favorite sport.

The marsh hare (*L. palustris*) and water hare (*L. aquaticus*), of the Southern Atlantic seaboard and the Mississippi valley respectively, are rather short-legged species, which differ from the others in the readiness with which they will enter water.

In Europe the common hare (*L. timidus*), the mountain hare (*L. variabilis*) and the rabbit (*L. cuniculus*), from which the domestic races have been derived, are the principal species. Consult: Coues and Allen, 'Monographs of the Rodentia' (1877); Thompson, 'Wild Animals I have Known' (1898); Stone and Cram, 'American Animals' (1902).

Hargraves, här'gravz, **Edmund Hammond,** English discoverer of the gold-fields of Australia: b. Gosport, England, 1815; d. Sidney, N. S. W., October 1891. When 18 he settled in Australia, but attracted to California in 1849, he there tried his luck as gold-digger, and detecting a similarity in the geological formation of California and Australia, inferred that gold would be found in the latter, also on his return established the correctness of his surmise by finding gold on the west slopes of the Blue Hills in New South Wales in 1851. He was appointed commissioner of crownlands, and received from the government of New South Wales a reward of $50,000. In 1855 he published 'Australia and Its Gold-fields.'

Hargreaves, här'grēvz, **James,** English inventor: b. Stanhill, near Blackburn, Lancashire; d. Nottingham, England, April 1778. In 1760 he invented a machine consisting of a revolving cylinder with cards or combs set round it as a substitute for the hand-cards formerly in use in combing out cotton. Some years after this he invented the spinning-jenny, by which he was able to spin with several spindles at once. With his new machines he succeeded in turning out a

much greater amount of yarn than his neighbors, which excited their jealousy, and they accordingly broke into his dwelling, and destroyed his machine. In consequence of repeated persecution of this kind Hargreaves removed in 1768 to Nottingham, and in 1770 obtained a patent for his invention. Here, however, he reaped scarcely any more benefit from it than before. After refusing £3,000 offered him by a private company for his patent, this was declared invalid on the ground that he had sold several of the machines before taking out the patent. For the rest of his life he carried on business as a cotton manufacturer in partnership with Mr. James. The only public recognition this invention ever obtained was in the form of a bounty of £250 granted by Sir Robert Peel, nearly 70 years after Hargreaves' death, to his last surviving daughter.

Häring, Wilhelm, vĭl'hĕlm hā'rĭng, "ALEXIS WILIBALD," German historical novelist: b. Breslau 29 June 1798; d. Arnstadt 16 Dec. 1871. His work was suggested by the 'Waverley Novels' and in fact, his first two important works, 'Walladmor' and 'Avalon Castle,' purported to be translations from Scott. His works are historical tales of Prussia, with Frederick the Great for hero: among these may be cited 'Cabanis'; 'The False Waldemar'; 'Peace is the First Civic Duty.' He was very fertile in plot and incident, but his style is mannered; the tales are still popular, however, from their patriotic fervor.

Harivaṅśa, hă-rĭ-văn'sha, a Sanskrit epic poem, later than the Mahâbhârata, to which it forms a sort of sequel or epilogue. It has been translated into French by Langlois (1834).

Hark, Joseph Maximilian, Moravian clergyman: b. Philadelphia 4 June 1849. Graduated from the Moravian College and Theological Seminary in Bethlehem, Pa., he entered the Moravian ministry and was successively pastor of Moravian churches in Lebanon, Philadelphia and Lancaster, Pa. Since 1893 he has been principal of the Moravian Seminary at Bethlehem, Pa., the oldest girls' boarding school in America. He has been a frequent contributor to 'The Outlook' and other periodicals, and has published 'The Unity of the Truth in Christianity and Evolution.'

Hark'ness, Albert, American Latinist: b. Mendon, Mass., 6 Oct. 1822. He was graduated from Brown University in 1842, and in 1855 was appointed professor of Greek in that institution. He was a founder of the American Philological Association, and its president in 1875–6. In 1884 he was elected director of the American School of Classical Studies at Athens, Greece. His best-known work has been in connection with a series of Latin text-books widely used and of much influence; including a first book, readers, a manual of prose composition, editions of Cæsar, Cicero, and Sallust, and an excellent 'Latin Grammar' (1881), revised and enlarged as 'A Complete Latin Grammar' (1898).

Harkness, William, American astronomer: b. Ecclefechan, Scotland, 17 Dec. 1837; d. 1903. He was graduated from Rochester University in 1858, studied medicine, was a surgeon in the Federal army for a time, in 1862–5 was an aid in the United States naval observatory, and during the total eclipse of 7 Aug. 1869 discovered the line K. 1474 of the solar corona. He is best known for his theory of the focal curve of achromatic telescopes, and for his invention of the spherometer caliper, the most nearly accurate device for the measurement of the inequalities of pivots in astronomical instruments. In 1894–9 he was astronomical director of the Naval Observatory, and in 1899 was retired with relative rank of rear-admiral. He published 'The Solar Parallax' (1891).

Harlan, James, American legislator: b. Clarke County, Ill., 25 Aug. 1820; d. Mount Pleasant, Iowa, 5 Oct. 1899. He was graduated from Indiana Asbury (now De Pauw) University in 1845, in 1853 was elected president of Iowa Wesleyan University, in 1855–65 served as United States senator, in 1865–6 was secretary of the interior, and then served a third term (1866–72) in the Senate. Subsequently he was editor of the Washington *Chronicle*, and in 1882–5 presiding judge of the court of commissioners of Alabama claims.

Harlan, John Marshall, American jurist: b. Boyle County, Ky., 1 June 1833. He was graduated from Centre College, Kentucky, studied law at Transylvania University, and entering upon the practice of his profession at Frankfort, became county judge in 1858, and was Whig candidate for Congress in 1859, but was not elected. In the Civil War he served in the Union army as colonel of a Kentucky regiment, and in 1863–6 was attorney general of his State. He was Republican nominee for governor in 1871 and 1875, but was defeated on both occasions. In the Republican National Convention of 1872 his name was presented by the Kentucky delegation for the nomination for vice-president of the United States. In 1877 he was appointed a member of the commission to investigate the troubles in Louisiana; and in November of that same year he was appointed associate justice of the United States Supreme Court, of which he is considered one of the most able and independent members. He supported the constitutionality of the income tax clause of the Wilson Tariff Bill.

Harlan, Iowa, city, county-seat of Shelby County; on the West Nishnabotna River, the Chicago, R. I. & P., the Chicago & N. R.R.'s; about 90 miles west of Des Moines. The chief manufactures are foundry products, agricultural implements, flour, bricks, gasoline engines, and furniture. Its shipping trade is in agricultural products and the manufactures of the city. Pop. (1900) 2,422.

Harland, här'land, **Henry,** pseudonym 'SIDNEY LUSKA,' Anglo-American novelist: b. St. Petersburg, Russia, 1 March 1861; d. San Remo, Italy, 21 Dec. 1905. He was educated at Harvard and after being in the surrogate's office in New York 1883–6 removed to London, where he edited the 'Yellow Book.' He published 'As It Was Written' (1885), a musician's story; 'Mrs. Peixada' (1886); 'The Land of Love' (1887); 'My Uncle Florimond' (1888); 'The Yoke of the Thorah' (1887); 'Mr. Sonnenschein's Inheritance' (1888); 'A Latin-Quarter Courtship'; 'Comedies and Errors' (1898); 'Cardinal's Snuff-box' (1900); etc., books which have been extensively circulated in both America and England.

Harland, Marion. See TERHUNE, MARY VIRGINIA.

Harlech, här'lĕh, Wales, an ancient town, the former capital of Merionethshire, situated on the coast, 10 miles north of Barmouth. On a steep hill overlooking the sea is the castle, which held out for the Lancastrians in the wars of the Roses, and later for Charles I. The 'March of the Men of Harlech' commemorates its capture by the Yorkists in 1468.

Harlem, a part of New York city above 106th street, between the East and Harlem Rivers and Eighth Avenue. See NEW YORK CITY.

Harlem, Ill., village in Cook County; on the Illinois C. and the Chicago & N. W. R.R.'s; about seven miles from Chicago and near Oak Park. The first permanent settlement was made in 1854, and the village of Harlem was incorporated in 1883. It is a residential suburb of Chicago, and is noted for its race track (see HORSE-RACING). Waldheim and Forest Home cemeteries are in Harlem. A monument to the men executed as anarchists who were connected with the Chicago riots of 1886 is in the Waldheim cemetery. The government is vested in a president and board of trustees elected annually. Pop. (1900) 4,085.

Harlem Plains, Battle of, in the Revolutionary War, a conflict on 16 Sept. 1776, which followed Howe's occupation of New York and Manhattan Island. On the Harlem Plains or Flats an advance guard of British troops came into contact with a body of Virginian and Connecticut troops commanded respectively by Majors Leitch and Knowlton. In attempting to flank the enemy Knowlton was killed, and by Washington's orders the Americans retreated, with a loss of 60 killed and wounded.

Harlem River, the name given to the tidal channel north of the island of Manhattan, which separates the boroughs of Manhattan and the Bronx, in New York. The Harlem is connected with the Hudson River by Spuyten Duyvil Creek, and extends south by east about seven miles to East River. Randall's Island is at its entrance to East River. In 1895 a ship-canal was opened which connects the Hudson and the Harlem south of the Spuyten Duyvil channel. A number of bridges span the Harlem, the finest being High Bridge, an aqueduct bridge, and Washington Bridge which crosses the river a little north of a point opposite Fort Washington on the Hudson. Along the western shore is the excellent roadway called the Speedway, and on the same side of the river are the polo and ball grounds, the High Bridge park and a number of fine public and private buildings.

Harlequin, här'lĕ-kĭn or -kwĭn (French, *arlequin*, Italian *arlecchino*), a word of doubtful origin, but probably from old French *Hellequin*, *Herlequin*, the name of a demon figuring in mediæval legends; this again is supposed to be of German origin, its elements corresponding to English "hell" and "kin." Riccoboni conjectures ('History of the Italian Theatre') that the dress of the harlequins is no other than the *centunculus* of the old Roman *mimi* or mimes, who were players in ridiculous pieces or farces of a loose character. The character of the ancient harlequin was a mixture of extravagant buffoonery with great bodily agility. But in the middle of the 16th century his character was essentially changed. He became a simple, ignorant servant, who tries very hard to be witty, even at the expense of being malicious. He is a chameleon, who assumes all colors, and can be made, in the hands of a skilful actor, the principal character on the stage. He must excel in extempore sallies. This account applies more particularly to the Italian harlequin. The gallant, obsequious French harlequin is an entirely national mask. In the vaudeville theatre he is silent, with a black half-mask, and reminds one throughout the representation of the grace and agility of the cat. In Great Britain, in the Christmas pantomimes, he becomes a lover and a magician; and in exchange for the gift of language, of which he has been deprived, he has been invested with a wonder-working wand. With this wand he protects his mistress, the columbine, against the clown and pantaloon, who pursue and endeavor to capture her, until the pursuit is brought to a termination by a good fairy. The harlequin wears a tight dress of bright colors, and glittering with spangles.

Harlequin Cabbage-bug. See CABBAGE-INSECTS.

Harlequin Duck. See DUCK.

Harlequin Snake. See CORAL SNAKE.

Har'ley, Robert, 1st EARL OF OXFORD, English statesman: b. London 5 Dec. 1661; d. 21 May 1724. After the accession of Anne he and his colleague St. John, afterward Lord Bolingbroke, became leaders of the Tories. The former was chosen speaker of the House of Commons in 1702, and was chief secretary of state 1704–8. After the fall of Marlborough Harley became chancellor of the exchequer in 1710, and next year was created Earl of Oxford. He and Bolingbroke secured the Treaty of Utrecht (1713), but afterward quarrelled. Early in the reign of George I. he was impeached of high treason on the ground of his alleged Jacobite intrigues, and was kept in the Tower for two years, but owing to the inability of the Peers and the Commons to agree about the mode of procedure, was acquitted. His patronage was extended to Swift, Pope, and other literary men, and he made a valuable collection of books and MSS., which latter are preserved in the British Museum, where they form the 'Bibliotheca Harleiana.' Those which have been printed constitute the 'Harleian Miscellany.'

Harlow, här'lō, **George Henry,** English painter: b. London 10 June 1787; d. there 4 Feb. 1819. After studying under other masters, he entered the studio of Sir Thomas Lawrence, who used to employ him to dead color. In 1818 he visited Rome, where he astonished the artists there by completing an effective copy of the 'Transfiguration' of Raphael in 18 days. This gained him the friendship of Canova, who procured his election as a member of the Academy of St. Luke. His best original works are two designs from Shakespeare, 'Hubert and Prince Arthur,' and the 'Trial of Queen Catharine.' The principal characters in the latter are portraits of members of the Kemble family; and the figure of Queen Catharine is a likeness of Mrs. Siddons (q.v.). He was eminent as a portrait painter, and his portrait of Fuseli is regarded as a work of great merit.

Harlowe, Clarissa, a novel published by Samuel Richardson in 1748. The story is told by means of letters, and while somewhat prolix

for modern taste, is an accurate record of many of the manners and ideals of the 18th century.

Har'maline and **Harmine,** two alkaloids which occur, probably in the form of phosphates, in the seed-coatings of the harmel or Syrian rue (*Peganum harmala*), a plant growing in the Mediterranean region and in southern Asia. The seeds are extracted with dilute acetic or sulphuric acid, and the hydrochlorids of the two alkaloids are precipitated by the addition of common salt. The precipitate is washed with salt solution, and afterward with water, in which the hydrochlorids dissolve. The filtrate is clarified by animal charcoal and heated to 140° F., after which ammonia is added. Harmine is precipitated first, and by the continued addition of ammonia the harmaline is thrown down subsequently. Harmine has the formula $C_{13}H_{12}N_2O$. It is practically insoluble in ether, and is but slightly soluble in water. It dissolves in alcohol, from which it crystallizes in colorless monoclinic prisms, melting at 495° F. Harmaline is the hydrid of harmine, and has the formula $C_{13}H_{14}N_2O$. It is somewhat soluble in water, ether, and cold alcohol, and dissolves freely in hot alcohol. It crystallizes from solution in alcohol in the form of octahedra belonging to the trimetric system, and melts at 460° F. The salts of harmine are mostly colorless, while those of harmaline are yellow; and the salts of both of these bases exhibit marked fluorescence. The name «harmaline» is also applied to the coloring matter now more commonly known as fuchsine.

Har'mar, Josiah, American soldier: b. Philadelphia 1753; d. there 20 Aug. 1813. He entered the patriot army as captain, became colonel in 1777, served with Washington (1778–80) and with Greene in the South. In 1784 he brought to France the ratification of the final treaty. In 1789 he was made brigadier-general in the United States army, and was general-in-chief of the army from 1789 to 1792. He conducted an expedition against the Miami Indians, which suffered a severe defeat, and shortly afterward resigned his commission. From 1793–9 he was adjutant-general of Pennsylvania.

Harmattan, här-măt'an, a land-wind, very dry and hot, blowing upon the coast of Africa between Cape Verde, in lat. 14° 43′ N., and Cape Lopez, lat. 0° 36′ S., during December, January, and February. It is generally attended by fog, through which the sun shines red. It hurts vegetation and injuriously affects man, drying up the eyes, the mouth, etc., even peeling off the skin. On the other hand, it tends to terminate fever and dysentery, and to mitigate cutaneous diseases. It corresponds to the sirocco of Italy and, to a certain extent, to the Indian and Australian hot wind.

Harmodius (här-mō'dī-ŭs) and **Aristogiton,** ă-rĭs-tō-jī't'n, two Athenian youths who in 514 B.C. killed Hipparchus, the younger brother of the tyrant Hippias, partly because of an insult offered to the sister of Harmodius, and partly with a view to the overthrow of the Pisistratidæ. Harmodius was slain by the soldiers of Hipparchus, while Aristogiton fled, but was afterward taken and executed. Subsequently they came to be regarded as patriotic martyrs, and received divine honors from the Athenians, and had statues raised to their memory. They were strongly attached to each other, and are sculptured in a group in the Museo Nazionale, Naples, copied from the bronze originals which once adorned the Acropolis at Athens.

Har'mon, Judson, American jurist: b. Hamilton County, Ohio, 3 Feb. 1846. He was graduated at Denison University, 1866, and at Cincinnati Law School, 1869. He was judge of the common pleas court (1876–8); judge of the superior court of Cincinnati, 1878–87; and attorney-general of the United States, 1896–7. He is president of the Ohio Bar Association, and a member of the faculty in the law department of the University of Cincinnati.

Harmonic Analysis, The. «The Harmonic Analysis» is the name first given by Thomson and Tait in their 'Natural Philosophy' to a method extensively and fruitfully employed in investigations in many branches of Mathematical Physics, and first used by Daniel Bernouilli and Euler in the middle of the eighteenth century in studying the musical vibrations of a stretched elastic string.

From the physical side it is described by J. Clerk Maxwell as «a method by which the solution of an actual problem may be obtained as the sum or resultant of a number of terms, each of which is a solution of a particular case of the problem.» The method is applicable to physical problems where the actual complicated state under investigation can be regarded as due to the superposition of a number of simpler states that can coexist without interfering with one another.

For example, in dealing with the small oscillations of a musical string it is known that the string is capable of sounding a variety of so-called pure notes, known as the fundamental note, the first harmonic or octave of the fundamental note, and the higher harmonics of the fundamental note, and that the forms of vibration giving these various notes may coexist, so that the string may be sounding at once its fundamental note and its various harmonics and thus be giving a note quite distinguishable from its pure fundamental note though of the same pitch. If we are dealing with the problem of the motion of a string sounding such a complicated note, the harmonic analysis enables us to obtain and to express its solution as a sum of the terms expressing the motions which separately would give the separate pure notes actually present.

From the mathematical side the problems to which the harmonic analysis is applicable are those in which it is necessary to find a solution of a homogeneous linear differential equation which shall satisfy a set of given initial or boundary conditions sufficiently numerous to make the problem determinate. It is well known that if a solution of such a differential equation has been obtained, it may be multiplied by any constant and will still be a solution; and that if several solutions have been obtained, their sum will be a solution. In using the harmonic analysis we attempt by a skilful use of these two principles to so combine simple particular solutions of the differential equation involved in the problem as to form a solution of the equation which satisfies all the given conditions. This usually makes it necessary to analyze some one of the given conditions into a sum or series of simpler so-called harmonic terms, or in other words to develop some function of one of the

independent variables, or of a set of the independent variables into a series whose terms are of specified form.

For instance, suppose a harp-string of length l initially distorted into a curve whose equation referred to the position of equilibrium of the string as the X-axis and to one end of the string as origin is $y=f(x)$, and then released, and that it is required to solve the problem of the subsequent motion of the string, the initial displacement being small.

Here we have to solve the differential equation

$$\frac{\partial^2 y}{\partial t^2}=a^2\frac{\partial^2 y}{\partial x^2}, \qquad (I)$$

subject to the conditions $y=0$ when $x=0$; $y=0$ when $x=l$; $\frac{\partial y}{\partial t}=0$ when $t=0$; $y=f(x)$ when $t=0$. It is known and is easily verified that $y=\sin\beta x\cos a\beta t$ is a particular solution of (I) if β is any constant. If we take $\beta=\frac{m\pi}{l}$, where m is any whole number, $y=\sin\frac{m\pi x}{l}\cos\frac{m\pi at}{l}$ is a solution of (I) which satisfies our first three conditions; and so is

$$y=a_1\sin\frac{\pi x}{l}\cos\frac{\pi at}{l}+a_2\sin\frac{2\pi x}{l}\cos\frac{2\pi at}{l}+a_3\sin\frac{3\pi x}{l}\cos\frac{3\pi at}{l}+\ldots, \qquad (1)$$

where a_1, a_2, a_3, ... are any constants. When $t=0$ (1) reduces to

$$y=a_1\sin\frac{\pi x}{l}+a_2\sin\frac{2\pi x}{l}+a_3\sin\frac{3\pi x}{l}+\ldots, \qquad (2)$$

and if we can choose a_1, a_2, etc., so that the series in (2) is equal to $f(x)$ for all values of x between 0 and l, (1) becomes our required solution. This calls for the development of $f(x)$ into a Trigonometric Series of somewhat peculiar form known as a Fourier's Series, and when that is accomplished our solution is complete.

Fourier's Series.—It was first shown by Fourier in his researches into the Conduction of Heat in 1812 that

$$f(x)=\tfrac{1}{2}b_0+b_1\cos\frac{\pi x}{c}+b_2\cos\frac{2\pi x}{c}+b_3\cos\frac{3\pi x}{c}+\ldots$$
$$+a_1\sin\frac{\pi x}{c}+a_2\sin\frac{2\pi x}{c}+a_3\sin\frac{3\pi x}{c}+\ldots, \qquad (3)$$

where $$a_m=\frac{1}{c}\int_{-c}^{c}f(x)\sin\frac{m\pi x}{c}dx,$$

and $$b_m=\frac{1}{c}\int_{-c}^{c}f(x)\cos\frac{m\pi x}{c}dx,$$

for all values of x between $-c$ and c.

If $f(-x)=-f(x)$, that is, if $f(x)$ is an odd function, (3) reduces to

$$f(x)=a_1\sin\frac{\pi x}{c}+a_2\sin\frac{2\pi x}{c}+a_3\sin\frac{3\pi x}{c}+\ldots, \qquad (4)$$

where $$a_m=\frac{2}{c}\int_0^c f(x)\sin\frac{m\pi x}{c}dx.$$

If $f(-x)=f(x)$, that is, if $f(x)$ is an even function, (3) reduces to

$$f(x)=\tfrac{1}{2}b_0+b_1\cos\frac{\pi x}{c}+b_2\cos\frac{2\pi x}{c}+b_3\cos\frac{3\pi x}{c}+\ldots, \qquad (5)$$

where $$b_m=\frac{2}{c}\int_0^c f(x)\cos\frac{m\pi x}{c}dx.$$

If the development need hold good merely for values of x between 0 and c, any one of the forms given above may be employed.

Harmonic Functions.—Laplace's Equation,

$$\frac{\partial^2 V}{\partial x^2}+\frac{\partial^2 V}{\partial y^2}+\frac{\partial^2 V}{\partial z^2}=0, \qquad (II)$$

in the numerous forms it assumes in different systems of coördinates plays a larger part in the various branches of mathematical physics than any other differential equation, and the harmonic analysis is required in a large proportion of the physical problems that obey the law it expresses.

A function which together with its first space derivatives is continuous within a specified region and which satisfies Laplace's equation at every point within the region is said to be *harmonic* in the region in question.

The form to which a harmonic function reduces on one of the level surfaces of the appropriate coördinate system is called a *Surface Harmonic.*

Zonal Harmonics.—The coefficient of z^m in the development of $(1-2\mu z+z^2)^{-\frac{1}{2}}$ in ascending powers of z, where $\mu=\cos\theta$, is represented by $P_m(\mu)$ and is called a *Surface Zonal Harmonic* of the mth degree, or a *Legendre's Coefficient* or *Legendrian.*

It can be shown that $V=r^mP_m(\cos\theta)$ and $V=\frac{1}{r^{m+1}}P_m(\cos\theta)$ are particular solutions of Laplace's equation in spherical coördinates,

$$\frac{r\partial^2(rV)}{\partial r^2}+\frac{1}{\sin\theta}\frac{\partial\left(\sin\theta\frac{\partial V}{\partial\theta}\right)}{\partial\theta}+\frac{1}{\sin^2\theta}\frac{\partial^2 V}{\partial\phi^2}=0. \qquad (III)$$

They are called *Solid Zonal Harmonics.* The first form is harmonic within the sphere whose centre is at the origin of coördinates and whose radius is unity, and the second form is harmonic in all space outside of that sphere. They are appropriate functions to use in solving problems where a solution of (III) is required, if it is evident from considerations of symmetry that the solution is independent of the coördinate ϕ.

$$P_m(\mu)=\frac{1\cdot3\cdot5\cdot\ldots\cdot(2m-1)}{1\cdot2\cdot3\cdot\ldots\cdot m}\left[\mu^m-\frac{m(m-1)}{2(2m-1)}\mu^{m-2}+\frac{m(m-1)(m-2)(m-3)}{2\cdot4\cdot(2m-1)(2m-3)}\mu^{m-4}\cdots\right],$$

whence

$$P_0(\mu)=1, \qquad P_2(\mu)=\tfrac{1}{2}(3\mu^2-1),$$
$$P_1(\mu)=\mu, \qquad P_3(\mu)=\tfrac{1}{2}(5\mu^3-3\mu),$$
$$P_4(\mu)=\tfrac{1}{8}(35\mu^4-30\mu^2+3),$$
$$P_5(\mu)=\tfrac{1}{8}(63\mu^5-70\mu^3+15\mu).$$
$$\ldots\ldots\ldots\ldots\ldots$$

A very important property of the Surface Zonal Harmonic $P_m(\mu)$ which follows readily from its definition is $P_m(1)=1$. That is, the function

reduces to unity at all points on the polar axis.

If, in a problem where V must satisfy Laplace's Equation and there is symmetry about the polar axis, the value of V on the axis is represented by a convergent series $a_0+a_1z+a_2z^2+\ldots$, z being the distance of the point from the origin, then the series formed by writing $r^mP_m(\cos\theta)$ instead of z^m in the given series gives the value of V at any point in space at which the new series is convergent. If the value of V on the axis is represented by a convergent series $\frac{a_1}{z}+\frac{a_2}{z^2}+\frac{a_3}{z^3}+\ldots$, then the series formed from the given series by replacing $\frac{1}{z^{m+1}}$ by $\frac{1}{r^{m+1}}P_m(\cos\theta)$ gives the value of V at any point in space at which the new series is convergent.

For instance, if a charge M of statical electricity be placed on a conductor in the form of a thin circular disc of radius a, it is known that the charge will so distribute itself that the surface density σ at any point of the disc at the distance s from its center will be $\sigma=\frac{M}{4a\pi\sqrt{a^2-s^2}}$.

If the axis of the disc is taken as the polar axis, the value of the Potential Function V due to the charge, at a point of the axis at the distance x from the centre is $V=\frac{M}{2a}\cos^{-1}\left(\frac{x^2-a^2}{x^2+a^2}\right)$. This can be developed into the series

$$\frac{M}{a}\left[\frac{\pi}{2}-\frac{x}{a}+\frac{x^3}{3a^3}-\frac{x^5}{5a^5}+\ldots\right] \quad \text{if} \quad x<a,$$

or $$\frac{M}{a}\left[\frac{a}{x}-\frac{a^3}{3x^3}+\frac{a^5}{5x^5}-\frac{x^7}{7a^7}+\ldots\right] \quad \text{if} \quad x>a.$$

Hence

$$V=\frac{M}{a}\left[\frac{\pi}{2}-\frac{r}{a}P_1(\cos\theta)+\frac{1}{3!}\frac{r^3}{a^3}P_3(\cos\theta)-\frac{1}{5}\frac{r^5}{a^5}P_5(\cos\theta)+\ldots\right] \text{ if } r<a, \text{ and } \theta<\frac{\pi}{2};$$

and

$$V=\frac{M}{a}\left[\frac{a}{r}-\frac{1}{3}\frac{a^3}{r^3}P_2(\cos\theta)+\frac{1}{5}\frac{a^5}{r^5}P_4(\cos\theta)-\ldots\right] \quad \text{if} \quad r>a.$$

If, in a problem where V must satisfy Laplace's Equation and there is symmetry about an axis, the value of V on the surface of the sphere $r=a$ is given and can be expressed as a sum or as a series of Surface Zonal Harmonics, the value of V at a point not on the sphere will be obtained by replacing the Surface Zonal Harmonics by the appropriate Solid Zonal Harmonics.

To take a very simple example: If a charge of electricity is placed on a spherical conductor of radius a, it is known that it will so distribute itself that all points on the surface will be at the same potential $\frac{M}{a}$.

Now $\frac{M}{a}=\frac{M}{a}P_0(\cos\theta)$ and is a Surface Zonal Harmonic. Hence any point at the distance r from the centre of the conductor is at potential $\frac{M}{a}\frac{r^0}{a^0}P_0(\cos\theta)$ or $\frac{M}{a}$ if $r<a$, and at potential $\frac{M}{a}\frac{a}{r}P_0(\cos\theta)$ or $\frac{M}{r}$ if $r>a$.

If the value of V on the surface of the sphere had been less simple, say $V=F(\theta)\equiv f(\cos\theta)\equiv f(\mu)$, then $f(\mu)$ would have had to be expressed in the form $a_0P_0(\mu)+a_1P_1(\mu)+a_2P_2(\mu)+\ldots$ before we could have used the simple method illustrated above. This can be done by the aid of the formula

$$f(\mu)=a_0P_0(\mu)+a_1P_1(\mu)+a_2P_2(\mu)+a_3P_3(\mu)+\ldots,$$

where $a_m=\frac{2m+1}{2}\int_{-1}^{1}f(x)P_m(x)dx$, the development in question holding good when $-1<\mu<1$.

For instance, let one half of the surface of a homogeneous sphere be kept at the temperature zero and the other half at the temperature 1; to find the stationary temperature u of any internal point. Here $f(\mu)=1$, $0<\mu<1$, and $f(\mu)=0$, $-1<\mu<0$. Consequently

$$a_m=\frac{2m+1}{2}\left[\int_{-1}^{0}0\cdot P_m(x)dx+\int_{0}^{1}P_m(x)dx\right]$$

$$=\frac{2m+1}{2}\int_{0}^{1}P_m(x)dx.$$

Letting $m=0, 1, 2, \ldots$, successively, and using the corresponding values $1, x, \frac{1}{2}(3x^2-1)$, etc., of $P_m(x)$, we get $a_0=\frac{1}{2}$, $a_1=\frac{3}{4}$, $a_2=0$, $a_3=-\frac{7}{8}\cdot\frac{1}{2}$, $a_4=0$, $a_5=\frac{11}{12}\cdot\frac{1}{2}\cdot\frac{3}{4}$, ... and $f(\mu)=\frac{1}{2}P_0(\mu)+\frac{3}{4}P_1(\mu)-\frac{7}{8}\cdot\frac{1}{2}P_3(\mu)+\frac{11}{12}\cdot\frac{1}{2}\cdot\frac{3}{4}P_5(\mu)-\ldots$.

If a is the radius of the sphere, the required temperature

$$u=\frac{1}{2}+\frac{3}{4}\frac{r}{a}P_1(\cos\theta)-\frac{7}{8}\cdot\frac{1}{2}\frac{r^3}{a^3}P_3(\cos\theta)+\frac{11}{12}\cdot\frac{1}{2}\cdot\frac{3}{4}\frac{r^5}{a^5}P_5(\cos\theta)\ldots.$$

Tables giving the numerical values of the Surface Zonal Harmonics have been computed and are accessible, and by their aid numerical results can be obtained in such problems as those we have been considering as readily as if we were using simple trigonometric functions. The following is such a table carried only to three places.

TABLE 1.—SURFACE ZONAL HARMONICS.

θ	$P_1(\cos\theta)$	$P_2(\cos\theta)$	$P_3(\cos\theta)$	$P_4(\cos\theta)$	$P_5(\cos\theta)$
0°	1.000	1.000	1.000	1.000	1.000
10	.985	.955	.911	.853	.784
20	.940	.824	.665	.475	.272
30	.866	.625	.325	.023	−.223
40	.760	.380	−.025	−.319	−.420
50	.643	.120	−.300	−.428	−.254
60	.500	−.125	−.438	−.289	.090
70	.342	−.324	−.413	−.004	.328
80	.174	−.455	−.247	.266	.281
90	.000	−.500	.000	.375	.000

Legendrians were first used by Legendre in a paper published in 1785 on the attraction of solids of revolution.

Laplace's Coefficients. — $P_m(\cos\gamma)$, where $\gamma\equiv\cos\theta\cos\theta_1+\sin\theta\sin\theta_1\cos(\phi-\phi_1)$, and is the angle made by the radius vector with a fixed

line through the origin whose direction is given by the angles θ_1 and ϕ_1, is called a Laplace's Coefficient or Laplacian, the fixed line being called the Axis and its intersection with the unit sphere the Pole of the Laplacian. A Surface Zonal Harmonic $P_m(\cos\theta)$ is merely a Laplacian whose axis coincides with the axis of coördinates. $r^m P_m(\cos\gamma)$ and $\frac{1}{r^{m+1}} P_m(\cos\gamma)$ are solutions of Laplace's Equation (III). The first is harmonic within and the second without the unit sphere.

Laplacians may be used in problems symmetrical about an axis if the axis does not coincide with the axis of coördinates just as Zonal Harmonics are used when the problem is symmetrical about the polar axis.

Laplacians were first used by Laplace, in one of the most remarkable memoirs ever written, in determining the attraction of a Spheroid. The paper in question was published in 1782.

Spherical Harmonics.—A Surface Spherical Harmonic of the mth degree Y_m may be most simply defined as the function obtained by dividing a rational, integral, homogeneous, algebraic polynomial of the mth degree in x, y, z which satisfies Laplace's Equation (I), by r^m, that is, by $(x^2+y^2+z^2)^{\frac{m}{2}}$. For example, $\frac{1}{r}(x+y+z)$, $\frac{1}{r^2}(x^2+xy+y^2)$, $\frac{1}{r^3}(2x^3-3xy^2-3xz^2)$ are Surface Spherical Harmonics of the first degree, of the second degree, and of the third degree, respectively.

It is clear that $r^m Y_m$ satisfies Laplace's Equation. The same thing can be shown of $\frac{1}{r^{m+1}} Y_m$. The first is harmonic within, the second without, the unit sphere. They are known as Solid Spherical Harmonics.

It is clear that if the value of V on the surface of a sphere whose centre is the origin can be expressed as a sum of terms each of which is a surface Spherical Harmonic, its value at any point not on the surface is the sum of the appropriate corresponding Solid Spherical Harmonics.

It can be shown by transforming from spherical to rectangular coördinates that the Surface Zonal Harmonic $P_m(\mu)$ or $P_m(\cos\theta)$ and the Laplacian $P_m(\cos\gamma)$ are Surface Spherical Harmonics, and by the reverse transformation that the general Surface Spherical Harmonic Y_m can be formulated as

$$Y_m = A_0 P_m(\mu) + \sum_{n=1}^{n=m}\left[(A_n\cos n\phi + B_n \sin n\phi)\sin^n\theta \frac{d^n P_m(\mu)}{d\mu^n}\right].$$

A function given arbitrarily on the surface of the unit sphere, i.e., a function of θ and ϕ, if expressed as a function of $\cos\theta$ and ϕ can be developed into a series of Surface Spherical Harmonics by the formulas

$$f(\mu,\phi) = \sum_{m=0}^{m=\infty}\left\{A_{0,m}P_m(\mu) + \sum_{n=1}^{n=m}\left[(A_{n,m}\cos n\phi + B_{n,m}\sin n\phi)\sin^n\theta\frac{d^n P_m(\mu)}{d\mu^n}\right]\right\},$$

$$A_{0,m} = \frac{2m+1}{4\pi}\int_0^{2\pi} d\phi \int_{-1}^{1} f(\mu,\phi)P_m(\mu)d\mu,$$

$$\frac{2\pi}{2m+1}\frac{(m+n)!}{(m-n)!}A_{n,m} = \int_0^{2\pi}\int_{-1}^{1} f(\mu,\phi)\cos n\phi \sin^n\theta \frac{d^n P_m(\mu)}{d\mu^n}d\mu,$$

$$\frac{2\pi}{2m+1}\frac{(m+n)!}{(m-n)!}B_{n,m} = \int_0^{2\pi} d\phi\int_{-1}^{1} f(\mu,\phi)\sin n\phi \sin^n\theta \frac{d^n P_m(\mu)}{d\mu^n}d\mu.$$

The following theorems concerning the integration of Spherical Harmonics are important. We give them without proof.

The integral of the product of two Surface Spherical Harmonics $Y_m Y_n$ of different degrees taken over the surface of the unit sphere is equal to zero.

The integral over the surface of the unit sphere, of the product of a Surface Spherical Harmonic by a Laplacian of the same degree, is $\frac{4\pi}{2m+1}$ multiplied by the value the Spherical Harmonic assumes at the Pole of the Laplacian.

These theorems enable us to solve many problems in the theory of Gravitation and the theory of Electrostatics by direct integration.

Bessel's Functions.—A Bessel's Function or Surface Cylindrical Harmonic of the nth order $J_n(x)$ may be defined as the coefficient of z^n in the development of $e^{\frac{x}{2}\left(z+\frac{1}{z}\right)}$ into an ascending Power Series in z. It can be shown that

$$V = \cosh(\mu z)(A\cos n\phi + B\sin n\phi)J_n(\mu r)$$

and

$$V = \sinh(\mu z)(A\cos n\phi + B\sin n\phi)J_n(\mu r),$$

where μ is any constant, are solutions of Laplace's Equation in Cylindrical Coördinates

$$\frac{\partial^2 V}{\partial r^2} + \frac{1}{r}\frac{\partial V}{\partial r} + \frac{1}{r^2}\frac{\partial^2 V}{\partial\phi^2} + \frac{\partial^2 V}{\partial z^2} = 0. \qquad \text{(IV)}$$

The Bessel's Functions most used are $J_0(x)$ and $J_1(x)$, which are appropriate when the problem has axial symmetry about the Axis of Z.

$$J_0(x) = 1 - \frac{x^2}{2^2} + \frac{x^4}{2^2\cdot 4^2} - \frac{x^6}{2^2\cdot 4^2\cdot 6^2} + \cdots,$$

and is convergent for all values of x.

$$J_1(x) = -\frac{dJ_0(x)}{dx}.$$

Important properties are given by the formulas

$$\int_0^x x J_0(x)dx = xJ_1(x)$$

and

$$\int_0^x x\{J_0(x)\}^2 dx = \tfrac{1}{2}x^2[\{J_0(x)\}^2 + \{J_1(x)\}^2],$$

and the following formulas for development in Cylindrical Harmonic Series, the development holding good for values of r between 0 and a.

$$f(r) = \Sigma A_\kappa J_0(\mu_\kappa r),$$

where μ_κ is a root of the transcendental equation in μ, $J_0(\mu a) = 0$, or of $J_1(\mu a) = 0$, or of

$$\mu a J_1(\mu a) - \lambda J_0(\mu a) = 0,$$

and

$$A_\kappa = \frac{2}{a^2[\{J_0(\mu_\kappa a)\}^2 + \{J_1(\mu_\kappa a)\}^2]} \int_0^a r f(r) J_0(\mu_\kappa r)\, dr.$$

For the important case where $f(r) = 1$,

$$A_\kappa = \frac{2}{\mu_\kappa a[\{J_0(\mu_\kappa a)\}^2 + \{J_1(\mu_\kappa a)\}^2]} J_1(\mu_\kappa a).$$

As an example in the use of Bessel's Functions let us find the stationary temperature of any point (r, z) in a homogeneous cylinder of radius a and altitude b if the convex surface and one base are kept at the temperature zero and the other base at the temperature 1.

Here we seek a solution V of equation (IV) which reduces to zero when $z = 0$, and when $r = a$, and to 1 when $r = b$. By the aid of the formulas above this is easily formed and is

$$V = \frac{2}{\mu_1 a J_1(\mu_1 a)} \frac{\sinh(\mu_1 z)}{\sinh(\mu_1 b)} J_0(\mu_1 r) + \frac{2}{\mu_2 a J_1(\mu_2 a)} \frac{\sinh(\mu_2 z)}{\sinh(\mu_2 b)} J_0(\mu_2 r) + \frac{2}{\mu_3 a J_1(\mu_3 a)} \frac{\sinh(\mu_3 z)}{\sinh(\mu_3 b)} J_0(\mu_3 r) + \ldots$$

If numerical results are desired, tables for $J_0(x)$ and $J_1(x)$ are needed. Such tables have been computed and are accessible. We give here a small three-place one.

TABLE II.—BESSEL'S FUNCTIONS.

x	$J_0(x)$	$J_1(x)$	x	$J_0(x)$	$J_1(x)$
0.0	1.000	0.000	5.0	−.178	−.328
0.5	.938	.242	5.5	−.007	−.341
1.0	.765	.440	6.0	.151	−.277
1.5	.512	.558	6.5	.260	−.154
2.0	.224	.577	7.0	.300	−.005
2.5	−.048	.497	7.5	.266	.135
3.0	−.260	.339	8.0	.172	.235
3.5	−.380	.137	8.5	.042	.273
4.0	−.397	−.066	9.0	−.090	.245
4.5	−.320	−.231	9.5	−.194	.161
5.0	−.178	−.328	10.0	−.246	.044

TABLE III.—ROOTS OF BESSEL'S FUNCTIONS.

n	x_n for $J_0(x_n) = 0$.	x_n for $J_1(x_n) = 0$.
1	2.405	3.832
2	5.520	7.016
3	8.654	10.173

Bessel's Functions of the zeroth order were first used successfully in the Harmonic Analysis by Fourier in 1812, in dealing with the flow of heat in a right circular cylinder.

Other more complicated Harmonic Functions are Lamé's Functions or Ellipsoidal Harmonics, Conal Harmonics, Toroidal Harmonics, etc. Each set is adapted to dealing with Laplace's Equation expressed in a suitable system of Curvilinear Coördinates.

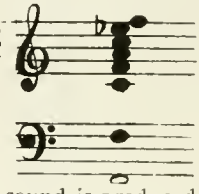
Bibliography.—For general treatises on the Harmonic Analysis and on the Harmonic Functions the reader is referred to Heine, 'Handbuch der Kugelfunktionen' (second edition, 1878); Todhunter, 'The Functions of Laplace, Lamé, and Bessel' (1875); Thomson and Tait, 'Natural Philosophy' (Appendix B, 1879); Ferrers, 'Spherical Harmonics' (1881); Byerly, 'Fourier's Series, and Spherical Harmonics' (1895); Gray and Matthews, 'Bessel's Functions' (1895). An excellent account of the history of the subject with detailed references to the early papers, memoirs, and other publications, prepared by Professor M. Bôcher, will be found at the end of Byerly's above-mentioned treatise. For the contemporary literature see the recent volumes of the 'Jahrbuch über die Fortschritte der Mathematik' under the heading Kugelfunktionen und verwandte Funktionen.

WILLIAM E. BYERLY,
Professor of Mathematics, Harvard University.

Harmon'ica, a musical instrument invented by Benjamin Franklin in 1762. It is formed of a number of glasses of water, and is played by touching them with the dampened finger. The less the quantity of water, the lower the tone of the scale. The name is also applied to a small wind instrument, or mouth-organ, which has a series of holes to conduct the breath to free reeds, like those of an accordion.

Harmon'icon, a chemical apparatus consisting of an open glass tube, the air in which may be made to give a sound resembling a musical note, when held over burning hydrogen. The note depends upon the size of the flame and the length of the tube.

Harmon'ics, the accessory or collateral sounds accompanying the primary, fundamental, or predominant tone of any string, pipe, or other sonorous body, and constituting in varying degrees what in English is known as "quality," in French as "timbre," and in German as "Klangfarbe." No purely simple sound—one whose vibrations are all in the same period—is producible. When a sound is produced by the vibration of an open string, the whole string vibrates as a unity, giving rise to a tone called the fundamental. The string, however, further divides into various sections, which vibrate separately and more rapidly, and produce sounds—the harmonics—differing from the fundamental, but bearing certain fixed proportions to it. By whatever vibrating body a musical sound is evoked harmonics also are produced; and although some of the harmonics are suppressed by modifying circumstances, some are always present. There is a regular succession of intervals in which the harmonics naturally accompany a fundamental sound, which is represented in the following scale of vibrations: 1 2 3 4 5 6 7, etc. These also are the intervals which produce the successive chords in harmony, although the natural harmonics when produced further go beyond the range of harmony which human ears can recognize or musical instruments produce at the will of the performer. (See illustration.) 1 is the interval of the octave; 2 is the fifth; 3 is the fourth; 4 is the major third; 5 the minor third; from 6 to 7 is already beyond the range of production on a keyed instrument, but is recognized by musicians as the complement of a four-part simple chord, and is represented approximately on the pianoforte, by E flat, for example, for the key of F.



A musical tone, then, is always complex, but the harmony which attends it is not always the

same. The different structure of different instruments suppresses now some, now others, of the succession of harmonics, and a different body of tone is thus produced, distinguishing a note in one instument from the same note in another. Hence the distinctive construction of the pianoforte in which dissonant harmonics are suppressed, and on the other hand, the use in the organ of mutation and mixture stops—the thirteenths and fifteenths — whereby the consonant harmonies of a given tone are much emphasized. Again, many of the higher harmonics are strongly dissonant both with the fundamental tone and with each other, whence arises the discordant quality of such instruments for instance as the cymbals. Harmonics are also called "overtones," and all the primary and secondary tones constituting an actual tone are frequently termed "partials" or "partial tones," the fundamental tone being the first partial, and the harmonics, the upper partials. See HARMONY.

Harmonics, Spherical. See HARMONIC ANALYSIS.

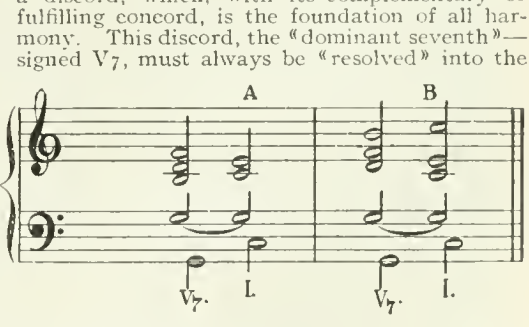
Har'monists, also called RAPPISTS and ECONOMITES, a religious-socialistic community founded in 1787 by George Rapp (1757–1847), a German of Würtemberg. The peaceable and spiritual tenets of the organization aroused antagonism and persecution, and in 1803 they emigrated to America, settling in the Connoquenessing Valley, where the Harmony Society was established on a working basis. By 1805, houses, churches, mills, and manufactories had been built, and the settlement had a population of 750 persons. In 1815 they removed to Posey County, Ind., where they founded New Harmony (q.v.); 10 years later, however, they returned to Pennsylvania, and built the township of Economy, in Beaver County, on the Ohio, 20 miles north of Pittsburg. In 1832, a German adventurer, Bernhard Müller, settling among them, caused dissensions and a split in the society; a separation and apportionment of the property was agreed upon, and 250 members retired. They held all property in common, believed in the second coming of Christ, the near advent of the millennium, and practised celibacy. As a result of the latter condition, the membership in 1902 was reduced to eight, and the valuable estate will pass finally into the hands of the last survivor. Consult Hinds, 'American Communities' (1902); Nordhoff, 'The Communistic Societies of the United States' (1874).

Harmon'ium, a modern musical instrument which produces sounds resembling those of the organ. The invention is ascribed to Alexandre Debain of Paris; but he has at the most merely the credit of perfecting an instrument previously known, called the *orgue expressif*, a kind of organ furnished with an apparatus of free vibrating reeds, intended to increase or diminish the intensity and volume of the sound, by regulating the pressure of the wind, by the aid of which the sounds were produced. The instrument has a keyboard like that of a piano, and when one of the keys is pressed down a valve is opened, which allows the wind from the bellows to rush through one of the wind-boxes and act on the vibrator. There are also several stops, like organ stops, by means of which the performer can direct the stream of wind into the wind-boxes, which produce a flute, clarinet, or any other sound, according to the number of stops which the instrument possesses. Such is the harmonium which was patented by Debain in 1840, but since that time various other improvements of more or less value have been made. The chief of these are the addition of a knee action, which either serves as an expression stop, or brings all the stops of the instrument into play at once, and what is called the percussion action, the invention of Kaufmann of Dresden, which consists in the application of a small hammer, which strikes the vibrator as soon as the key is pressed down, and thus aids the action of the wind.

Harmony, (from the Greek *ἁρμόζειν*, to join or fit together), in music is the science which controls the relationship of chords, and decides that of the dissonant elements in a discord to the fundamental concord; the fundamental law being that discord is an unfinished design which requires concord for its completion.

A chord, or combination of tones, in any scale or key may be a concord or discord. The one concord in a major key consists of the keynote or tonic with its major third and fifth. This means of course the tonic triad; but in every major key there are two other major triads, absolutely equal in consonance with the tonic triad—those founded on the dominant and subdominant. In a minor key the triad on the keynote consists of the tonic with a minor third and perfect fifth. The major third and fifth are the notes which produce, naturally, a perfect sound in combination; they are called "consonances," and any foreign element is a "dissonance." They can be inverted, that is, any tone of a chord can be in the bass or lowest part. (See FUNDAMENTAL NOTE, TONE, OR BASS.) This, the "common chord" or "major triad," makes a starting point and a point of finality, from which the harmonies proceed, diverge and converge, and into which they resolve themselves finally.

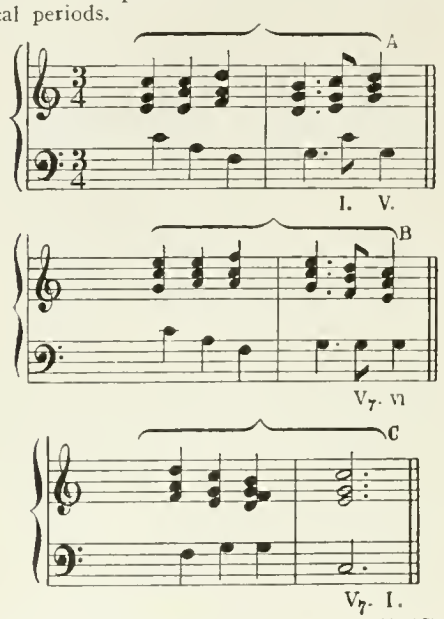
The seventh harmonic of nature (see HARMONICS), which is one semitone less than the seventh consecutive note in an ascending major scale, constitutes a minor seventh, and produces a discord, which, with its complementary or fulfilling concord, is the foundation of all harmony. This discord, the "dominant seventh"—signed V_7, must always be "resolved" into the



chord of the tonic (1) of the key to which it belongs. (See illustration.)

A is an example of "close," B of "open" or "extended" harmony. The discord on G instinctively demanding the chord of C as its resolution, the note G, or the similar fifth degree in any scale, is called the "dominant"—signed V, of that key, and the chords and discords built on it constitute the dominant harmonies. Position B is the most satisfactory to the ear, be-

cause of the effect of finality induced by the resolution to the first position of the triad. The two chords together form the dominant or authentic cadence — the most important of those terminal phrases which serve the same purpose in music as the marks of punctuation in literary composition. "My country, 'tis of thee" exhibits examples of two other important cadences, showing at the same time how these mark the completion of more or less final musical periods.



The first period is closed at A by a "half" or "imperfect" cadence — that is, the order V.—I. is reversed; the second at B by a "false" or "deceptive" cadence — that is, the dominant chord, instead of proceeding to the tonic, "deceives" the ear by proceeding to another chord; the third period is brought to a close by the authentic cadence at C.

The dominant chord can also bear the more elaborate dissonances of the 9th, 11th, and 13th, as well as the 7th, but it is impossible here to enter into the varieties of discord — "suspensions," "double-root chords," etc., into the analogous discords which may be built on the tonic as a ground-note, or the chords belonging to the minor scale. Suffice it to say the effects which can be evolved from the almost innumerable inversions and involutions of single chords and combinations of chords are subject to stringent natural laws, and the possibilities of variety are infinite.

An important branch of harmony, however, must be mentioned, that is "modulation" or change from one key (or "mode") to another. Modern scales have had the relation of their intervals so modified (see TEMPERAMENT) as to be approximately alike. By the addition of a single sharp or flat any melody can proceed from the key of C to G (with F♯), F (with B♭), or A minor (with G♯). These — the dominant, subdominant (next below the dominant), and the minor of the sixth degree — are the keys of the first relation, as out of the seven notes which constitute each scale six are present in the scale of C, thus providing as it were six more or less convenient bridges by which to pass from one key to the other. The conventionality of these modulations makes them inadequate to convey the more passionate coloring of modern music, and more striking changes to remoter keys are necessary. A favorite device with modern composers is to take advantage of the "tempered" system, and by using one note in two significations (for example, F×E♯) to secure means of startling and also of very tender effects in modulation.

Harmony comparatively is of modern growth. In counterpoint (q.v.), the science which preceded harmony, attention was given altogether to the correct progression of the individual voices or parts, while the combinations made by the voices at any moment were regarded as merely accidental. But unconsciously the ear of musicians was being cultivated, and in the richness of Palestrina's simpler writings was shown the possibility of obtaining undreamt-of effects from chords as integral units in a march of harmonies, rather than accidental combinations of independent melodies. One of the fundamental rules of counterpoint was that a dissonance must either be "prepared" — that is, it must appear as a consonance in the previous chord — or else it must be approached very gradually. This rule of the old science was disregarded by Monteverde (1608), who used unprepared discords, and at one blow released the new feeling for chords from its bondage to counterpoint.

Only those who understand counterpoint and harmony can appreciate the full importance of the new departure. It meant that discords were no longer mere variations of concords, but individual creations with an individual's rights and duties. The discord most easily used was the dominant seventh, the first discord produced by nature's harmonics; and so the relation of dominant to tonic — the central idea of all harmony — developed from an increasingly general tendency into a recognized rule. During the 17th century many experiments were made by Monteverde's followers, until at the end of the century Rameau's famous treatise called attention to the fact that all chords are derived from some note which is the generator or root, and the relationships of these roots govern the progressions of the harmonies. The less known, but hardly less important, researches of Tartini formed a good supplement to Rameau's theory; and the basis of scientific harmony established by these two works was not seriously disturbed even by the thorough investigation and the astonishing discoveries of Helmholtz, who extended the foundation and built a complete superstructure thereon. In the meantime, notwithstanding that theorists fought each other with great fierceness, the science made extraordinary progress under such practical harmonists as Bach, Mozart, and Beethoven, while Wagner, who handled any number of parts as easily as did Bach himself, so enlarged the possibilities of harmony that it is difficult to conceive of any further advance. Consult the manuals by Bannister, Bowman-Weitzmann, Jadassohn, Macfarren, Ouseley, Richter, and Riemann.

Harmony of the Spheres, a hypothesis of Pythagoras and his school, according to which the motions of the heavenly bodies pro-

duced a music imperceptible by the ears of mortals. He supposed these motions to conform to certain fixed laws, which could be expressed in numbers, corresponding to the numbers which give the harmony of sounds.

Harmotome, här'mō-tōm, a mineral of the zeolite family; a hydrous silicate of aluminum and barium, invariably occurring in twin crystals of various colors from white to red-brown.

Harms'worth, Alfred Charles, English newspaper proprietor: b. Chapelizod, County Dublin, Ireland, 15 July 1865. He is the principal proprietor of the London *Daily Mail,* and *Evening News,* as well as some 30 other English journals, and equipped the arctic expedition under F. G. Jackson in 1894.

Harnack, här'näk, **Adolf,** German theologian: b. Dorpat 7 May 1851. He began his studies in his native town in 1869 and in 1874 took up his residence at Leipsic, for the purpose of pursuing a course in church history, and was made extraordinary professor there in 1876, and ordinary professor of theology, first at Giessen in 1879, and eventually at Berlin 1889. In 1890 he was made a member of the Berlin Academy. He has been a prolific writer, both in theology and church history, and some of his books have given rise to much controversy; among his works are: 'Lehrbuch der Dogmengeschichte' (1894); 'Die Ueberlieferung und der Bestand der altchristlichen Litteratur' (1893); etc.

Har'ned, Virginia, American actress: b. Boston 1868. She became a member of a traveling company about 1884, in 1895 appeared as Trilby in P. M. Potter's dramatization of Du Maurier's story, and subsequently took various roles, including Alice Rousillon in 'Alice of Old Vincennes,' and the title-part in A. W. Pinero's 'Iris.' She was married to E. H. Sothern (q.v.) in 1896.

Harness and Saddlery Trade, The. It is extremely difficult to trace the history of the harness and saddlery industry in America as far back as the days of the colonies, for in that period of our existence as a nation oxen were so generally used for purposes of plowing and carting that harnesses were in small demand. Those were the days in which roads were so poor that driving could scarcely be regarded as a pleasure, and the equipments required in saddle riding were chiefly imported from England.

The first attempt to make saddlery hardware, one of the most important accessories to the saddlery trade, was inaugurated by Seth J. and Alvin North, at New Britain, Conn. Originally engaged in the blacksmithing business, they began to extend the facilities of their shop until they were finally making bridle-bits, and other harness equipments, including shoe-buckles, and rings to be used for a variety of purposes. All these articles were originally produced from wire drawn out by hand. Later, horse-power was introduced for this purpose, but it was many years before all the finishing work on these products, the polishing, the welding, etc., ceased to be a matter of manual labor. The discovery of a more rapid method of polishing was made by a blacksmith at Middletown, Conn., to whom Alvin North paid $25 to learn the process, which simply consisted in taking an old woolen stocking, which, after all the holes had been darned, was filled with the articles to be polished. A number of small pieces of soap were added, after which the stocking was dipped in a pail of warm water and was rubbed briskly between the hands. This method of polishing was finally improved by the substitution of canvas bags for the stockings, but, with this exception, no better process was found until the tumbling-barrels were introduced.

The advent of better roads, and the corresponding increase in the popularity of driving and riding, was the means of creating a greater demand for both saddlery and harness. To meet these requirements of the trade, factories were established at Newark, N. J., Hartford, Conn., St. Louis, Mo., Wheeling, W. Va., Louisville, Ky., and Cincinnati, O., but the greater part of the harness made in those days was suitable only for the heavy stages and wagons, which were then so generally utilized both for the transportation of passengers and in business traffic. At that period in our history the movement for the betterment of roads had been confined almost exclusively to the more populous sections of the East, and as the black soil of the western prairies made the use of wagons practically impossible during certain seasons of the year there was an insistent call for heavy riding saddles. Those that were made in foreign countries had proved to be utterly unsuited, either for the rough frontier life of the West, or for the hard usage which they received in the South, and, as the result of these conditions the manufacturers of saddlery, with the characteristic inventive genius of the Yankee, devised the tree made of wood, and covered with rawhide, with long skirts and fenders to act as a protection, both from the elements and the many deep quagmires which the rider was quite certain to encounter.

It was in 1828 that the Franklin Institute presented a medal to Seth Boyden for his achievement in inventing the first buckles and bits made of annealed cast iron. The discovery had been made by putting a few pounds of cast iron into an ordinary cooking stove, in which, in the process of baking, it became annealed, a process which was largely responsible for the early success of the manufacture of saddlery hardware in this country. About the same time, Peter Hayden, then 22 years of age, began to manufacture hames and saddlery at Auburn, N. Y. His shop was a small one, and as there was little demand for such goods in his neighborhood, he extended his trade by loading his sleigh or wagon with his stock and peddling it through Central New York and Canada. By these methods his business became so well established that, in 1835, he entered into a contract with the State of Ohio, by which he agreed to furnish employment for its convict labor in the making of hames, saddle-trees, saddlery hardware, and chains. At times he employed upward of 300 convicts, to say nothing of a large force of free labor, and he was soon able to open connections for the sale of his product with the largest mercantile houses in Chicago, St. Louis, Cincinnati, Detroit, Galveston, San Francisco, and New York. Thus, from a small beginning, for Hayden's business netted but a few thousand dollars during the first years of its existence, he increased his trade until it reached millions, while it was largely due to

his control of the domestic market that the importations of foreign saddlery almost entirely ceased.

The first horse-collars regularly manufactured in this country were made by Timothy Deming, in East Hartford, Conn., in 1828. Prior to this time the making of horse-collars had been the work of itinerant laborers, who traveled from place to place, hiring themselves to make collars for individuals who were in need of several, or to any local harnessmaker whose stock might need replenishing. When Deming invented and patented his short-straw collar and the block upon which it was made, the event marked the first stage in the development of collar-making in America.

Although the wax-thread, chain-stitch sewing-machine was invented by a New England concern, as early as 1853, it was three years later before it had attained such practicability that it could be used in the sewing of boots and shoes, and fully 10 years before it was applied to the making of harness. Even then the prejudice against machine-stitching was so great that such products were not easily disposed of, and it was only the enormous reduction in cost that ultimately brought it into favor. Another important improvement came in 1858, when W. K. Thornton, of Niles, Mich., perfected the invention of the creasing-machine, but so slow was the trade of those days in the matter of adopting any process which necessitated a radical departure from the old-time and traditional methods that the inventor found that the only way in which he could introduce his machines was to leave them on three months' trial at such shops as would accord him this privilege. A few years later, he entered into partnership in Cincinnati, under the firm name of Thornton & Perkins. In 1865 the business was sold to Randall & Company, the concern which is now engaged in the manufacture of similar, but vastly improved machinery. In fact, the sewing-machine and the creasing-machine were such important inventions that they may be said to have practically revolutionized the industry of harness-making. Other inventions have been patented, but few of them have been of lasting benefit to the trade. The most important, perhaps, was the iron gigtree which was patented by Samuel E. Thompkins, of Newark, N. J., in 1872, the radical change which this invention heralded being indicated by the fact that all buggy saddles up to this time had been made on wooden trees imported from England, but only a few years elapsed after the introduction of the iron gigtree before the wooden tree was entirely discarded.

It was about this time that the harness industry began to enjoy a period of almost phenomenal progress. The invention of labor-saving devices enabled manufacturers to produce goods at a cost which naturally tended to increase the demand for such articles.

Among the inventions which were patented at about this time one must mention the Bosworth lock-stitching, wax-thread sewing-machine, which first appeared in 1872, as well as the Campbell lock-stitching machine, patented first in 1880. With the introduction of these inventions, hand-sewed harness largely disappeared, for these stitches, which were interlocked, made the sewing alike on both sides, which gave the appearance of hand work, a great improvement upon the product of the old harness-sewing machines which produced a sometimes unsatisfactory chain-stitch. The other kinds of harness machinery which have proved themselves such great labor-saving inventions that they are now regarded as indispensable in all well-equipped factories are the tubular riveting-machines, which entirely dispensed with the old processes of hand riveting; the box-loop sewing-machines, which now sew up all the long loops formerly sewed by hand; the quilting-machines, by means of which pads, gig and riding saddles are quilted; the power trace-trimmers, and trace-polishers; the power splitters, and the dieing-out machines. The first factory for the making of harness thread in this country was established at Paterson, N. J., by Barbour Brothers, in 1863, prior to which time such thread had been imported from Ireland, while the hard-rubber-covered harness trimmings were invented by Andrew Albright, of Newark, N. J., in 1867.

The great development in the making of horse-collars dates only from 1883, for it was in that year that William Fogelsong, of Dayton, O., invented a machine for the stuffing of collars. Some 10 years later R. Brownson, of St. Paul, Minn., perfected a metal-staple machine for sewing collars, and, with these two practically recent innovations, one set of machinery will now do the work which formerly required the labor of some 20 men. It was by means of such machinery, practically all of which is due to American push and enterprise, that the trade of saddlery and harness-making has been advanced from a position of inferiority to a commanding place among the great industries of the United States. To comprehend the extent to which this business has progressed it is only necessary to glance at the following table in which the figures prepared by the census bureau are recapitulated:

SADDLERY AND HARNESS, 1880–1900.

	1880	1890	1900
Establishments	7,999	7,931	12,934
Capital	$16,508,019	$35,346,620	$43,354,136
Wage earners	21,446	23,672	24,123
Wages	$ 7,997,752	$10,908,918	$10,725,647
Cost of materials	$19,968,716	$24,674,225	$31,127,926
Value of products	$38,081,643	$52,970,801	$62,630,902

The fever for the organization of combinations, "trusts," and other associations had its natural effect upon some of the saddlery manufacturers, and, in 1890, the first move was made toward the establishment of an organization for conference and mutual improvement. This initiative was taken by the Western manufacturers who called a meeting of the trade to be held at St. Louis, Mo., and it was at this time that the organization known as "The National Wholesale Saddlery Association of the United States," was formed. According to the terms of the constitution adopted at this first gathering, the objects of the association were to correct abuses, adopt uniform terms, and encourage a more fraternal feeling among competitors, but, although its annual meetings and elections have been held, and men prominent in the trade have been elected as officials, its effect upon the growth of the industry is entirely problematic.

See CARRIAGE AND WAGON INDUSTRY.

Harnessed Antelopes. See BUSHBUCK.

Har'nett, Cornelius, American statesman: b. England 20 April 1723; d. North Carolina 1781. He came in early life to America, and was one of the earliest to denounce the stamp act and kindred measures. In 1770–1 he was representative of Wilmington, N. C., in the Provincial Assembly, and chairman of the most important committees of that body. In 1772 he was appointed with Robert Howe and Maurice Moore, to prepare a remonstrance against the appointment, by the royal governor Martin, of commissioners to fix the southern boundary of the province. Josiah Quincy, who visited him in 1773, called him "the Samuel Adams of North Carolina"; and, as the Revolution approached, he was its master spirit throughout the Cape Fear region. He was elected to the Provincial Congress in 1775, and drew up the instructions to the North Carolina delegates in the Continental Congress. When in 1776 Sir Henry Clinton appeared with a British fleet off Cape Fear, Harnett and Howe were excepted, as arch-rebels, from the terms of a general pardon. As member of the Continental Congress he signed the articles of confederation. When in 1780–1 the British held possession of the country around Cape Fear, Harnett was made prisoner, and died while a captive.

Har'ney, John Hopkins, American journalist: b. Bourbon County, Ky., 1806; d. 1867. He was educated at Oxford University, Ohio; became professor of mathematics at the University of Indiana and at Hanover College, and was president of a college at Louisville, Ky. He was for a number of years editor of the Louisville *Democrat*, a paper which took a radical attitude during the Civil War.

Harney, William Selby, American soldier: b. Haysboro, Tenn., 27 Aug. 1800; d. 9 May 1889. He entered the army in 1818; served as colonel in the Mexican War and was brevetted brigadier-general for gallantry at Cerro Gordo, and promoted to that rank in 1858. While commanding the department of Oregon, in 1859 he took possession of the island of San Juan, which was claimed by the English government. He was in consequence recalled. He retired in 1863 and was brevetted major-general in 1865.

Harney's Peak, the highest point of the Black Hills, South Dakota, named in honor of Gen. W. S. Harney; height 7,215 feet.

Haro Islands. See SAN JUAN ISLANDS.

Harold I., surnamed HAREFOOT, king of England: d. Oxford 17 March 1040. He succeeded his father Canute in 1035, notwithstanding a previous agreement that the sovereignty of England should descend to the issue of Canute by his second wife, the Norman princess Emma. Hardecanute, who was about to invade England at the time of Harold's death, dug up his body and beheaded it. See Freeman, 'The Norman Conquest,' Vol. I.

Harold II., king of England, second son of Godwin, earl of Kent: b. about 1022; d. Senlac, near Hastings, Sussex, 14 Oct. 1066. On his father's death in 1053 he succeeded him in the earldom of Wessex and other great offices, and upon the death of Edward the Confessor, 5 Jan. 1066, who had named him his successor, he was chosen king by the nobles, notwithstanding the claim of Edgar Atheling, or the asserted bequest of Edward in favor of William, duke of Normandy. The latter called upon him to resign the crown, and upon his refusal prepared for invasion. He also instigated Harold's brother, Tostig, to invade the northern coasts of England in conjunction with the king of Norway. The united fleet of these chiefs sailed up the Humber and landed a numerous body of men, who defeated the opposing forces of the Earls of Northumberland and Mercia; but at Stamford Bridge, on the river Derwent, in Yorkshire, were totally routed by Harold, whose brother Tostig fell in the battle. A day or two later he heard of the landing of the duke of Normandy at Pevensey, in Sussex. Hastening southward with all the troops he could muster, a general engagement ensued at Senlac, near Hastings, in which Harold was slain with an arrow, and the crown of England was passed to William. See SENLAC. Consult: Freeman, 'The Norman Conquest,' Vols. II. and III.; Tennyson, 'Harold' (1876).

Harold, or **Harald I.,** surnamed HAARFAGER (Fair-haired), king of Norway, son of Halfdan the Black: d. Trondjhem 933. He succeeded to the throne in 860. While he reduced the lesser kings he left them with the title jarl, the administration of their territories, and the third part of their income; but many of them emigrated, and founded Norwegian colonies. Hrolf or Rollo emigrated to Neustria (France). Others, with their followers, established themselves in Iceland, the Shetland Isles, the Faroes, and the Orkneys, then uninhabited. When Harold found that the emigrants often extended their incursions into his dominions he embarked with a naval force to subdue them, conquered the Orkneys, etc., and returned.

Harold, or **Harald III.,** surnamed HAARDRADA, king of Norway: d. Stamford Bridge, England, 25 Sept. 1066. The date of his birth is unknown. During a great part of his youth and prime he served in the imperial bodyguard at Byzantium, returning to Norway about 1045. He persuaded his nephew Magnus to divide the supreme power with him, in return for a share of his treasures, and two years later (1047) his nephew died, when he himself became sole king of Norway. In 1066 he joined Tostig, the brother of Harold II. (q.v.) of England, in an invasion of that country, having been promised half of it in case of success; but he was slain at the battle of Stamford Bridge.

Haroun-al-Rashid. See HARUN-AL-RASHID.

Harp, the oldest of stringed instruments. The Bible mentions Jubal as the inventor. It has been used by all nations in one form or another. The modern instrument is nearly triangular and the strings are extended from the upper part to one of the sides. It stands erect, and is played with both hands, the strings being struck or pulled with both fingers and thumbs. The improvements which have rendered the modern harp an efficient musical instrument are due to Sebastian Erard, who in 1794 took out a patent for a harp with seven pedals, and again in 1808 for a double-action harp with the same number of pedals, each of which effects two changes in the pitch of the strings. The harp thus constructed contains 43 strings tuned according to the diatonic scale, every eighth string being a replicate in another

octave of the one counted from. Various improvements over Erard's harp were made during the 19th century.

Harp, or Saddleback, Seal. See SEALS.

Harp-shell, a genus (*Harpa*) of gasteropodous mollusks of the whelk family (*Buccinidæ*), having the last whorl of the shell large, and covered with numerous sharp smooth ribs, resembling the strings of a harp. The foot is large, and there is no operculum. These shells are elegantly marked, and much prized for their beauty. Nine species are known, all of them tropical, and living in deep water, on soft, sandy, or muddy bottoms.

Har'per, Charles G., English artist and author: b. 1863. He is one of the best-known of English book illustrators, and his own books, mainly lively, entertaining descriptions of pedestrian and bicycle tours in England illustrated by himself, have been popular in the United States as well as in his own country. Among them are: 'Some English Sketching Grounds'; 'From Paddington to Penzance'; 'The Brighton Road'; 'The Great North Road'; 'The Norwich Road'; 'Cycle Rides Around London.'

Harper, Ida Husted, American journalist and author: b. Fairfield, Ind. She attended the University of Indiana for two years; entered journalism when about 18, conducted a woman's department in the Terre Haute 'Saturday Evening Mail' and in the 'Firemen's Magazine,' and was a contributor to many papers, including the Cleveland *Leader,* San Francisco *Chronicle,* and Washington *Post.* She was managing editor of the Terre Haute *Daily News,* for a year, has written for the McClure syndicate, and since January 1899 has been on the editorial staff of the New York *Sun.* She was a member of the International Congress of Women in London in 1899, and was appointed chairman of the international press committee for a five years' term. She prepared the Indiana State monograph for the World's Fair at Chicago under the title 'Organized Work of Indiana Women,' and has written 'Life and Work of Susan B. Anthony' (1898) and 'History of Woman Suffrage to the Close of the Nineteenth Century' (1901).

Harper, John Murdock, Canadian educator: b. Johnstone, Renfrewshire, Scotland, 10 Feb. 1845. He was graduated from Queen's University (Kingston, Ont.), later was appointed superintendent of education for Prince Edward Island, but declined the appointment, and became successively rector of Quebec High School, and inspector of superior schools for the province of Quebec. Among his publications are textbooks and various pamphlets.

Harper, Robert Goodloe, American lawyer and statesman: b. near Fredericksburg, Va., 1765; d. Baltimore, Md., 15 Jan. 1825. In his 15th year young Harper joined a troop of horse, and under Gen. Greene served during the latter part of the southern revolutionary campaign. He was graduated from Princeton College in 1785, while there acting for a time as tutor to lower classes. Sailing from Philadelphia for Charleston, with the intention of studying law, he arrived at his destination nearly penniless, but was assisted by the father of a former pupil, who obtained a position for him in a lawyer's office. In one year he was qualified to practise, and soon established a reputation, and became well known by a series of newspaper articles on the proposed change in the State constitution of South Carolina. He was soon after elected to the State legislature, and in 1794 to the national Congress. In this position he showed marked ability, supported the administrations of Washington and John Adams, and was regarded as one of the leaders of the Federal party. On the election of Thomas Jefferson as President in 1801 he retired from Congress, and resumed the practice of his profession in Baltimore. At the Maryland bar he attained great eminence, at the period too of its highest renown. He was associated with Joseph Hopkinson as counsel for Judge Chase of the United States Supreme Court, when under impeachment. In 1815 he was elected United States senator from Maryland.

Harper, William Rainey, American college president and Hebrew scholar: b. New Concord, Ohio, 26 July 1856; d. Chicago, Ill., 10 Jan. 1906. He was graduated at Muskingum College in 1870; was professor of Hebrew at the Baptist Union Theological Seminary, Chicago, in 1879–86; and of Semitic languages in the graduate faculty of Yale. From 1889 he was also professor of biblical literature. He was principal of the Chautauqua College of Liberal Arts in 1885–91, and in 1891 was appointed director of the Chautauqua system. In 1891 he was chosen first president of the new University of Chicago, where he was also head of the department of Semitic languages and literature. He was a founder and editor of 'Hebraica' and the 'Hebrew Student,' was an editor of three of the publications of the University of Chicago — the 'Biblical World,' the 'American Journal of Theology,' and the 'American Journal of Semitic Languages and Literature.' His administration was noted for its rapid development of the facilities of the university. Among his works are: 'Elements of Hebrew' (2d ed. 1890), 'Hebrew Method and Manual' (1885), and 'Elements of Hebrew Syntax' (1888), 'The Trend in Higher Education' (1905); 'The Priestly Element in the Old Testament' (1905).

Harper, William Saint John, American artist: b. Rhinebeck, N. Y., 8 Sept. 1851. He studied painting at the National Academy of Design, New York, and afterward became pupil of Munkacsy and Bonnat at Paris. He has done much successful work both as a painter and book illustrator.

Harper and Brothers, the designation of a noted firm of New York publishers. It consisted originally of James (1795–1869), John (1797–1875), Joseph Wesley (1801–70), and Fletcher (1806–77). The first two commenced to publish in 1818, as J. & J. Harper. The firm of Harper and Brothers, established in 1833, is now managed by descendants of the founders. It not only publishes books but 'Harper's Magazine' (monthly, since 1850), 'Harper's Weekly' (since 1857), 'Harper's Bazar' (fashions, social life, etc.; since 1867), and 'Harper's Round Table' (started in 1881 as 'Harper's Young People' and recently consolidated with 'St. Nicholas').

Harper's Ferry, W. Va., is situated in Jefferson County, 55 miles northwest of Washington, on the Baltimore & O. railroad. It is at the confluence of the Potomac and Shenandoah

VIEW OF HARPERS FERRY, VA.

rivers, where the former breaks through the Blue Ridge, presenting one of the most picturesque scenes in America. Attracted by its fine water-power, Washington, in 1790, chose it as a site for a United States arsenal and armory, and up to 1860 $1,800,000 had been expended for land and improvements. Here 10,000 muskets were made annually, and over 75,000 small arms were usually in store. It is the seat of Storer College and of a normal school for colored pupils. Pop. (1900) 896.

Harper's Ferry came into great prominence in 1859 through the acts of John Brown (q.v.), and was the scene of noteworthy military events during the Civil War. When Virginia seceded, Harper's Ferry was held by Lieut. Roger Jones, with 45 men. On the night of 18 April 1861 a large body of Virginia militia, hastily assembled from the surrounding country, appeared before the place. Jones set fire to the arsenal, destroyed as much public property as possible, and retreated across the Potomac to Hagerstown, Md., and thence to Carlisle, Pa. The Virginia militia occupied the place, and troops were hastened to it from other States of the Confederacy. The Confederate government attached much importance to the place as a strategical point, but it was abandoned by Gen. J. E. Johnston, 15 June 1861, when he heard that Gen. Patterson, marching from Chambersburg, Pa., was threatening to cross the Potomac at Williamsport. The place was then occupied by the National forces. When Gen. Lee invaded Maryland early in September 1862, Harper's Ferry was held by Col. Dixon S. Miles with a large garrison, and there were strong outposts at Winchester and Martinsburg. Lee supposed that his presence at Frederick, Md., would cause the evacuation of Harper's Ferry and its outposts, and thus open his communications by way of Shenandoah Valley, but as it was still held by the National forces it became a necessity to dislodge them. On the morning of 10 September he set three columns in motion from Frederick to surround the place and capture its entire garrison. Gen. Jackson, with 14 brigades, marched rapidly over the South Mountain, crossed the Potomac at Williamsport on the 11th, drove the garrison from Martinsburg into Harper's Ferry, and appeared before Bolivar Heights on the 13th, thus investing the place from the west. Gen. McLaws, with 10 brigades, marched through Brownsville Gap, and, after a severe engagement with Col. Thomas H. Ford on the 12th and 13th, drove him from Maryland Heights and into Harper's Ferry. Gen. Walker, with his division, crossed the Potomac at Point of Rocks, 12 miles below Harper's Ferry, and on the 13th seized Loudoun Heights beyond the Shenandoah. Miles was now completely surrounded, the Confederates occupying high ground, commanding his position. Artillery fire was opened from all these points on the 14th, and late in the afternoon Jackson moved upon Bolivar Heights, drove in Miles' skirmish lines, and gained an advantageous position on the left of the Union line. During the night 1,500 Union cavalry crossed from Harper's Ferry to the Maryland side and escaped. During the same night Jackson crossed 10 guns to the right bank of the Shenandoah and established them on a plateau at the foot of Loudoun Heights, enfilading Miles' entire position on Bolivar Heights. Early on the 15th the Confederate guns on Maryland Heights, Loudoun Heights, and in front of Bolivar Heights opened fire, which was responded to for more than an hour, but the direct and plunging flank-fire from the Confederate batteries partially silenced the Union guns and created some disorder in the Union ranks. Jackson had advanced his lines to within 150 yards of the Union works on Bolivar Heights, and was about to assault, when Miles ordered a white flag displayed on his works and directed Gen. Julius White to arrange terms of capitulation, soon after which Miles was mortally wounded by a shell from a battery that had not seen the white flag. The Union loss during the siege was 44 killed and 173 wounded, and the number of prisoners surrendered and paroled 12,520. The Confederates captured 70 guns, 13,000 small arms, 200 wagons, and a large amount of quartermaster and commissary stores. The Confederate loss was 41 killed and 247 wounded, the greater part of whom were lost in the engagement on Maryland Heights. The Confederates abandoned Harper's Ferry on the 20th, and it was again occupied by the Union forces on the 22d. Consult: 'Official Records,' Vols. II. and XIX.; Allan, 'Army of Northern Virginia in 1862'; The Century Company's 'Battles and Leaders of the Civil War,' Vols. I. and II.

E. A. Carman.

Har'pies (Greek, *Harpuiai*, swift robbers), the goddesses of storms. Their ages, appearance, names and number are so differently given by the poets that it is difficult to say anything definite concerning them. In the Homeric poems they are represented as personified storm-winds. The later poets and artists vied with each other in depicting them under the most hideous forms. One has given them the head of a fowl, with wings and a body covered with feathers, human arms with claws, a white breast, and human legs which terminate in the feet of a fowl. Others have given them the face of a young woman with the ears of a bear. See Furies.

Harpignies, Henri Joseph, ŏñ-rē zhō-zĕf är-pēn-yē, French landscapist: b. Valenciennes 28 July 1819. He studied at Paris with Achard, first exhibited at the salon of 1853, and in 1861 attracted attention by his 'Edge of a Wood beside the Allier.' His landscapes, done with equal success in oils or water-colors, evince a skilfulness of drawing and a coloristic truthfulness marred only occasionally by a harshness in matters of technique. His works number: 'View of Capri,' 'Le Saut du Loup,' 'Banks of the Rhone' (Metropolitan Museum, N. Y.), and 'Garden of the Villa Medici.'

Harp'sichord, a stringed instrument formerly in use, in appearance and construction similar to a grand pianoforte. In the front the keys were disposed, the long ones being the naturals, and the short ones the sharps and flats. This instrument, called by the Italians *clavicembalo*, by the French *clavecin*, was an improvement upon the clavichord, which was borrowed from the harp. Both are now superseded by the pianoforte. See Pianoforte.

Harps'well, Maine, a township including the post village of Harpswell Centre, and comprising a peninsula and some islands in Casco Bay, 14 miles east of Portland. It has agricul-

tural interests and grist-mills, but is chiefly noted as a summer resort. Pop. (1900) 1,750.

Harpy-eagle. See EAGLE.

Har'raden, Beatrice, English novelist: b. Hampstead, London, 24 Jan. 1864. She took her degree at London University at 21, and subsequently traveled extensively in the United States and on the Continent. Her first novel, 'Ships that Pass in the Night' (1893), was instantly successful and was widely circulated. It has been followed by 'In Varying Moods' (1894); 'Hilda Strafford,' a Californian story (1897); 'The Fowler' (1899).

Harrier, a small mottled hound used in Europe in ancient times, and up to the end of the 18th century for chasing hares, the sportsmen following on foot. The old breed has disappeared except a few bred for show purposes by fanciers; its place being taken in sport by a small kind of foxhound followed on horseback.

Harrier. See MARSH-HAWK.

Har'rigan, Edward, American actor and playwright: b. New York 1845. He entered upon the stage as a variety performer and was a partner of Tony Hart (1871–85), when they opened in New York their first Theatre Comique (1876). Among his dramas, which are strong in character drawing, but of little value in a literary sense, are: 'Squatter Sovereignty'; 'Cordelia's Aspirations'; 'Old Lavender'; and 'Reilly and the Four Hundred.'

Harrild, Robert, English inventor: b. London 1780; d. 1853. He was the inventor and manufacturer of composition rollers for inking type, the introduction of which alone rendered cylinder presses practicable. He began the manufacture of printers' materials in London in 1809 and the printing-press with which Franklin worked in London was owned by him before it was brought to the United States in 1841 and put into the Patent Office at Washington, where it now stands.

Har'riman, Tenn., city in Roane County; on the Emory River, the Southern, the Tennessee C., and the Queen & C. R.R.'s; about 78 miles northeast of Chattanooga, and 37 miles west of Knoxville. It was founded in 1890 and received its city charter in 1891. The charter was revised in 1899. It is situated in an agricultural region which contains rich deposits of coal and of iron ore, and some timber land. Its chief manufactures are foundry and machine shop products, leather, farm implements, iron, flour, lumber, cotton goods, and furniture. It is the seat of an industrial school for colored children, and of the American University, established in 1893. Its trade in agricultural and mining products and in its own manufactured articles is rapidly increasing. The waterworks and electric-light plant are owned and operated by the city. Pop. (1900) 3,442.

Harriman Alaska Expedition, an American scientific and artistic expedition which visited the southern coast of Alaska during the summer of 1899. The party was organized by Edward H. Harriman, and consisted of the members of his own family, a few friends, and 50 gentlemen interested in science, art and literature. Among them were Messrs. Henry Gannett, W. H. Dall, C. H. Merriam, R. Ridgway, G. K. Gilbert and F. V. Calville of Washington; D. G. Elliot of Chicago; William Trelease of St. Louis; John Muir and W. E. Ritter of California, and several professors from Eastern institutions of learning. Messrs. John Burroughs, Swain Gifford and F. S. Dellenbaugh represented the literary and artistic contingent. These gentlemen made good use of their opportunities in investigating the geography, geology, glacial phenomena, and fauna and flora of the region visited.

The results so far as announced (1904) are over 300 species and sub-species of animals and plants, records of observations of 22 "living" glaciers, those which discharge icebergs directly into the sea, and of 100 "dead" glaciers, those whose fronts do not reach the sea. A new chart was made of the part of the coast explored. (See HARRIMAN FIORD.) Some of the new animal species found are two of foxes, five species and sub-species of shrews, five of hares, one crab, a shrimp, and 25 sea-worms. One of the sea-worms is about six feet long and of a deep vermilion color; another about the same size is blood-red with a white head. In no other part of the world have been found sea-worms of such varied and striking forms and colors. Among the plants found were a large number of new species and sub-species. Each department of science was represented by one or more experts who made critical observations and accurate reports. Consult: 'Reports of the Harriman Alaska Expedition'; 'The World's Work' (1900); 'Discoveries in our Arctic Region.'

Harriman Fiord, on the southern coast of Alaska, at about lat. 61° N. and lon. 145° W., is an arm of Prince William Sound, 15 miles in length. This fiord was discovered by the Harriman Alaska Expedition (q.v.), in 1899. The finding of this fiord is described by John Burroughs, a member of the Expedition, as follows: "Later in the afternoon we ascended an arm of Port Wells more to the westward and entered upon a voyage of discovery. We steamed up to a glacier of prodigious size that reared its front across the head of the inlet and barred further progress in that direction — the Barry Glacier. According to the United States Coast Survey map we were at the end of navigation in these waters; but we went on under a good head of steam down this new inlet where no ship had ever before passed. Glaciers hung on the steep mountain sides all about us. One of these was self-named the Serpentine by reason of its winding course down from its hidden sources in the mountains — a great white serpent with its jaws set with glittering fangs at the sea. Another was self-named the Stairway, as it came down in regular terraces or benches. As we neared the front of this glacier the mountains to the left again parted and opened another new arm of the sea, with more glaciers tumbling in mute sublimity from the heights, or rearing colossal palisades across our front. Another ten-mile course brought us to the head of this inlet, which was indeed the end of navigation in this direction. Subsequently this inlet was fitly named the Harriman Fiord, and the glacier at the head of it, Harriman Glacier."

Har'rington, Mark Walrod, American astronomer: b. in Sycamore, Ill., 18 Aug. 1848. He was educated at the University of Michigan, and in 1870–1 assisted in the United States Coast and Geodetic Survey of Alaska. He was

professor of astronomy and director of the observatory at the University of Michigan, 1870–91. In 1884 he established the 'American Meteorological Journal' and was its managing editor until 1892. In 1891 he became chief of the Weather Bureau at Washington, D. C., which post he held till 1895, and was president of the Washington State University 1895–7.

Harriot, Thomas, English mathematician: b. Oxford 1560; d. London 2 July 1621. He entered Saint Mary's Hall, Oxford, and was graduated in 1580. In 1585 he was sent by Sir Walter Raleigh as surveyor on the Grenville expedition to Virginia, and on his return he published an account of Virginia, later printed in Hakluyt's 'Voyages.' He gained the favor of the Earl of Northumberland, who gave him an annual pension, and thereafter devoted himself entirely to mathematical and scientific research. His chief work, 'Artis Analyticæ Praxis ad Equationes Algebraicas Resolvendas,' published in 1631, embodied the most important results of his mathematical work. He practically gave to algebra its modern form, improving the notation, being the first to equate all the terms of an equation to zero, and announcing the principle that every equation has as many roots as its dimension. He also did important work in astronomy. See ALGEBRA, HISTORY OF THE ELEMENT OF.

Harris, Amanda Bartlett, American writer b. Warner, N. H., 15 Aug. 1824. She is a popular writer for young people and has published: 'How We Went Bird-Nesting' (1880); 'Wild Flowers, and Where They Grow' (1882); 'American Authors for Young Folks' (1887); 'The Luck of Edenhall' (1888); etc.

Harris, George, American college president: b. East Machias, Maine, 1844. He was graduated at Amherst, 1883; and at Andover Theological Seminary 1860. After taking several pastoral charges he became professor of Christian theology at Andover 1883, from which position he passed in 1899 to the presidency of Amherst, which he now holds. He was one of the editors of the 'Andover Review,' 1884–93. Among his works are 'Moral Evolution' (1806); 'Inequality and Progress' (1897).

Harris, James Rendel, English scholar. He was graduated at Cambridge University, where he was fellow and librarian of Clare College. He was professor at Johns Hopkins University and at Haverford College, and is now university lecturer in palæography at Cambridge, England. He has written many volumes on philology, palæography and kindred subjects, his latest work being 'Annotators of the Codex Bezæ' (1901).

Harris, Joel Chandler, American journalist and author: b. Eatonton, Ga., 8 Dec. 1848. He began his career as a printer's apprentice on the Forsyth (Ga.) 'Countryman' and was on the staff of the Savannah *Daily News,* 1871–6. He has been connected with the Atlanta *Constitution* from 1876 and became its editor in 1890. The series of "Uncle Remus" sketches and songs which have given him an international reputation were first printed in the *Constitution.* His published books include: 'The Folk-Lore of the Old Plantation' (1880); 'Nights With Uncle Remus' (1883); 'Mingo and Other Sketches' (1883); 'Daddy Jake, the Runaway' (1889); 'Free Joe and Other Stories' (1887); 'Balaam and his Master' (1890); 'Mr. Rabbit at Home' (1895); 'The Story of Aaron' (1896); 'Stories of Georgia History' (1897); 'Sister Jane,' a novel (1897); 'Minervy Ann' (1899); 'On the Wing of Occasion' (1900); etc.

Harris, Joseph, American agricultural writer: b. Shrewsbury, England, 1828; d. 1892. He began his scientific study of agriculture with Lawes and Gilbert at Rothamsted and in 1864 emigrated to the United States, and began to contribute to the agricultural press. His 'Walks and Talks on the Farm' was a series of articles which appeared partly in the 'Genesee Farmer,' and partly in the 'American Agriculturalist,' in which the former had become merged. Among his other writings are: 'Harris on the Pig' (1888); 'Talks on Manures' (1883); and 'Gardening for Young and Old' (1882).

Harris, Miriam Coles, American novelist: b. Dosoris, L. I., 7 July 1834. She was married to Sidney S. Harris in 1864 and has since lived in New York. She wrote: 'Rutledge' (1860); 'The Sutherlands' (1862), both widely read, and among many later and almost equally popular works of hers are: 'A Perfect Adonis' (1875); 'Missy' (1800); and 'An Utter Failure' (1891).

Harris, Samuel, American theologian: b. East Machias, Maine, 14 June 1814; d. Litchfield, Conn., 25 June 1899. He was graduated from Bowdoin College and from Andover Theological Seminary. He was a teacher for a time and held Congregationalist pastorates in Conway, Mass., 1841–51. In 1855 he was appointed professor of systematic theology in Bangor Seminary; was president of Bowdoin 1867–71; and then became professor of systematic theology in the Yale Divinity School. His writings include: 'Zaccheus or the Scriptural Plan of Benevolence'; 'Kingdom of Christ on Earth' (1874); 'Philosophical Basis of Theism' (1883); 'Self-Revelation of God' (1887); 'God, Creator and Lord of All' (1897).

Harris, Thaddeus William, American naturalist: b. Dorchester, Mass., 12 Nov. 1795; d. Cambridge, Mass., 16 Jan. 1856. He was graduated at Harvard College in 1815, studied medicine and practised his profession in Milton, Mass., until appointed librarian of Harvard in 1831. This position he occupied until his death. Early in life he exhibited a fondness for natural history, and though plodding alone, attained to a scientific eminence which secured for him the fellowship of all the principal learned societies of America, and of many abroad. For several years he gave instruction in botany and general natural history in the college, and originated the Harvard natural history society for the students. He was chiefly distinguished, however, as an entomologist, and has been surpassed as such by no one in the United States. He was one of the founders of the Massachusetts Horticultural Society. In 1837 he was appointed one of the commissioners for a zoological and botanical survey of Massachusetts, the result of which was his 'Systematic Catalogue of the Insects of Massachusetts' (1832), in which 2,350 species are enumerated. He also published: 'A Treatise on some of the Insects of New England which are Injurious to Vegetation' (1842), a work of permanent value.

Harris, Thomas Lake, American socialistic and religious reformer: b. Fenny Stratford, England, 15 May 1823. He accompanied his father to the United States in childhood, was for a time a Universalist pastor, and founded an 'Independent Christian Society' in 1850; but became a lecturer upon spiritualism. He lectured abroad in 1858, and on his return to the United States organized the society of the "Brotherhood of the New Life." This was established at Wassaic, Dutchess County, N. Y., 1861–7, but removed to Brocton, Chautauqua County, N. Y., in the last named year. Its nature was co-operative rather than communistic, and farming and industrial occupations were engaged in by his followers, numbering at one time about 2,000 in the United States and Great Britain, among them Lady Oliphant and her son, the well-known writer, Laurence Oliphant (q.v.). Harris removed to California in 1887, and retired to private life in 1895, residing in New York city. He published many works in prose and poetry, among which are 'Wisdom of Angels' (1856); 'Arcana of Christianity' (1857); 'Modern Spiritualism' (1860); 'God's Breath in Man' (1891).

Harris, Townsend, American merchant and diplomatist, of Welsh descent and of Revolutionary stock, the youngest of five children: b. Sandy Hill, N. Y., 4 Oct. 1804; d. New York city 25 Feb. 1878. He received his education at the village school and academy. From 1817 to 1848 he was in business in New York city, continuing his self-culture by continuous and critical reading of the best literature, learning also the French, Spanish, and Italian languages; was member of the Board of Education and in 1846–7 its president. He was the practical founder of the New York Free Academy, now the College of the City of New York, and in many ways was a typically useful citizen. He never married. In 1848 he went to California and during the following six years made trading voyages to China and the Dutch and English Indies, becoming thoroughly acquainted with the manifold Oriental varieties of human nature. He acted for a time as American vice-consul at Ningpo. He was appointed Consul General to Japan and on the U. S. S. S. San Jacinto arrived at Shimoda, his future dwelling place (and now noted for its stone quarries), where the flag of the United States was hoisted 4 Sept. 1856. From the first Mr. Harris spoke the truth as against the constant deceit and prevarication of the corrupt officials of the Yedo Shogunate, demanding the courtesies due to an accredited envoy of a civilized power and refusing to deliver the President's letter to any one but the Shogun in Yedo and to him personally. Unbacked by a single ship or man, and with his secretary only, after prolonged negotiations lasting 18 months, he made a triumphal progress to Yedo, and standing erect received personal audience of the Shogun in the palace. Then began four months' instruction of these political hermits in the methods of modern international law and procedure. He concluded the treaty and received the promise of signature by the premier, without regard to anything happening in China. Nevertheless the arrival of Commodore Tatnall with two American men-of-war, bringing news of the humiliation of the Chinese emperor and court, undoubtedly had its influence on the Japanese. Mr. Harris urged the importance of having the treaty signed without a moment's delay, and the premier Ii despatched commissioners to affix their signatures and soon after an embassy to the United States, for which reason chiefly, Ii was assassinated in Yedo, 23 March 1860. The Harris treaty secured the right of trade, residence, and of missionary operations and teachings. He was buried in Greenwood cemetery, Brooklyn, N. Y. Mr. Harris has always been very highly thought of by the Japanese, and is still the subject of much praise and appreciative writing by Japanese writers. His journals with comment and biography were published in 1896.

William Elliot Griffis,
Author of 'Townsend Harris, First American Envoy in Japan.'

Harris, William Torrey, American educator and metaphysician: b. North Killingly, Conn., 10 Sept. 1835. He studied at Yale in the class of 1858 but was not graduated, and after teaching in the St. Louis public schools, 1857–67, was superintendent of the schools of that city 1867–80. While in St. Louis he founded in 1867 the 'Journal of Speculative Philosophy,' which he still edits. He removed to Concord, Mass., in 1880 and aided in founding the Concord School of Philosophy at which he lectured on metaphysical themes. Since September 1889, he has been United States Commissioner of Education. He has edited Appleton's School Reader and Appleton's Educational Series and is the author of 'Hegel's Logic: a Critical Exposition' (1890); 'The Spiritual Sense of Dante's Divina Commedia' (1891); 'Introduction to the Study of Philosophy'; 'Psychologic Foundations of Education.'

Harrisburg, Pa., city, State capital; county-seat of Dauphin County, on the Susquehanna River, the Pennsylvania canal, and on the Northern Cent.; Pennsylvania; Cumberland Valley, and Philadelphia & R. R.R.'s., and is situated 105 miles northwest of Philadelphia. This is an important railroad, agricultural, industrial and commercial centre, and is the home of a system of municipal reform known as "the Harrisburg Plan" which has attracted widespread attention throughout the United States. The Susquehanna River is nearly a mile in width at this point, and is crossed by numerous bridges.

History.—The site of the future city was selected by John Harris in 1785, and the settlement was incorporated as a borough in 1791. Harris was an adventurous English trader who built the first house here in 1726, and secured a grant of 800 acres. His son established a ferry here in 1753, and the place was known for many years as Harris Ferry. The town became the capital of the State in 1812, and was chartered as a city in 1860. The Harrisburg convention (q.v.), famous in American political history, was held here in 1828, and Harrison and Tyler were nominated here in 1839.

Topography.—The city has a most picturesque location on the left bank of the Susquehanna, which is spanned here by five bridges, three of

them modern steel structures. The old historic "Camel-back Bridge," a part of which was burned during the middle of the 19th century, has been removed (1904). There is an extensive and beautiful park of 16 acres, well-made streets, an abundance of shade, and a fine sewage system with natural drainage.

Commerce and Industry.— The iron, steel, lumber and railroad interests of Harrisburg are of great importance. The roundhouses and repair shops of the Pennsylvania Railroad are located here and give employment to thousands of workmen. There are extensive manufactories of machinery, malt liquors, boilers, castings, brooms, cars, coaches, tanned leather, lumber, cotton goods, beds, mattresses, coffins, silk goods and a large number of rolling-mills, tin-mills, blast furnaces, nail-works, typewriter works and boot and shoe factories. The city has two morning and two evening newspapers and many weekly and monthly publications.

Public Buildings.— Prominent among the public buildings is the new State capitol, erected at a cost exceeding $4,000,000. It is built of brick and steel, with facings of marble and granite. At the main entrance is a fountain 78 feet wide, from which the water leaps down an incline in many cascades. On each side of the fountain rises a granite stairway 48 feet wide, broadening at the top into an esplanade and widening at the corners of the building to the proportions of a reviewing ground for troops. The lesser approaches to the grounds are ornamented with statues of the animals native to Pennsylvania. The State Library here, founded in 1790, contains over 100,000 volumes. In State Street stands the Dauphin County soldiers' monument, 110 feet high, in memory of the soldiers who died in the Civil War. There is also a statue here of Gen. John F. Hartranft, and a monument erected to the memory of the soldiers who fell in the Mexican War adorns the Capitol Park. Among other points of interest are the State Arsenal, the court-house, lunatic asylum, executive building, post-office, Harris Park, and Harrisburg Cemetery. The educational institutions include the high school, Harrisburg academy, St. Genevieve's academy, and the Young Ladies' Seminary. Harrisburg is the seat of a Roman Catholic bishop, and its charitable organizations include several hospitals, the Home of the Friendless, and the Children's Industrial Home.

Transportation.— Harrisburg has in operation one of the most extensive and perfect electric street railway systems in the United States. Every part of the city, and suburbs, and the neighboring towns and city are reached by electric trolley lines. The suburban railway service of the Pennsylvania and other railroads is unusually advantageous in extending the outlying residential sections of the city.

Municipal Administration.— The city government is vested in a mayor, elected every three years, with no second term, and a bicameral and select council. The highway commissioner, police officials, building inspector, fire department and sanitary officers are selected by the select council. The city solicitor, board of tax revision and appeals, water commissioners, city engineer, city clerk, 3 members of the board of public works and 5 members of the board of park commissioners, are selected by the common council. The treasurer, controller, school directors, supervisors and assessors are elected by vote of the citizens.

Banks and Finance.— Harrisburg has four national banks and a dozen other banking institutions and building and loan associations. The assessed property valuation is $26,000,000, the tax rate of course constantly changing. The municipal income amounts to $600,000 and the expenditure to $530,000. The principal items of expense are: Fire department, $15,000; waterworks, $30,000; street lighting, $30,000; police, $35,000; schools, $185,000. Public improvements involving an expenditure of $1,000,000 were begun in 1902, for the development of a new sewer system, water filtration, park development and street paving.

Municipal Reform.— Harrisburg through the progressiveness and enterprise of her citizens in the municipal improvement of the city, has been called "the model city," and the plans of 1902, for an expenditure of $1,000,000 have created an improvement system now known as "the Harrisburg plan." In May 1901, a citizen wrote a letter to a daily paper offering $100 toward a fund of $5,000 to engage expert engineers to examine the city and to report a plan of improvement. The proposal met instant approval. In a few weeks the $5,000 was pledged by 60 citizens. An organization and an executive committee soon followed, and these included the mayor, civil engineer and other officials elected by a reform element in local politics. Three noted engineers were employed, and their reports published in October 1901, included plans and estimates for the immediate improvement of the city. The subject was presented to the people at the annual election, 18 Feb. 1902. "The Harrisburg League for Municipal Improvements" carried on an aggressive campaign, proposing a million dollar expenditure. Objections were raised and to overcome these a board of public works was formed (under the laws of the State), composed of citizens who would serve without pay, and to have entire control of the improvements. An ordinance authorizing this board and providing for its appointment before the election was passed by councils immediately after an ordinance had been passed submitting to the voters the question of increasing the city's debt for the following purposes:

"The sum of $310,000 for the extension, improvement and filtration of the water supply; $365,000 for the extension and improvement of the sewerage system; $65,000 for the construction of a dam in the Susquehanna River to form part of the improved sewerage system; $250,000 for acquiring land and property for parks and for making park improvements; and $100,000 for the creation of a fund out of which the city may defray the cost of paving the intersections of streets hereafter authorized to be paved."

Upon this board three leading citizens of high character were appointed, the campaign was opened, the newspapers supported the movement, and even the women formed a civic league and aided in the work. Pamphlets, maps and diagrams were issued and a booklet, 'The Plain Truth About the Proposed Improvements for Harrisburg,' was widely circulated. The result of the election was a casting aside of party lines, and out of a total of 11,048 ballots, the "improvement" party had a majority of 3,590 votes. It

was a mixed ticket selected for reform that won the election, the mayor being a Democrat (in a city naturally Republican), the treasurer, also a Democrat, while the controller was a Republican. Of the six candidates for the board of assessors, an important body, fixing the tax valuation of the city, the best three (two Republicans and one Democrat) were selected. Harrisburg in 1904 with her $1,000,000 improvements well advanced, is on the high road to remarkable prosperity. The State construction of a capitol building costing over $4,000,000, and the local railroads projecting improvements involving the expenditure of several millions, add additional strength to the movement toward municipal reform. Pop. (1900) 50,167; (1903) 52,951.

Harrisburg Convention, the assembly convened in 1828 at Harrisburg, Pa., by the protectionist faction of the New England and Middle States, consequent on the rejection of the high tariff "Woolen Bill" in the Senate, by the casting-vote of the Vice-President. The forcible presentation of the cause of protection, and the demands of the convention for an increased duty on several manufactured articles, resulted in the passage of the high tariff bill of 1828.

Harrison, Benjamin, American statesman: b. Berkeley, Va., about 1740; d. April 1791. While a very young man he was elected to the House of Burgesses of which he was twice Speaker, and in 1773 was chosen a member of the committee which united the colonies against Great Britain. He was a member of the Continental Congress, 1774–7, and on 4 July 1776, reported, as chairman of the committee of the whole House, the Declaration of Independence, of which he was one of the signers. He was opposed to the ratification of the Federal constitution, but after its adoption, supported the national government. His brother, Charles, was a noted general in the American army during the Revolution, and his son, William Henry, became ninth President of the United States.

Harrison, Benjamin, 23d President of the United States: b. North Bend, Ohio, 20 Aug. 1833; d. Indianapolis, Ind., 13 March 1901. He was a great-grandson of Benjamin Harrison, signer of the Declaration of Independence (q.v.), and grandson of William Henry Harrison, ninth President (q.v.) He was graduated from Miami University (Oxford, Ohio) in 1852, studied law in Cincinnati, was admitted to the bar in 1853, and in 1854 began in Indianapolis the practice of his profession. In 1860 he was elected reporter of the supreme court of the State. At the time of his election to the Presidency (1888) he was one of the foremost leaders of the State bar. At the outbreak of the Civil War he assisted in recruiting the 70th regiment of Indiana Volunteers, of which he became colonel (August 1862). He was an exceedingly efficient commander. For some time he was detailed to guard railways in the West; and in the campaign from Chattanooga to Atlanta the regiment was in the 20th Army Corps, the commander of which was Gen. Joseph Hooker. Harrison commanded a brigade at Peach Tree Creek, where he served with especial distinction, and also at Nashville. He was present at Johnston's surrender at Durham Station, N. C., in 1865 was brevetted brigadier-general for his services in command of the brigade, and in June of that year was mustered out. The supreme court of Indiana had declared that Harrison by his enlistment vacated his office of reporter, and a Democrat was elected by default to fill that office for the unexpired term. At the election of 1864 Harrison, while still in the field, was rechosen. In 1867 he refused a renomination, and recommenced his legal practice, in which he was largely retained in both the Federal and State courts. In 1876 he became, on the retirement of the original candidate, the Republican candidate for the governorship, and though he ran about 2,000 votes ahead of his ticket, he was defeated by a Democratic plurality of 3,000. He was appointed a member of the Mississippi River commission in 1879, and in 1880 was chairman of the Indiana delegation in the Republican national convention. At that convention, where he cast nearly the entire vote of the State for Garfield, he was himself mentioned in connection with the Presidency. From 1881 to 1887 he was in the United States Senate, in which he took rank as a prominent debater. He opposed Cleveland's vetoes of the pension bills, urged increase in the navy and civil-service reform, and as chairman of the committee on territories demanded the admission as States of North and South Dakota, Montana, Washington, and Idaho. In 1884 he was a delegate to the Republican national convention. At the convention of 1888 (Chicago, Ill.) he was presented by the solid Indiana delegation as a candidate for the nomination to the Presidency; and on the eighth ballot he received the nomination by a vote of 544. The campaign was a vigorous one, and Harrison made many excellent speeches. He was elected, receiving in the electoral college 233 ballots to 168 for Grover Cleveland. His administration was broadly characterized by a firm defence of American interests in foreign affairs and a general promotion of industry and governmental effectiveness. During this time the 55th Congress passed the tariff act known as the McKinley law; the reciprocity system was introduced; the new navy was extended; civil-service reform was promoted; and the Pan-American congress with representatives from all Central and South American countries was held at Washington in the winter of 1889–90. The Bering Sea arbitration respecting the seal fisheries was also organized between Great Britain and the United States. The Samoan difficulties were adjusted; and the Chile affair, concerned with an attack on American sailors either connived at or permitted by Chilean authorities, was promptly and satisfactorily settled by enforced reparation on the part of Chile. At the Minneapolis convention of 1892 Harrison was renominated without serious opposition. He was a second time opposed by Cleveland, and his defeat by 276 electoral votes to 145 was an occasion for some surprise. Upon his retirement from office, he returned to the practice of law, and in 1893–4 delivered a course of lectures on constitutional law at Stanford University. In 1899 he appeared as council for Venezuela in the Anglo-Venezuelan boundary arbitration commission. He was appointed a member for the United States of the Peace Conference held at The Hague in 1899, and became one of the International Board of Arbitration. He wrote 'This

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Country of Ours' (1897). A complete collection of his public addresses from 1888 to 1892 was edited by Hedges (1892). A posthumous collection of articles, 'Views of an Ex-President,' was published in 1901. Consult the campaign life by Lew Wallace (1888), and Wilson (editor), 'The Presidents of the United States' (1894). GEORGE EDWIN RINES,
Editorial Staff, 'Encyclopedia Americana.'

Harrison, Burton Norville, American lawyer: b. New Orleans 1836; d. Washington, D. C., 29 March 1904. He was graduated from Yale in 1859, shortly afterward became professor of mathematics and astronomy in the University of Mississippi, and at the outbreak of the Civil War was appointed private secretary to Jefferson Davis, president of the Confederate States. Captured with Davis, he remained in imprisonment until January 1866, when his release was effected by the intervention of F. P. Blair and President Johnson. Subsequent to the war he followed the law in the north with much success.

Harrison, Mrs. Burton. See HARRISON, CONSTANCE CARY.

Harrison, Carter Henry, American politician: b. Elk Hill, Fayette County, Ky., 15 Feb. 1825; d. Chicago 28 Oct. 1893. He was graduated from Yale in 1845, from the Transylvania University law school (Lexington, Ky.), in 1855, and in the latter year was also admitted to the bar and removed to Chicago. There he invested in real estate, in 1869 was defeated as a candidate for State senator on the Democratic ticket, but in 1871 was elected county commissioner of Cook County, and in 1874 was sent to Congress from the 2d Illinois district, and in 1876 re-elected. In 1879 he was elected mayor of Chicago, and again in 1881, 1883, 1885, and 1893. He was also an unsuccessful independent candidate in 1891. In 1891 he purchased the Chicago *Times*, in the direction of which he was active until his election as mayor in 1893. In several instances his mayoralty contests assumed national interest, particularly so that of 1893 — the "World's Fair year" — when the success of the great exposition was thought to depend much upon the occupant of the mayor's chair. He was opposed by the united Citizens' and Republican forces and by nearly the entire press of Chicago, but after a vigorous campaign of public meetings was elected by more than 21,000 majority. He wrote: 'A Race with the Sun'; and 'A Summer Outing.'

Harrison, Carter Henry, American politician: b. Chicago 23 April 1860. He is son of the preceding. He graduated from St. Ignatius College, Chicago, in 1881, and from the Yale Law School in 1884. He practised law in Chicago, was later engaged in the real estate business, and in 1891 became editor of the Chicago *Times*, a position which he held for two years. He has been active in Chicago politics as a Democrat, and has been four times elected mayor of the city, in 1897, 1899, 1901, and 1903.

Harrison, Constance Cary, American novelist and miscellaneous writer: b. Vaucluse, Va., 25 April 1846. She was married in 1867 to Burton N. Harrison (q.v.) and has since lived in New York. She is one of the most popular of American authors and among her published books are: 'Woman's Handiwork in Modern Homes' (1881); 'Old-Fashioned Fairy-Book' (1884); 'Bar Harbor Days' (1887); 'The Anglomaniacs' (1887); 'Sweet Bells Out of Tune' (1893); 'An Errant Wooing' (1895); 'A Bachelor Maid' (1894); 'A Son of the Old Dominion' (1897); 'A Merry Maid of Arcady' (1897); 'Good Americans' (1898); 'A Princess of the Hills' (1901); a play, 'The Unwelcome Mrs. Hatch' (1901); etc.

Harrison, Frederic, English philosopher and historian: b. London 18 Oct. 1831. He was educated at Oxford; was called to the bar at Lincoln's Inn in 1858, and for a time practised as a conveyancing and equity lawyer. In 1877 he was appointed professor of jurisprudence and international law at the Inns of Court, a post which he held till 1889. He is the chief living representative in England of Positivism and the Religion of Humanity. He has been widely read in the United States, which he visited on a lecturing tour in 1901. He is a master of English style and his literary judgments command the fullest respect. Among his publications 'The Meaning of History' (1862); 'Science and Humanity' (1879); 'The Present and the Future' (1880); 'Byzantine History in the Early Middle Ages' (1900), his Rede Lecture. The volume entitled 'The Religious Systems of the World' (1893) includes an account by him of the Religion of Humanity.

Harrison, Gabriel, American author and artist: b. Philadelphia 25 March 1825; d. Brooklyn, N. Y., 15 Dec. 1902. He began life as a photographer and an actor and in 1845 supported Charles Keane at the Park Theatre, New York, and later taught elocution, and wrote dramatic and art criticism. Among his works are: 'Life of John Howard Payne' (1873); dramatization of 'The Scarlet Letter' (1878); etc.

Harrison, James Albert, American philologist: b. Pass Christian, Miss., 21 Aug. 1848. He was graduated at the University of Pennsylvania in 1868; and has since been professor of Latin and modern languages at Randolph-Macon College, Va., 1871–6; of English and modern languages at Washington and Lee University 1876–95, and of English and romance languages at the University of Virginia. He is a prominent member of the American Philological Association and the founder and editor of the 'Library of Anglo-Saxon Poetry.' Among his works are: 'Group of Poets and Their Haunts'; (1881); 'Story of Greece' (1885); 'Dictionary of Anglo-Saxon Poetry' with Baskerville (1886); etc.

Harrison, Joseph, American engineer: b. Philadelphia 20 Sept. 1810; d. there 27 March 1874. In 1834 he began the construction of locomotives, and in 1840 designed for the Reading railway an engine which was copied and introduced into Russia with such success that he was invited to Russia, and there with two other American engineers concluded a contract with the Russian government to build the rolling-stock and locomotives of the St. Petersburg and Moscow railway. He executed also other important contracts with that government, and in 1852 returned to the United States, where he subsequently patented a safety-boiler and received both the gold and silver Rumford medals from the American Academy of Arts and Sciences. In 1869 he published a folio containing his autobiography, incidents of his Russian ex-

perience, and his poem, 'The Ironworker and King Solomon.'

Harrison, Lowell Berge, American artist: b. Philadelphia 28 Oct. 1854. He studied with Alexander Cabanel in Paris, became known for his landscapes, especially snow-scenes, and obtained medals at the Paris Salon of 1887 and the Columbian Exposition (1893). His works include: 'Friends, or Foes?'; 'A Waif from the Sea'; 'Calling Home the Cows'; and 'November,' purchased by the French government for the Marseilles Museum.

Harrison, Mary Saint Leger ("Lucas Malet"), English novelist: b. Eversley, Hampshire. She is a daughter of Charles Kingsley (q.v.) and was married to Rev. William Harrison, rector of Clovelly, who died in 1897. She inherits the talent of the Kingsleys and her novels published under the pseudonym of "Lucas Malet" have been as widely popular in America as in England. They are marked by vigorous characterization and skilful construction, and include: 'Mrs. Lorimer' (1882); 'Colonel Enderby's Wife' (1885); 'Little Peter' (1887); 'A Counsel of Perfection' (1888); 'The Wages of Sin,' a notably strong tale (1891); 'The Carissima' (1896); 'The Gateless Barner' (1900); 'Sir Richard Calmady' (1901).

Harrison, Thomas, English regicide: b. Newcastle-under-Lyne 1606; d. London 13 Oct. 1660. He was a soldier of Parliament in the civil war and commanded the guard that carried King Charles from Hurst Castle to London, sat among his judges, and signed his death warrant. He fought at Worcester, but his uncompromising attitude in religion and politics was unacceptable to Cromwell and he was deprived of his commission, and later imprisoned for his share in some of the plots devised by the extremists. At the Restoration, he was seized, tried, and condemned to death.

Harrison, Thomas Alexander, American painter: b. Philadelphia 17 Jan. 1853. He studied painting under Gérôme in the Ecole des Beaux Arts at Paris, and first exhibited in the Salon of 1881. He was awarded the gold medal by the Pennsylvania Academy of Fine Arts in 1894 and elected an associate of the National Academy in 1898. His best known works are: 'Coast of Brittany'; 'Little Slave'; 'The Sea-Shore.'

Harrison, Susan Frances Riley, Canadian author: b. Toronto 24 Feb. 1860. She was at one period literary editor of the Toronto 'Week' and has been a frequent contributor to American and English periodicals. She has written 'Crowded Out and Other Sketches' (1889); 'Pine, Rose, and Fleur-de-Lis' (1891); 'Down the River and Other Poems' (1891); and edited an anthology, 'French and English Native Writers' (1889).

Harrison, William Henry, 9th President of the United States: b. Berkeley, Charles County, Va., 9 Feb. 1773; d. Washington, D. C., 4 April 1841. He studied at Hampden and Sidney College, later pursued a course in medicine, and was about to be graduated as a practitioner, when the sudden death of his father gave him the liberty to disengage himself from a profession for which he had no natural bent nor aptitude. He received from Washington a commission in the army, and was soon on his way to Cincinnati, making the journey from Philadelphia to Pittsburg on foot, to join the regiment to which he had been assigned. He arrived at Fort Washington just after the defeat of General St. Clair's army. His first military service was to command a company of twenty men as an escort for a train of pack-horses to Fort Hamilton, a military post on the west bank of the Big Miami River from which the seat of Butler County was named. In 1793 he joined the new legion under General Anthony Wayne who made him an aide-de-camp, and in December of that year he took part in the expedition which repossessed General St. Clair's field of battle, and erected thereon Fort Recovery. He participated in all the engagements with the Indians and their British allies during this campaign, and displayed conspicuous gallantry at the Battle of Fallen Timbers. Shortly after the close of this campaign Harrison was advanced to the rank of captain and placed in command of Fort Washington. The position was largely a confidential one. The conduct of the Spaniards on the Mississippi was exasperating. French citizens and agents were engaged in exciting the people of Kentucky into a war with the Spanish of Louisiana with the object of thus embroiling our government with Spain and of forcing it into a league with France. Captain Harrison was instructed to prevent the passage down the river of boats laden with military stores belonging to the French agents. The English posts on the northern frontier, which had been held so long in violation of good faith, were now evacuated by the English in obedience to the Jay Treaty of 1794; the new garrison and supplies were sent to Fort Washington and forwarded thence through the wilderness under the supervision of the commandant of that post. In the spring of 1798 Harrison resigned his commission in the army and settled on a tract of land at North Bend about 16 miles from Cincinnati, but was immediately appointed by President John Adams as secretary of the Northwest Territory under Gen. Arthur St. Clair as governor. A year later he resigned this position to take his seat in Congress as the first delegate from the Territory. Up to this time the public lands had been sold in such vast tracts that none but men of wealth could buy them. Harrison secured the division of the land into small tracts and made it possible for the poor man to obtain a homestead. During that session of Congress a part of the Northwest Territory was formed into the Territory of Indiana. It included the present States of Indiana, Illinois, Michigan, Wisconsin, and a part of Minnesota, and contained a civilized population of nearly five thousand souls. Harrison was appointed its first governor by President Adams, and so satisfactory was his administration, he was successively reappointed by President Jefferson and President Madison. He was also made superintendent of Indian affairs. Governor Harrison organized the new government at Vincennes. Many difficult questions demanded his attention, but the most difficult and delicate was the restless and finally hostile attitude of the savages under the leadership of Tecumseh, and the preaching of Tecumseh's brother, "the Prophet." The beginning of open warfare by the Indians was averted many times by his calmness and courage. He made in all thirteen treaties with the Indians, and secured the cession from several tribes of more than three million acres of land on the Wabash and White Rivers. Tecumseh condemned these treaties on

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the ground that the land belonged to all of the Indians, and that a single tribe could not give a legal title without the consent of every other tribe. Harrison invited Tecumseh to Vincennes for a conference, and directed that he should bring with him not more than thirty warriors; but he came with four hundred completely armed. There were many evidences that treachery was intended, and but for the conciliatory methods of the governor, the council would have terminated in bloodshed. Nothing was accomplished by this interview, nor by a second in the following summer. Meanwhile, frequent depredations by the Indians made it evident that conciliatory measures could no longer be employed, and on 26 Sept. 1811 Harrison set out with 900 men to punish them. On 6 November, when the army was within a short distance of Tippecanoe, it was met by messengers demanding a parley. A council was agreed upon for the next day, but at 4 o'clock on the following morning, the treacherous savages fiercely attacked the camp of Harrison in an endeavor to take it by surprise. The fighting continued till daylight when the Indians were routed with great loss. In the war of 1812 Harrison was appointed to the chief command of the Northwest, and given a major-general's commission. He urged upon the government the importance of creating a navy on the Lakes. That advice was heeded, and the splendid achievement of Commodore Perry on 10 Sept. 1813, was made possible by the military sagacity of this accomplished soldier. Six days after Perry's victory General Harrison embarked his artillery and supplies for a descent on Canada. The British general, Proctor, burned the fort and navy-yard at Malden and retreated, closely pursued by Harrison who overtook him and his Indian allies led by Tecumseh near the river Thames. Within five minutes almost the whole British force was captured, and shortly afterward the Indians were completely routed, and their leader Tecumseh was slain. The battle of the Thames and Perry's victory ended the war in Upper Canada, and gave the United States undisputed possession of the Great Lakes excepting Lake Ontario.

The years between the War of 1812 and the presidential campaign of 1840 Harrison devoted in part to the service of his country, and in part to the life of a country gentleman. He was in turn a member of Congress, state senator in the general Assembly of Ohio, presidential elector, United States senator from Ohio, and minister to the United States of Colombia. In 1829 he retired to his farm at North Bend. In December 1839, he was nominated by the National Whig convention for the Presidency of the United States, with John Tyler of Virginia for vice-president. The campaign which followed was one of the most exciting in the history of the country. Political mass meetings and processions were introduced for the first time, and party watchwords and emblems were employed with telling effect. That canvass has commonly been called the "log-cabin and hard cider campaign." The eastern end of General Harrison's house at North Bend consisted of a log cabin covered with clapboards, and his table was reputed to be well supplied with good cider, instead of wines. Log cabins and hard cider thus became party emblems typifying republican simplicity. "Tippecanoe and Tyler too" was shouted and sung and emblazoned from one end of the country to the other. Nothing could stem the tide of wonderful popular enthusiasm for the hero of Tippecanoe and the Thames. Van Buren, the Democratic candidate, received only sixty electoral votes out of two hundred and ninety-four. The death of the President occurred only thirty-one days after his inauguration. Consult Bostwick in Wilson's 'Presidents of the United States' (1894).

Harrison, Ark., town, county-seat of Boone County; on the St. Louis & N. A. railroad; about 120 miles northwest of Little Rock. It is in the lead and zinc section, and its industries are chiefly connected with mining. Considerable fruit is grown in the vicinity, and it has flour-milling and dairy interests. It is the seat of a collegiate and normal institute for women. The United States government building cost about $80,000. Pop. 1,603.

Harrison, N. J., city in Hudson County; on the Passaic River, the Pennsylvania and the Erie R.R.'s. It is a suburb of Newark, and a sub-station of the Newark post-office, but has an independent municipal government. It was settled in 1668 and incorporated in 1873. The charter of 1873 is still in force, and by it the government is vested in a common council elected by wards. The chief manufactures are wire-cloth, marine-engines, steel, machinery, tubes, refrigerators, ink, beer, and leather. The water-plant is owned and operated by the city. Pop. (1900) 10,596.

Harrison, Ohio, village in the township of Harrison, Hamilton County, on the boundary between Ohio and Indiana, and on the Cleveland, C., C. & St. L. railroad, 23 miles by rail west-northwest of Cincinnati. The village situated on the north bank of the Whitewater River, a tributary of the Great Miami, in a fertile farming section, has manufactures of furniture, sashes, blinds, brushes, bricks, shoes, a corn-drill factory, a cannery, and lumber, flour, and roller mills. Its public buildings include a high school and six churches. Pop. (1900) 1,456.

Har'risonburg, Va., town, county-seat of Rockingham County; on the Chesapeake & W., the Southern, and the Baltimore & O. R.R.'s; about 100 miles northwest of Richmond. It is in the Shenandoah Valley, and is surrounded by a rich agricultural country. Its chief manufactures are flour, staves, saw and planing mill products, foundry and machine shop products, and pottery. It is the trade centre for the greater part of the county. The town owns and operates the water-works. Pop. (1900) 3,521.

Harrisonburg, Engagement Near. Harrisonburg, Va., on the Great Valley Turnpike, 22 miles north of Staunton, and 122 miles northwest of Richmond, was the scene of many stirring events in the Civil War. The place was occupied by Gen. Banks late in April 1862, and abandoned when Jackson forced Banks down the valley in May. When Jackson, in turn, was forced up the valley by the combined armies of McDowell and Frémont, he abandoned the main valley, moving from Harrisonburg to Cross Keys and Port Republic, his rear-guard, two regiments of Virginia cavalry, under Gen. Turner Ashby, halting about two miles southeast of Harrisonburg. On 6 June 1862 Col. Wyndham, with the First New Jersey cavalry and a battalion of the Fourth New York, moving from Harrisonburg, attacked Ashby and

was defeated and followed to within one mile of the town, with the loss of several men killed and wounded, and about 60 taken prisoners, including Wyndham himself. Gen. Bayard then pushed forward with cavalry and infantry and Ashby fell back and called for infantry support. Jackson sent him Stuart's brigade — First Maryland, Forty-fourth, Fifty-second, and Fifty-eighth Virginia. A few miles beyond Harrisonburg Bayard attacked with the Pennsylvania «Bucktails» under command of Lieut.-Col. T. L. Kane, and in the engagement Ashby was killed, and Kane was wounded and captured. While this was happening on the right, the Sixtieth Ohio infantry and First Pennsylvania cavalry, on the left, drove in the Confederate skirmish-line, without loss on either side. As soon as the wounded could be removed the Confederates fell back in the direction of Port Republic, and the Union forces retired to Harrisonburg. The Union loss in the engagement was 65 killed, wounded, and missing. The Confederate loss including Ashby, was 18 killed, 50 wounded, and 3 missing. Consult: 'Official Records,' Vol. XII.

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Har'risonville, Mo., city, county-seat of Cass County; on the Missouri, K. & T., and the Missouri P. R.R.'s; about 30 miles southeast of Kansas City. It is situated in an agricultural and stock-raising region and the trade and manufactures are connected chiefly with the products of the surrounding farms. The shipping consists mostly of grain, live stock, lumber, and dairy products. Pop. (1900) 1,844.

Harrisse, hăr-ēs', **Henri,** American critic, bibliographer, and historian: b. Paris 1830, of Russian-Hebrew parentage. He became a citizen of the United States, and for several years practised law in New York. He has published 'Bibliotheca Americana Vetustissima' (1866); 'Christopher Columbus' (1884–5); 'John and Sebastian Cabot' (1883); 'The Discovery of North America'; etc.

Har'rodsburg, Ky., city, county-seat of Mercer County; on a branch of the Southern railroad; about 45 miles southwest of Lexington and 58 miles southeast of Louisville. It is the oldest permanent settlement in the State, and was founded by James Harrod in 1774. Two years later Kentucky was incorporated as one of the counties of Virginia and Harrodsburg was made the county-seat. Stock-raising and farming are the principal occupations in the surrounding country. It has flour and planing mills, a distillery, brick-yard, and ice factory. The climate, scenery, and the Greenville Springs nearby make it a pleasure and health resort. It is the seat of Beaumont College, an institution for women, opened in 1894. Pop. (1900) 2,876.

Harrow School, England, an academic institution situated at Harrow-on-the-Hill, a town of Middlesex, 12 miles northwest of London. It is one of the famous public schools of England and was founded by John Lyon in 1571. The original red brick school house, now the Fourth Form School, was built 1608–15. New buildings were added in 1819 and since, the chief of these being the Vaughan Memorial Library (1863), and the semi-circular speech-room (1877). The school was primarily intended to afford free education to 30 poor boys of the parish; but provision was also made for the admission of 'so many foreigners as the place can conveniently contain.' The age of admission is 12 to 14; and there are six entrance scholarships of from $150 to $400 per annum, offered every Easter. The most valuable learning scholarships are Baring's three of $500 a year for five years to Hertford College, Oxford. Among the distinguished alumni of Harrow are Dr. Parr, Theodore Hook, Sheridan, Byron, Palmerston, Anthony Trollope, and Cardinal Manning. Under the Public Schools Act of 1868 the governing body comprises six members, elected respectively by the Lord Chancellor, the universities of Oxford, Cambridge and London, the Royal Society and the undermasters.

Hart, Albert Bushnell, American historian: b. Clarksville, Pa., 1 July 1854. He was graduated from Harvard in 1880, subsequently becoming professor of history there. He has written: 'Coercive Powers of the United States Government' (1885); 'Formation of the Union'; 'Introduction to the Study of Federal Government' (1890); 'Studies in American Education' (1895); 'Life of Salmon P. Chase' (1899); 'Practical Essays on American Government' (1893); etc. He has also edited 'American History Told by Contemporaries' (1898–1901); 'American Citizen Series' (1899); and since 1895, the 'American Historical Review.'

Hart, James McDougal, American painter: b. Kilmarnock, Ayrshire, Scotland, 10 May 1828. He came to the United States in 1831, and studied art under his brother William (q.v.), and at Düsseldorf in the studio of Schirmer (1851). He was elected a member of the National Academy in 1859, and devoted himself principally to American forest scenery with a preference for autumnal effects. His 'Landscape with Cattle' is in the New York Metropolitan Museum, and his best known pictures are 'On the Croton'; 'Morning in the Adirondacks'; and 'Oaks in Autumn.'

Hart, James Morgan, American scholar: b. Princeton, N. J., 1839. He was the son of John S. Hart (q.v.). He was graduated from Princeton in 1860, studied in Göttingen, and took the degree of A. M. from Princeton in 1863. He was professor of modern languages at Cornell (1868–72); professor of modern languages and English literature in the University of Cincinnati (1876–90); returning to Cornell as professor of rhetoric and English philology in 1890. He has written: 'German Universities' (1874); 'Syllabus of Anglo-Saxon Literature' (1887); 'Hand-book of English Composition' (1895); has revised and edited his father's 'Manual of Composition and Rhetoric' (1897); and has translated 'German Classics' and 'Goethe Prose Selections.'

Hart, Joel T., American sculptor: b. Clarke County, Ky., about 1810; d. Florence, Italy, 2 March 1877. He was of humble parentage, and in 1830 entered a stone-cutter's establishment in Lexington. He was induced to attempt modeling busts in clay, and among others, Gen. Jackson and Cassius M. Clay (q.v.) sat to him, the latter giving him his first commission for a bust in marble. This when completed proved so satisfactory that Hart was commissioned to execute a marble statue of Henry Clay. He began this, but various delays prevented its completion, and it was not set up in Richmond, Va., till 1859. Other important

works by Hart are 'Woman Triumphant' in the court-house, Louisville, Ky., and 'Il Penseroso.' He was particularly well known for his portrait busts.

Hart, John, American patriot: b. Hopewell, N. J.; d. there, at an advanced age, 1780. Frequently elected to the colonial assembly he was prominent especially in the legislation for local improvements. In 1774 he was chosen to the general Congress at Philadelphia, where he was noted for his sound judgment and inflexible determination; was re-elected in the two following years, and was one of the signers of the Declaration of Independence. New Jersey was soon invaded by the British army, his estate devastated, and special exertions were made to take him prisoner. The capture of the Hessians by Washington permitted his return home.

Hart, John Seeley, American educator: b. Stockbridge, Mass., 28 Jan. 1810; d. Philadelphia 26 March 1877. He was for many years principal of the New Jersey State Normal School, at Trenton, and subsequently professor of English literature at Princeton College. His textbooks on English and American literature had a wide circulation, and in the long course of his career as educator he did much to stimulate a taste for good literature among students.

Hart, Sir **Robert,** English diplomatist, director of the Chinese imperial maritime customs: b. Portadown, County Armagh, Ireland, 1835. He was educated at the Taunton Wesleyan School, and was graduated at Queen's College, Belfast. He entered the British consular service in China in 1854, was appointed inspector-general of customs in 1863 and accepted his present position in 1885. During the Boxer outbreak in 1900, he underwent the siege in the British legation, at Peking, and since then has published his views on the position of things in China in a very remarkable work, 'These From the Land of Sinim' (1901). He attributes the disturbances in China to the arrogance of foreigners and the unyielding pride of the Chinese. He discusses China's army, law, transportation, communication, currency, education, administration, and religion in a highly optimistic vein, and shows that the Chinese government does a great deal better than it gets credit for. He is a firm believer in the Chinese plans for reform. He is certainly deeply trusted by the Chinese authorities and is one of the best oriental administrators that England has ever been blest with in China.

Hart, Samuel, American Episcopal clergyman: b. Saybrook, Conn., 4 June 1845. He was graduated from Trinity College in 1866, and was ordained priest of the Episcopal Church in 1870. He was at Trinity College as assistant professor of mathematics (1870–3), professor of mathematics (1873–83), and professor of Latin (1883–99). In 1899 he became vice-dean and professor of doctrinal theology at Berkeley Divinity School. In 1886 he was appointed custodian of the Standard Prayer Book of the Episcopal Church of the United States, in 1892, secretary of the House of Bishops, and in 1896, historiographer of the church. He is a member of several learned societies, including the American Historical Society, the American Oriental Society, and the Society of Biblical Literature and Exegesis. He is editor of 'Satires of Juvenal,' 'Satires of Persius,' and Bishop Seabury's 'Communion Office.'

Hart, Thomas Norton, American merchant and politician: b. North Reading, Mass., 20 Jan. 1829. He entered business in Boston as partner in a mercantile firm, later founding a firm under the name of Hart, Taylor & Co. When he withdrew from this business, he became president of the Mount Vernon National Bank, and was connected with many eleemosynary institutions. He has also been active in politics, was a member of the common council, and of the board of aldermen; was nominated for mayor of Boston in 1887 and 1888, but defeated at the election; was, however, elected in 1889, 1890, 1900 and 1901.

Hart, William, American painter: b. Paisley, Scotland, 31 March 1823; d. Mount Vernon, N. Y., 17 June 1894. Emigrating with his parents to the United States in 1831, he settled in Albany, and was at first apprenticed to a firm of coachmakers, in Troy, by whom he was employed to paint the panels of coaches. He subsequently painted landscapes, portraits, and even window shades. In 1848 he became a regular exhibitor at the National Academy of Design, of which in 1858 he was elected as academician. He was president of the American Water Color Society 1870–3. He was a brother of James McDougal Hart (q.v.).

Hart, a hunting term, applied to the male, or stag, of the red deer after it has completed its full antlers at the age of six or seven years.

Hartbeest, härt'bēst, one of the large African antelopes of the genus *Bubalus,* specifically the caama (*B. cama*), formerly excessively numerous on the South African plains. They have long narrowing heads, doubly-curved, ringed horns, cow-like tails, and usually are of a grayish or reddish color, with decided markings on the face, especially in the bontebok (*B. pygargus*), blesbok (*B. albifrons*) and sassaby (*B. lunata*). All were noted for swiftness. Other very distinctive species are the konzi, tora, korigum and hunter's antelope. Most of these have become greatly diminished in numbers since about 1870.

Harte, Francis Bret, American novelist and poet: b. Albany, N. Y., 25 Aug. 1839; d. Aldershot, England, 6 May 1902. In 1854 he went to California, attracted there by the gold excitement. He was first a teacher at Sonora, then tried mining, in which he was unsuccessful. He next entered a printing-office, and in 1857 was compositor on the San Francisco 'Golden Era.' At that time he began to write short sketches, which appeared in the 'Golden Era,' and soon attracted attention; he was invited to join the staff of the 'Californian,' to which he contributed a series of clever parodies on famous contemporary writers of fiction, later published as 'Condensed Novels.' In 1864 he was appointed secretary to the United States branch mint; in 1868 became editor of the 'Overland Monthly,' for which he wrote 'The Luck of Roaring Camp' and others of his most successful stories of frontier life. In 1871 he went to New York and became a regular contributor to the 'Atlantic Monthly.' In 1878 he was appointed United States consul in Crefeld, Germany, and in 1880 received the consulship at Glasgow, Scotland. In 1885 his tenure of office as consul came to an end, and he settled in London, devoting his whole time to literary

work. He was a prolific writer, and continued for the most part to deal with California themes. Among his shorter stories the following may be mentioned: 'Miggles'; 'The Outcasts of Poker Flat'; 'M'Liss' (1872); 'The Twins of Table Mountain' (1879); 'An Heiress of Red Dog' (1879); 'Flip' (1882); 'On the Frontier' (1884); 'By Shore and Sedge' (1885); 'Devil's Ford' (1887); 'A Phyllis of the Sierras,' and 'A Drift from Redwood Camp' (1888); 'The Heritage of Dedlow Marsh' (1889); 'A Sappho of Green Springs' (1891); 'The Bell-Ringer of Angel's' (1894); 'A Protégé of Jack Hamlin's' (1894); 'Barker's Luck' (1896); 'Tales of Trail and Town' (1898); 'Stories in Light and Shadow' (1898); 'Mr. Jack Hamlin's Mediation' (1899); and 'From Sand Hill to Pine' (1900), a collection of short stories. His longer stories and novels include: 'Gabriel Conroy' (1876); 'Thankful Blossom: A Romance of the Jerseys' (1877); 'In the Carquinez Woods' (1883); 'Maruja' (1885); 'Snowbound at Eagle's' (1886); 'The Crusade of the Excelsior' (1887); 'Cressy' (1889); 'A Waif of the Plains' (1890); 'A Ward of the Golden Gate' (1890); 'A First Family of Tasajara' (1892); 'Colonel Starbottle's Client, and Some Other People' (1892); 'Clarence' (1895), dealing with incidents in the American Civil War; 'In a Hollow of the Hills' (1895); and 'Three Partners' (1897). He has also written much verse comprised in volumes entitled 'Poems' (1871); 'East and West Poems' (1871); 'Echoes of the Foot-Hills' (1874); and 'Some Later Verses' (1898).

In estimating Harte's work it must be remembered that it was his rare good fortune to break new ground, and to become the first literary interpreter of a life which with its primitive breadth and freedom, its striking contrasts of circumstance and character, offered singular opportunities to the novelist. That he ever did anything quite so good as his first group of stories and poems cannot be said, for his later volumes are marked, as a whole, by the repetition of well-worn motives and by declining spontaneity and power. Still, the average quality of his output remained high; and when the circumstances of its production are borne in mind, it may perhaps seem remarkable that it should have preserved so many traces of the writer's youthful freshness and vigor. Among qualities of his work those which perhaps most constantly impress the critical reader are his dramatic instinct, his keen insight into character, his broad sympathy, and his subtle and pervasive humor. Dealing for the most part with large, strongly marked, elemental types, as these develop and express themselves under conditions which give free play to instinct and passion, he does not indulge in lengthy analyses or detailed descriptions. His men and women are sketched with a few strokes, and left to work out their own personalities in speech and deed; and yet, such is the skill with which this is accomplished that they stand out before us as creatures of real flesh and blood. He did not purposely soften the shadows in his pictures; the sin and wretchedness of frontier life are frankly portrayed; none the less, there can be little doubt that consciously or unconsciously he contrived to throw an idealizing glamor over the mine and the camp, and that many of his most lifelike and successful characters are wrought in the imagination, though out of the stuff of fact. But it is here that we touch upon what is perhaps one of the finest qualities of his work,—a quality not to be separated from his tendency toward idealization. Though he dwelt habitually upon life's unexplained and inexplicable tragic complexities, he nevertheless suffused his stories with an atmosphere of charity, clear, sweet, and wholesome. The weakness of his writing is closely connected with some of its main elements of strength. A master of condensed and rapid narration, he produced many stories which are too sketchy in method to be completely satisfactory; while in his desire to achieve terseness he occasionally sacrificed clearness of plot. This is particularly the case with his more ambitious efforts, especially with his long novel 'Gabriel Conroy,' an elaborate study of the culture conditions of early California civilization, which, though it abounds in memorable descriptions and vivid character sketches, lacks wholeness and proportion. As a writer of verse, he is unequal; some of his poetry shows the originality and power of his earlier prose, while much is of too temporary a character to find a lasting place in literature. Consult: Pemberton, 'Life of Bret Harte.'

Hartford, Conn., State capital, seat of Hartford County, port of entry, and head of navigation on the Connecticut River, 60 miles from Long Island Sound. By the main line of the New York, N. H. & H. railroad it is 110 miles from New York and 124 from Boston (a midway position which has enhanced its business development), 36 from New Haven, and 26 from Springfield, Mass.; the Highland Division (old N. Y. & N. E.) connects it with Fishkill on the Hudson (110 miles) and Providence, R. I. (90 miles); the Valley Division extends down the river to its mouth, the Connecticut Central to Springfield east of the river. The Central New England runs to Poughkeepsie and beyond. Pop. (1903) about 86,000.

Hartford lies on the west bank of the river, on rolling ground; Prospect Avenue in the west and Fairfield Avenue in the south afford a superb view across the entire Connecticut Valley, some 20 miles wide. It extends about 5½ miles north and south to Windsor and Wethersfield lines, by 3½ west to West Hartford line, about 18 square miles in all; the town and city are conterminous. It is divided about equally by the little Park River, which joins the Connecticut just south of the centre and is crossed by many bridges, and through whose bed runs the great main sewer into the Connecticut. The chief business street is Main, following the river line along the first high ground back from its shore, the latter frequently overflowed in the spring freshets; next Asylum, west past the railroad station, and State east to the steamer landing with the chief wholesale warehouses; Pratt and Pearl parallel to Asylum, and Central Row opposite Pearl across Main. It is a place of great beauty; and from its age, early and continuous business importance, and consequent accumulated wealth and generations of inherited incomes, is of noted social and intellectual cultivation,—more like the old European provincial capitals in a mingling of metropolitan advantages with those of moderate numbers and coun-

BRET HARTE,
Died May 6th, 1902.

try roominess than any other American city. There are several costly residence districts: the most notable are Washington Street with its magnificent arch of old elms, Asylum Avenue, and a portion of Farmington, and Woodland Street, with some handsome places on Wethersfield Avenue. One of the finest streets, Prospect Avenue, is the West Hartford boundary, and built up only on that side; and fine places extend well into West Hartford. The street-railway system is very extensive and well managed: it runs in all directions for many miles. The Connecticut is spanned by a wooden bridge to East Hartford; but work has begun on a splendid stone bridge, to be completed by the end of 1904, at a cost with handsome street approaches of nearly $2,000,000.

The park system contains some 1,200 acres: within the past few years the munificence of several citizens has endowed the city with a ring of beautiful parks, which with the city's help will ultimately encircle it entire. The oldest is Bushnell Park, in the heart of the city, 48½ acres, crowned by the State capitol and containing monuments to Israel Putnam and Horace Wells. The largest is Keney Park in the extreme north, extending into Windsor, 663.4 acres; next Goodwin Park in the extreme south, some 200 acres. Elizabeth Park in the extreme west, largely in West Hartford, 90 acres, is the nursery for the other parks; Pope Park southwest of the centre has 73 acres, ultimately to be 92 with city additions; and Riverside Park is a reclamation and beautifying of the formerly squalid river front north of the East Hartford bridge. There are also smaller squares and spaces.

The city has a remarkable number of handsome and architecturally notable buildings. Foremost is the State capitol, of white marble, towering over Bushnell Park; the handsomest in the country except the one at Albany, and architecturally surpassing that in many ways. It was completed in January 1880, at a cost of $2,534,024.46; land and other expenses made the total $3,342,550.73. The general plan was of 13th-century Gothic, but modern needs forced very much change in this. Each side is an individual and separately beautiful design; and the interior is as notable as the exterior. Its extreme length is 295 feet 8 inches; depth of centre part, 189 feet 4 inches; depth of wings, 111 feet 8 inches; height from ground line to top of crowning figure, 256 feet 6 inches. It is fireproof, the only known fireproof capitol. The red-sandstone Cheney Building was designed by H. H. Richardson. Trinity College (q.v.) has fine buildings on high ground in the south part, ultimately to form a quadrangle. The homes of the Connecticut Mutual Life, the Ætna Life, the Phœnix Mutual Life, and the National Fire, are the finest insurance buildings; the Phœnix Bank and the First National, of the bank buildings. The white granite government building (post-office and custom-house) may be noted; and the Wadsworth Atheneum is pleasing and dignified. Of several handsome church structures, St. Joseph's Cathedral (R. C.) is most notable. Of interest historically is the city hall, formerly the state house, completed May 1796: the famous Hartford Convention (q.v.) was held here in 1814. Of the city monuments, the two most notable are the Soldiers' Memorial Arch, forming a gateway into Bushnell Park across the Park River; and the superb Corning fountain in that park, a bronze with symbolical figures.

The educational institutions are widely famed. At their head stands Trinity College noted above. The Hartford high school is the most completely equipped in the country; it has cost in buildings, land, and equipment, $598,500. The pupils from surrounding towns are admitted on payment of a fee. A manual-training department was added in a new wing in 1897. The city schools are operated on the district system; several attempts to consolidate them have been heavily defeated. There are nine districts, with 18 buildings altogether. The school expenses are about $400,000 a year. The school tax is assessed with the city taxes, but each district by itself. Hartford has also a theological seminary managed by the Pastoral Union (Congregational) of Connecticut. There are 71 church societies, of which the Congregational (13), Roman Catholic (10), Baptist (9), Episcopal (8), and Methodist (7), are the chief denominations. Hartford is the seat of a Roman Catholic bishop. Its charitable institutions are renowned; it was the earliest seat of attempts to instruct the deaf and dumb in the United States, through Gallaudet and Clerc; and the School for the Deaf, formerly Deaf and Dumb Asylum (whence Asylum Street, where it is located), carries on the work. The Retreat for the Insane, the Hartford Hospital, the Hartford Orphan Asylum, the Y. M. C. A., the City Mission and Open Hearth, and the Union for Home Work, are only part of its overflowing charities. The Connecticut Humane Society also has its head office here.

The library facilities of the city are very large for its size, and far more varied in contents than if they had been collected by a single institution. In the Wadsworth Atheneum are housed the Hartford Free Public Library with 79,000 volumes, the Watkinson Library (reference only) with 59,000, and the Connecticut Historical Society with about 25,000, besides as many pamphlets, and toward 50,000 MSS. The libraries of the Theological Seminary (81,000, and about 40,000 pamphlets) and Trinity College (43,000) contain many valuable specialties; and the State Library in the capitol (40,000, and some 50,000 MSS.), with its great collection of statutes, law reports, public documents, Hansard, etc., is of extreme value.

Hartford, as the head of navigation and therefore distributing point for the Connecticut Valley, early gained an importance as a centre of wholesale trade which it has never lost; to accommodate this, the Hartford Bank, the fifth in the United States, was organized in 1792. But its largest importance is now as one of the leading insurance centres in the world, and third in the United States. This business developed from the marine insurance on its West India cargoes, added fire insurance as a branch, and in 1846 life insurance. The loans of its insurance companies with their vast assets, not restricted by law as are those of New York, have been one of the greatest agencies in developing the West, amounting to several hundred millions of dollars. There are now six life companies, two of which also have accident branches — the latter being the original and chief department in one; five fire companies besides a county mutual, and the United States branches of three foreign companies; and a

steam-boiler insurance company. There are 7 national and 5 other banks of discount, 4 savings-banks, and 4 trust companies. The manufacturing interests are heavy and varied. Firearms, including Gatling guns, at the famous Colt Works; electric machinery and vehicles; bicycles, of which it is the centre in the United States; cyclometers; woven-wire mattresses; horse nails; screws; steam-engines and boilers; typewriters; leather belting; and special machinery of all kinds, besides knit goods, furniture, carriages, harness, and many other things are manufactured here. It has also one of the largest printing houses in New England, which has manufactured many famous works; four daily papers, one of them the oldest newspaper in the United States (The *Courant,* 1764), and a number of wecklies, monthlies and quarterlies.

The mayor holds office for two years, and the representative body is two-chambered. The assessed valuation of property is about $81,000,000, making it *per capita* one of the richest cities in the United States. The tax rate is under 2 cents on the dollar.

The first white settlement of Hartford was by the Dutch in 1633, at the junction of the Park and Connecticut, still called Dutch Point (though the original point is now out in the Connecticut). They built there a fort called the "House of Hope." (For the settlement by the Newtown men in 1635–6, and the adoption of the first written constitution of modern times, whence Hartford is called the "birthplace of American democracy," see CONNECTICUT.) Hartford was first named Newtown, changed to the present name from Samuel Stone's English birthplace. From here in 1637 sailed the first organized military expedition in the English colonies, John Mason's against the Pequots. The Dutch were ejected from their fort in 1654; they had never really made a settlement. (For the attempt of Andros to seize the charter, in 1687, see CHARTER OAK.) In 1701 Hartford became joint capital with New Haven. In the Revolution, Hartford, as the head of the one rich store of food which the British could not seize, became of prime importance; the second commissary-general of the United States army, Jeremiah Wadsworth, was a Hartford merchant. Gov. Trumbull was also a strong reliance of Washington, who came to Connecticut to consult him; and in 1780 Washington and Rochambeau planned the Yorktown campaign here. The Hartford Convention (q.v.) of 1814 sat here. In 1873 Hartford became the sole capital of the State.

Its native and adopted citizens have made the city one of the literary glories of New England. It was the birthplace of Noah Webster, Frederick Law Olmsted, and John Fiske, with others of note; had the services of George D. Prentice, John G. Whittier, Joel Barlow, and others; and was the long or permanent residence of Harriet Beecher Stowe, Mark Twain, Charles Dudley Warner, and Horace Bushnell, besides John Trumbull and Lydia H. Sigourney. In the business world, both Edwin D. Morgan and Junius S. Morgan began their career as Hartford merchants.

Population.— 1800, 5,347; 1810, 3,955; 1820, 4,726; 1830, 7,074; 1840, 9,468; 1850, 17,966; 1860, 29,152; 1870, 37,180; 1880, 42,015; 1890, 53,230; 1900, 79,850. Of these 23,758 were of foreign birth: 8,076 in Ireland, 3,364 in Germany, and Austria, 2,260 in Russia, 1,952 in Italy, 1,714 in Sweden, 2,073 in England and Canada (English).

FORREST MORGAN,
Of Connecticut Historical Society.

Hartford, Mich., village of Hartford Township, Van Buren County, 15 miles west of Paw Paw on the Paw Paw River, and 17 miles northeast of Benton Harbor, on the Chicago & M. L. S. R.R. It has a graded school and five churches. It carries on a considerable traffic in agricultural produce and stock, has grain elevators, flour, saw-, and planing-mills, canneries, electric light plant, and manufactures staves, cigars, cheese, vinegar, etc. Pop. (1900) 1,077.

Hartford, Vt., town of Windsor County, on the White River, about one mile above its junction with the Connecticut River, and 60 miles south of Montpelier, on the Central Vt. and on the Woodstock R.R.'s. It has woolen, saw, and grist mills, and manufactures of agricultural implements and furniture. Pop. (1900) 3,817.

Hartford City, Ind., city, county-seat of Blackford County; on the Pittsburg, C. C. & St. L. and the Lake E. & W. R.R.'s; about 45 miles southwest of Fort Wayne, and 60 miles northeast of Indianapolis. The natural resources which contribute to the industrial and commercial interests are the products from the surrounding agricultural country, the natural gas supply, and the oil fields. The chief manufactures are iron, glass, flour, pulp, and paper, strawboard, and wagons. The city owns and operates the waterworks. Pop. (1900) 5,912.

Hartford Convention, of 1814: a gathering of New England Federalists to discuss measures for securing New England interests against the South and West; especially in relation to the War of 1812. The convention opposed the war on several grounds,— the vital objection being that it was destroying all American commerce in order to punish Great Britain for crippling a part of it. It was believed by the delegates that the agricultural States were sacrificing New England, whose life-blood was commerce, from ignorance mingled with sectional malice (see EMBARGO). All through the war, the New England Federalists, impoverished and excluded from the national councils, harassed and hampered the government in conducting it; the government retorted by leaving the whole section to its fate; the British inflamed the discord by exempting the New England coast from blockade, and the government countered by laying a new embargo which did the same work. All the New England States and New York were swept by the Federalists on this issue. In November 1813 the governor of Vermont recalled a brigade of militia from garrison duty; the government threatened prosecution, the Massachusetts legislature threatened to use the State power to support him. In the autumn of 1814 the destruction of New England industries had become intolerable; the coast was undefended, the British were occupying that of eastern Maine, and Congress was proposing a conscription so severe as to enlist minors without the consent of their parents; whereupon the Connecticut legislature ordered the governor to call a special session to protect its citizens

THE STATE CAPITOL AND SOLDIERS AND SAILORS' MEMORIAL BRIDGE AND ARCH,
IN BUSHNELL PARK.

if the measure were adopted. On 18 October the Massachusetts legislature proposed a convention of the New England States, to take action "not repugnant to their obligations as members of the Union," and "lay the foundation of a radical reform in the national compact" through a future national convention. Connecticut and Rhode Island accepted the proposal with similar qualification; New Hampshire was divided politically and Vermont was excited over Macdonough's victory at Plattsburg, but certain counties sent delegates. The war was a growing and alarming failure. England was demanding the renunciation of the whole Northwest as the price of peace, national bonds were at 25 per cent discount. The government sent a regular army officer to oversee the convention, and use force if it attempted disunion; deputed secret agents to see if it was true that there was a plot to make New England an English grand-duchy under a prince of the blood; and appointed the succeeding 12th of January a national fast-day. The convention met at Hartford, Conn., 15 Dec. 1814, with 12 delegates from Massachusetts, 7 from Connecticut, 4 from Rhode Island, 2 from New Hampshire, and 1 from Vermont,—26 in all. George Cabot of Massachusetts was chosen president, Theodore Dwight of Connecticut, secretary. A secret session of three weeks was held, a report to the New England legislatures prepared, and 5 Jan. 1815, the convention adjourned. The report stated the before-mentioned grievances, and charged the government with making naturalizations too easy and with destroying the balance of sections by forming new States at will out of the western territory; but denied any present intention to dissolve the Union. It was proposed that Congress should confide the defense of each State to the State itself, and return a share of its taxes for the purpose; and recommended seven changes in the Constitution, namely: abolition of the three fifths slave representation, the requirement of a two thirds vote for the admission of new States, the limitation of embargoes to 60 days, the requirement of a two thirds vote to sanction the prohibition of commercial intercourse, or to declare war or hostilities except in case of invasion; the exclusion of naturalized foreigners from civil offices or a seat in Congress, and prohibition of a President's re-election. They proposed also that two Presidents in succession should never be elected from the same State. They also recommended that another convention should be held at Boston the following June if affairs did not mend or the amendments were rejected. The Massachusetts and Connecticut legislatures adopted the report and sent commissioners to Washington; but before they arrived a satisfactory peace was made, all disasters forgotten in the blaze of the battle of New Orleans, and the promoters of the convention detested as traitors preparing to secede. They were in fact killed for public life. But in 1819 Cabot deposited the journal of the convention with the Massachusetts secretary of state as a permanent testimony that nothing treasonable was attempted; in 1833 Dwight wrote its history.

Hartford Fern. See *Filicales* (2), under FERNS AND FERN ALLIES.

Hartford Theological Seminary, an institution founded in 1834 for the education of Congregational preachers, at East Windsor Hill, Conn. It was formerly called the Theological Institute of Connecticut, and took its present name on its removal to Hartford in 1805. Its control is vested in a board of trustees elected by the Pastoral Union, an association of 200 ministers who have subscribed to the creed of the Union. The aim of the institution is to train ministers for pastoral work on the broadest lines of intellectual and spiritual life. The seminary has always been a leader in theological pedagogy. In 1903 its faculty comprised 12 professors and 12 lecturers, and the number of students was between 80 and 90. It has a library of 81,000 volumes, and nearly 45,000 pamphlets. Hosmer Hall, the main building, was erected 1880 by James B. Hosmer, and as it is estimated, at a cost of $150,000. In 1902 the Case Memorial Library was built by Newton Case at a cost of $100,000. Since 1890 the faculty have issued their valuable theological quarterly, 'The Hartford Seminary Record.'

Harting, James Edmund, English naturalist: b. London 29 April 1841. He was a solicitor until 1878, since when he has devoted himself to zoological research. Among his numerous publications are: 'The Ornithology of Shakespeare' (1871); 'Handbook of British Birds' (1871); 'Rambles in Search of Shells' (1875); 'British Animals Extinct within Historic Times' (1880); 'Essays on Sport and Natural History' (1883).

Har'tington, Spencer Compton Cavendish, MARQUIS OF. See DEVONSHIRE, SPENCER COMPTON, DUKE OF.

Hartington, Neb., city, county-seat of Cedar County; on Bow Creek, and on the Chicago, St. P. & O. R.R.; about 42 miles west by north of Sioux City, Ia., and 18 miles south by east of Yankton, S. D. It is in a fertile agricultural region and is the commercial centre of a large part of Cedar County. Large shipments of wheat and live stock are made annually. Pop. (1900) 971.

Hart'ley, SIR Charles Augustus, English civil engineer: b. Heworth, County of Durham, England, 1825. After being employed on several important engineering works he served in the Crimean war as captain of Turkish engineers, was knighted in 1862, and in 1867 was awarded, against 20 competitors, the prize for plans for extending the harbor of Odessa. He was appointed by President Grant a member of a board of engineers to report on the improvement of the lower Mississippi and recommended the improvement of the South Pass of its delta. He has been consulting engineer on many other notable engineering projects and has received many medals and decorations from home and foreign societies. He has published 'The Delta of the Danube'; 'Public Works of the United States and Canada'; 'Inland Navigation in Europe'; 'History of the Engineering Works of the Suez Canal.'

Hartley, David, English philosopher and physician: b. Armley, Yorkshire, 30 Aug. 1705; d. Bath, Somerset, 25 Aug. 1757. He practised medicine at Newark, Bury St. Edmund's, and London, and is remembered for his 'Observations on Man' (1749) in which is stated his hypothesis of nervous vibration and of the association of ideas.

Hartley, Jonathan Scott, American sculptor: b. Albany, N. Y., 23 Sept. 1845. He early developed a taste for working in marble and after spending several years in studying art in England, Rome, and Paris, he established himself in New York where he was professor of anatomy in the schools of the Art Students' League, 1878–84, and president of the league, 1879–80. Among important works by him are: 'King René's Daughter'; 'The Whirlwind'; bas-reliefs on the battle monument at Saratoga; and the Miles Morgan statue at Springfield, Mass.

Hart'man, Sadikichi, American author and artist: b. Nagasaki, Japan, 1867, of German and Japanese parentage. He was educated in Germany, came to New York in 1890 and has since devoted himself to painting and literary work. He has published 'Schopenhauer in the Air' (1899); 'Shakespeare in Art' (1901); 'Modern American Sculpture' (1901); etc.

Hartmann, härt'män, **Karl Robert Eduard von,** German philosopher: b. Berlin 23 Feb. 1842. He was educated in the School of Artillery, resigning in 1861. A year later he was attacked by an incurable disease which has confined him to his bed for the greater part of the time, but which has not prevented his engaging in the most profound philosophical studies. His great work, 'The Philosophy of the Unconscious' (1868), was followed by 'The Ethical Consciousness,' at first entitled 'Phenomenology of the Ethical Consciousness' (1879); 'The Philosophy of Religion' (2d ed. 1888); and 'Æsthetics' (1886–7). These constitute his exposition of a system of philosophy. Among other works of his are: 'Critical Grounds of Transcendental Realism'; 'The Crisis of Christianity in Modern Theology' (1880); 'Judaism in the Present and the Future' (1885); 'Lotze's Philosophy' (1888); 'The Ghost Theory in Spiritism' (1891); 'The Fundamental Social Questions' (1894); and many other works on society, religion, etc.

Hartranft, härt'tränft, **Chester David,** American educator: b. Frederick Township, Montgomery County, Pa., 15 Oct. 1839. He was graduated at the University of Pennsylvania in 1861 and at the New Brunswick Theological Seminary in 1864; was pastor of the Dutch Reformed church at South Bushwick, N. Y., in 1864–6, and of that in New Brunswick, N. J., in 1866–78. In 1879 he was appointed professor of ecclesiastical history at the Hartford Theological Seminary; in 1888 was elected its president, and held the chair of Biblical theology 1892–7 and of ecclesiastical dogmatics from 1897. He is a writer on theological subjects, and was at one time president of the Conservatory of Music at New Brunswick, N. J.

Hartranft, John Frederick, American soldier: b. New Hanover, Pa., 16 Dec. 1830; d. Norristown, Pa., 17 Oct. 1889. He was graduated at Union College in 1853, and in 1859 was admitted to the bar. At the outbreak of the Civil War he organized the 51st Pennsylvania regiment, was made its colonel, and with it participated in Burnside's expedition to North Carolina (1862). He also commanded the regiment in a charge at Antietam, and at Fredericksburg. In March 1865, he commanded a division of the Ninth corps in their assault on Fort Steadman, and was brevetted major-general. He received the nomination of the Republican convention in 1865 for auditor-general of Pennsylvania, was elected at the succeeding election, and was re-elected to the office in 1868. From 1872 to 1878 he was governor of Pennsylvania, and during his administration thoroughly reorganized the Pennsylvania militia, which from 1879 he commanded, with rank of major-general.

Hart's-horn, the horn of the common stag and its decomposition products. The substances derived from the horns were the volatile liquor, salt, and oil, and the ash which remains when the horns are calcined in the air. The fluid portions are got by destructive distillation in a convenient still, and are separated, the salt mechanically, and the others, after washing with water, by repeated rectification either alone or with quicklime, by which the more volatile portions are got free from the tarry matter and heavier oils. The salt which is formed in this operation is ammonic carbonate, which in part condenses in the neck of the retort, in part is washed over by the aqueous vapor into the receiver; and when the ammonia is got pure from the distillate and is condensed in water it constitutes the spirit of hart's-horn. The volatile alkali or spirit of hart's-horn is now no longer obtained from that source, except in special circumstances; the ammonia of commerce is now obtained from gas-liquor, from blast-furnaces, or from other sources.

Hart'suff, George Lucas, American soldier: b. Tyre, Seneca County, N. Y., 28 May 1830; d. New York 16 May 1874. He was graduated from West Point in 1852, entered the artillery, was on duty on the frontier and in Florida, in the Civil War became assistant adjutant-general, with rank of captain, in 1861, and major in 1862. Later appointed major-general of volunteers, he was one of the board for revision of the rules and articles of war and the preparation of a code for the government of the armies in the field. He was mustered out of the volunteer service in 1865, and in 1871 was retired from the regular army for disability from wounds received in battle, with rank of lieutenant-colonel and brevet major-general, United States army.

Hartsville, Engagements at. Hartsville, Tenn., on the north bank of the Cumberland River, about 35 miles northeast of Nashville, is an important crossing and connected by good roads with Lebanon on the south and Gallatin on the northwest. In August 1862 Gen. John H. Morgan, with his Confederate command, was operating north of the river and Gen. R. W. Johnson, with a cavalry command, was sent to drive him back. Johnson, approaching on the Gallatin road, attacked Morgan 21 August, near Hartsville, and was defeated with a loss of 80 killed and wounded, and 75 prisoners.

On 6 Dec. 1862 Hartsville was held by Col. A. B. Moore, with a Union force of three regiments of infantry, a regiment and a company of cavalry, and a section of artillery, in all about 2,100 men. Morgan had been instructed by Gen. Bragg to operate on Gen. Rosecrans' lines of communication in rear of Nashville and, learning that Moore was isolated, with no supports near, resolved to capture him. While two infantry brigades of Cheatham's division

and Wheeler's cavalry demonstrated on Nashville, Morgan, with four regiments and a battalion of cavalry, two regiments of infantry, and a battery, set out from Baird's Mills, 25 miles south of Hartsville, on the morning of 6 Dec. 1862, marched through Lebanon, crossed the Cumberland below Hartsville, during the night, disposed his forces so as to cut off Moore's retreat on the roads leading to Gallatin and Castalian, posts occupied by other Union commands, and early in the morning of 7 December, closed in on the Union camp, surprised it, attacked the troops, who were being hastily drawn up to receive him and, after a stubborn fight of an hour and a half, defeated and captured the entire command. Col. John M. Harlan, in command of a small Union brigade at Castalian Springs, nine miles away, hearing the noise of battle, marched to Hartsville and attacked Morgan's rear-guard as it was recrossing the river, recapturing some of the wagons taken. The Union loss was 58 killed, 204 wounded, and 1,834 captured and missing. The Confederate loss was 21 killed, 104 wounded, and 10 missing. Consult: 'Official Records,' Vol. XX.

E. A. Carman.

Hartt, Charles Frederick, American geologist: b. Fredericton, N. B., 23 Aug. 1840; d. Rio de Janeiro, Brazil, 18 March 1878. He was a pupil of Agassiz in the Museum of comparative anatomy at Harvard, and accompanied the great naturalist as geologist of a Brazilian expedition (1865). During this expedition he explored the coast from Bahia to Rio, made extensive zoological collections, and by his researches made himself a leading authority on the natural history of South America. In 1875 he was appointed chief of the geological surveys of the empire of Brazil. He was also from 1876 director of the National Museum at Rio, where are deposited his collections, the most complete of South American geology in existence. He published: 'Geology and Physical Geography of Brazil' (1870), and 'Contributions to the Geology and Physical Geography of the Lower Amazon' (1874).

Hart'well, Ga., town and county-seat of Hart County, the terminal of a branch of the Southern railway, 50 miles northeast of Athens. Its educational institutions include a high school. There are cotton, flouring, and sawmills, and a fruit cannery. Pop. (1900) 1,672.

Hartwell, Ohio, village of Hamilton County, 11 miles north of Cincinnati, on the Cincinnati, H. & D. and on the Cleveland, C. & C. R.R.'s. It has manufactures of wagons and carriages and a general retail and agricultural trade. Pop. (1900) 1,833.

Harty, Jeremiah J., American Catholic prelate: b. St. Louis 1853. He was graduated from the St. Louis University in 1872, and took a theological course at St. Vincent's College, Cape Girardeau, Mo. He was ordained priest in 1878, and appointed assistant pastor of St. Bridget's parish in St. Louis, holding this position until 1888, when he was commissioned to build the church and organize the parish of St. Leo in the same city. His organizing work has been most successful, and in 1902 he built a school accommodating over 700 children. In 1903 he was appointed archbishop of Manila, the most important see in the Philippines.

Hartz'ell, Joseph Crane, American Methodist bishop and missionary: b. Illinois 1 June 1842. He was graduated from Wesleyan University and Garrett Biblical Institute (Evanston, Ill.), and in 1896 was elected missionary bishop to Africa where he has since been actively engaged in organizing missions. In June of 1903 he sailed from New York on his seventh missionary tour of inspection in Africa.

Harugari, hä-roo-gä'rē, a social and benevolent order established in the United States in 1847. It had in 1903 over 300 lodges with a total membership of 30,000. Its purpose is largely the preservation of German language, customs, and traditions.

Harun-al-Rashid, hä-roon'äl-räsh'ĭd, or **Haroun-al-Rashid,** caliph of Bagdad: b. Rhey about 765 A.D.; d. Thous 2 April 809. (See Caliph.) The popular fame of this caliph is by the 'Arabian Nights' Entertainments,' in which Harun, his wife Zobeide, his vizier Giaffar, and his chief eunuch Mesrur, are frequent and conspicuous characters. He was the fifth caliph of the dynasty of the Abbassides, and the most powerful monarch of his race. In 786 he succeeded his elder brother Hadi, who had vainly attempted to exclude him from the throne, and by his conquests and vigorous internal administration raised the caliphate of Bagdad to its greatest splendor, and made his reign esteemed the golden era of the Mohammedan nations. His favorite ministers were Yahia and his son Giaffar, of the ancient Persian family of the Barmecides, whose ancestors had for many generations been hereditary priests at the fire temple of Balkh, and who now rapidly exalted the family to the highest dignities under the caliphate.

Harus'pices. See Aruspices.

Har'vard, John, American clergyman, founder of Harvard University: b. England, probably in Middlesex; d. Charlestown, Mass., 24 Sept. 1638. He was entered as a pensioner at the university of Cambridge in 1628, was graduated B.A. in 1631–2, and M.A. in 1635, and having emigrated to America was made a freeman of the colony of Massachusetts, Nov. 2, 1637. The following year, as appears from the town records, a portion of land was set off for him in Charlestown, where he exercised the ministry. In April 1638, he was appointed one of a committee "to consider of some things tending toward a body of laws." These are the only particulars known of his life. His property at his death was worth about £1,600, one-half of which he gave for the erection of the institution which bears his name; but part of this bequest, it is said, was diverted from its original purpose. He also left to the college a library of more than 300 volumes, indicating in their selection the taste and skill of a scholar. A monument to his memory was erected in the burial ground of Charlestown by the alumni of the university, and inaugurated with an address by Edward Everett, 26 Sept. 1828. See Harvard University.

Harvard, Ill., a city and important railway junction in Chemung Township, McHenry County, at the intersection of three divisions of the Chicago & N. railroad, 63 miles northwest of Chicago. It has railroad repair shops, a malt house and brewery, manufactures

of agricultural implements, wagons, and carriages, and grist and woolen mills. Pop. (1900) 2,602.

Harvard University, the oldest institution of learning in the United States, was founded in Cambridge, Mass., in 1636. At a meeting of the general court of the Colony of Massachusetts Bay, convened on 8 September, 6 years after its first settlement, it was voted to give £400 toward a "schoale or colledge," for the purpose of educating the "English and Indian youth in knowledge and Godliness." The ensuing year 12 of the eminent men of the colony, including John Winthrop and John Cotton, were authorized "to take order for a college at New Towne." The name Cambridge was adopted soon afterward in recognition of the English University where many of the colonists had been educated. In 1638 John Harvard, a young nonconformist minister, died in Charlestown, leaving to the college £750 and his entire library of 300 volumes. The institution was opened soon after and was named Harvard in honor of its first benefactor.

In 1637 the first building was erected. The first president was Rev. Henry Dunster, who was elected in 1640. The first graduating class was in 1642, and consisted of nine members. This same year a change was made in the government of the college; a board of trustees was created, the members of which were the governor, the deputy governor, the teaching elders of the "5 next adjoining towns"— Boston, Cambridge, Charlestown, Dorchester, and Roxbury — the magistrates, and the president of the college. The college was established as a corporation in 1650, with power of control over the educational and financial concerns of the institution. The members of the corporation were the president, the treasurer, and 5 fellows. In 1657 the corporation charter was changed so that the overseers had practically no control over the internal management of the college, although a final appeal might be made to them if necessary. Now there were two governing bodies; the overseers and the corporation, at times working in harmony and again antagonistic to each other. In 1780 the board of overseers consisted of the governor, lieutenant-governor, senate, and council of the commonwealth, the president of the college, and the ministers of the Congregationalist churches of the "6 adjoining towns" already mentioned. In 1810 a further change was made in the board of overseers, and instead of the senate and the ministers of certain churches, there were substituted 15 Congregationalist ministers, 15 laymen, the president of the senate, and the speaker of the house, all to be inhabitants of the State. The members constituting the senate were restored as overseers in 1814. A still further broadening of the spirit of the board was shown by the act of 1834, but not ratified until 1843, when clergymen of all denominations were made eligible for membership to the board, and in 1851 an act was passed in which no mention was made of clergymen, but the clause that made only inhabitants of the State eligible was retained. It was not until 1880 that Harvard was freed from all sectional lines, and non-residents of the State of Massachusetts became eligible for membership to the board of overseers.

During the 17th century Harvard had to contend with serious obstacles, many of which had their origin in religious differences or shades of differences; but the desire to give the youth of Massachusetts an opportunity to learn the things taught to their fathers in the schools of Europe never faltered. It required heroic courage then to persevere in such a work, which at present seems a comparatively easy task. The religious controversies continued even after donations and endowments had come to the aid of the institution and had made its success seem almost certain. Under the presidency of Rev. Increase Mather, the college was placed under the control of the Calvinists (1692), but in 1707 the liberals gained the ascendency. An English merchant, Thomas Hollis, in 1721, founded a chair of divinity, and directed that no religious test should be given to the candidate for the professorship. The gift was refused by the overseers, but the corporation urged its acceptance, and the latter finally prevailed. However, the first candidate for a professorship was really subjected to a religious test, for a confession of faith on various disputed points was exacted of him. The religious controversies were carried so far that at one time there was a strong effort made by the orthodox friends of learning to found another college in the colony; but Governor Bernard refused them a charter.

In 1764 the college met with a serious loss by fire; the first Harvard Hall, containing the library and apparatus, was entirely destroyed, but the loss was repaired to some extent by the generous aid of the Colonies. Harvard was loyal to the American cause during the Revolutionary period; even going so far in the readjustment of its financial affairs as to suffer considerable loss. The alumni and students have ever been patriotic, ready to contribute their best to the needs of their country. The fine building, Memorial Hall, was erected by the alumni in memory of their dead who fell in the Civil War. Harvard has always followed a conservative course when parties were agitating questions of government.

Between 1636 and 1782 Harvard College conferred only the degrees of bachelor and master of arts, but in 1780 the term university was applied to it in the Constitution of the State of Massachusetts. The class of 1768 evidently gave some attention to dress, as they voted to wear homespun at their graduating exercises, although their action on the matter is often quoted to prove their democratic simplicity. In 1782 and 1783 three professorships of medicine were established, and the first degree of bachelor of medicine was conferred in 1788. In 1810 the lectures in medicine were transferred to Boston, and there the first medical college was built. The law school was established in 1817, and it has the distinction of being the earliest school of law in the country connected with a university and authorized to confer degrees in law. The divinity school was a gradual outgrowth of the college; the Hollis professorship of divinity, which has been mentioned, was established in 1721, but the divinity faculty was not formally organized until 1819. It is now undenominational, no assent to the special doctrines of any sect or denomination of Christianity being required of any instructor or student. The schools of medicine, law and divinity are the three oldest additions to the college proper, and it was de-

THE YARD, HARVARD UNIVERSITY.

SHOWING UNIVERSITY, GRAY'S, MATTHEW'S, MASSACHUSETTS, AND HARVARD HALLS.

THE GREAT ELECTOR,

THE STATUE PRESENTED BY EMPEROR WILLIAM II, TO HARVARD UNIVERSITY.

cided that such an institution, having 4 schools and several departments, justified the title, university.

In about 1822, a number of the friends of education and of the institution thought the time had come when further changes should be made in the work required of the students. George Ticknor (q.v.), professor in the department of modern languages, urged that some division of studies should be made whereby students might be permitted to pursue special courses or specialize on certain subjects. A committee, with Joseph Story as chairman, was appointed to investigate the wisdom of such a change, and how best to meet the needs of the students. The committee reported (1824) the advisability of instituting two lines of study — the one a course necessary for a degree, the other a scientific and mechanical course for those not intending to take degrees, but who desired to fit themselves for certain departments of work. The departure from old customs as recommended by the committee was opposed by many, but in 1825 changes were made and the special students were admitted. Prof. Ticknor and later his successor, Henry W. Longfellow, introduced to some extent elective courses in the department of modern languages, but not until a number of years later did they become popular in other departments.

Charles William Eliot (q.v.) was elected president in 1869. At this time the departments were almost independent schools, to which no entrance examinations were required; but the students were largely from classical preparatory schools, the majority of which were located in New England. The college required certain courses, and all demanded good work and a high degree of scholarship before graduation. In four years, so rigorous and thorough had been the work of President Eliot, that practically a reorganization had been made, the departments had been correlated, and individual work had been given recognition.

To Harvard much credit is due for the conservative manner in which it has dealt with the question of higher education of women. The Society for the Collegiate Instruction of Women was the name of an organization which began the work (1869) of providing ways and means for giving young women an opportunity to obtain a collegiate education. The name of the organization was changed, in 1894, by the general court of Massachusetts to that of Radcliffe College (q.v.). Systematic collegiate instruction is now given in this college, under the professors and teachers of Harvard University. The requirements are the same as for admission to the university. The schools and departments of Harvard University now comprise: (1) Harvard College, the Lawrence Scientific School, and the Graduate School, established in 1872 for students making original research. The Scientific School was established in 1847 as an advanced school in science and literature; later the name was changed to Lawrence Scientific School, in honor of Abbott Lawrence who presented it with $50,000. Those three schools, which include 14 departments offering elective courses, were placed, in 1890, under the charge of the faculty of arts and sciences. In 1904–5 there were in attendance 2,905 students under the faculty of arts and science. Of this number 366 were in the graduate school and were engaged in original research. For the students of this school who are engaged in original investigations there is available a number of fellowships, at present 58, which are from $200 to $1,000. The Edward Austin Fellowship and the Austin Teaching Fellowship are given only to resident graduate students. Some of the fellowships may be given to persons pursuing their studies in other parts of the country or abroad: but non-resident appointments are given only to persons who have been resident students in some department of the university. (2) The law school has been mentioned. The attendance in 1904–5 was 758. (3) The divinity school, already noticed, has an attendance of 43. (4) The medical school, founded in 1782, and the dental school, established in 1867, were united in 1899 and are in charge of the faculty of medicine. The school is located in Boston. The attendance in 1904–5 was, in the medical school, 307; in the dental school, 106. The new buildings for the medical school (1903), in process of erection, promise to be second to none other in the world. There will be seven separate buildings, the central structure and two of the side pavilions are provided for by the gift of $1,000,000 from J. Pierpont Morgan, and $1,000,000 from other friends. The site comprises 26 acres, in Brookline, about three miles from the main buildings of the university in Cambridge (5) The Bussey Institute, a school of agriculture and horticulture, was established in 1870 in accordance with the will of Benjamin Bussey. It is at Jamaica Plain, in the southwestern part of Boston. (6) The Arnold Arboretum, established in 1872, is devoted to scientific research in forestry, dendrology, and arboriculture. It was founded under the will of James Arnold. It is practically a large park containing about 220 acres, and is located in West Roxbury. (7) The astronomical observatory was established in 1843 by means of a public subscription. The Sears Tier was built in 1846, and two years later Edward Bromfield Phillips bequeathed to the university the sum of $100,000 for the observatory; this early bequest has since been supplemented by many others, so that the observatory now has an endowment of about $900,000. It has a director and four other professors and 40 assistants. A branch station is established on a mountain 8,000 feet high, near Arequipa, Peru. The annals of the observatory fill about 50 volumes. Among the more important instruments are the 15-inch and 6-inch equatorial telescopes, the 8-inch transit-circle, the 11-inch Draper photographic telescope, the 8-inch photographic telescope, and the meridian photometer. A grant has recently (1903) been made by the Carnegie Institution, for the study of the collection of photographs at the Harvard Observatory. The amount of material, including photographs and photographic charts of the sky that has been collected in this department, requires a special building for its accommodation. (8) The university library, including the libraries of the schools and departments, contains about 673,394 volumes and 393,892 pamphlets. (9) The Gray Herbarium, so named because it contains the Herbarium of Asa Gray (q.v.), presented to the university in 1864. (10) The university museum is made up of the following collections:

the Peabody Museum of American Archæology and Ethnology; the Museum of Comparative Zoology, established in 1859 by private subscription, State aid, and the collection of Louis Agassiz, and valuable gifts from his son; the Mineralogical Museum, established in 1890–1; the Semitic Museum, completed in 1902; the William Hayes Fogg Art Museum, completed in 1895; and the Germanic Museum, established in 1902. (11) The botanical garden, established in 1809, covers about seven acres and contains thousands of plants for scientific study.

Great credit is due Harvard for its leadership in the movement to better the teaching of the English language and literature in the schools of the country. Harvard mentioned the subject in its catalogue of 1865–6; an announcement was made, in the catalogue of 1869–70, that "Students would be examined, as early as possible after their admission, in English." In 1874, for the first time, every applicant for admission to Harvard was required to present English composition. The report of the committee who visited the preparatory schools to ascertain what they were doing with the subject of English, the discussions by educators on the "new demands of Harvard," the progress of the movement, the grand results, all now are parts of the "History of Education" of America.

The university summer school gives short courses of study under the charge of a committee of the faculty of arts and sciences, and is held in the college buildings during the summer vacation. The school is popular and has had a large attendance each year. In 1904 the students numbered about 1,007. Athletics are provided for — two fields of 24 acres each and the Hemmenidaу gymnasium furnish opportunities for physical training The stadium erected on Soldiers' Field has a seating capacity of about 30,000. It is shaped like the letter "U," with the open space toward the Charles River. It is of steel and concrete construction. The mezzanine floor under the seats, the promenade above the seats, the stairs, the perfect arrangement of all the parts make this stadium a model of construction. It was built under the auspices of the class of '79. A club house, called the Harvard Union, was donated by Henry Lee Higginson in 1901. The Phillips Brooks house is used for religious meetings. In 1903 Harvard received a valuable collection of plaster replicas of Germanic art; a number of them were given by Emperor William III. of Germany. Among them is a replica of the equestrian statue of the Great Elector, by Schülter, one of Frederick the Great, by Schadow, a cast of the golden gate of the Cathedral of Freiburg, the bronze door of Hildesheim Cathedral, on which the Biblical story of Creation, the wood screen of Naumburg Cathedral, and several other reproductions of great value.

The university has now about 60 buildings. In 1904–5 the number of members of the corporation was 6; of overseers, 30; of professors and instructors composing the faculty, 525; of students in all the schools and departments, 5,143. In 1904 the invested funds of the university amounted to $16,755,753.10; and the grounds, buildings, and apparatus were estimated to be worth about $21,000,000: the annual income was $1,572,539.50; and bequests and gifts amounted to $1,509,563.76. Harvard has had 22 presidents, including the present incumbent (1903), Charles William Eliot. There are 13 periodicals which represents the interests of the university as a whole, and of special schools and departments.

Consult: Quincy 'The History of Harvard University'; Thayer, 'Historical Sketch of Harvard University'; Hill, 'Harvard College by an Oxonian'; Peabody, 'Harvard Graduates Whom I Have Known'; Bush, 'History of Harvard'; Eliot, 'A Sketch of the History of Harvard University'; Thayer, 'History of Middlesex County.'

Harvest Bug or **Mite.** See MITES.

Harvest-fish. See BUTTERFISH.

Harvest-fly. A cicada (q.v.).

Harvest-moon, the full moon nearest to the autumnal equinox, when the earth's satellite, almost full, rises for several nights in succession about the same hour. This phenomenon is less plainly seen in the United States than in higher latitudes, and is not met with in the tropics. It is due to the fact that at the time of the autumnal equinox the full moon, being exactly opposite the sun, is in that part of her orbit which makes a small angle with the horizon at the point of moon-rise.

Harvest Mouse. See MOUSE.

Harvestman, or **Harvest Spider.** See DADDY-LONGLEGS.

Harvey, George Rossiter McClellan, American publisher and editor: b. Peacham, Vt., 16 Feb. 1864. After a secondary education, he became a reporter successively for the Springfield (Mass.) *Republican,* the Chicago *News,* and the New York *World,* was for a time managing editor of the *World,* and later a constructor and president of various electric railways. He purchased and became editor of the 'North American Review' in 1899, and in 1906 received the presidency of the reorganized firm of Harper and Brothers, publishers.

Harvey, Moses, Newfoundland historian: b. Armagh, Ireland, 25 March 1820; d. St. John's, Newfoundland, 3 Sept. 1901. He was graduated at Queen's College, Belfast, in 1840; later studied theology; and was ordained in the Presbyterian Church. He was pastor of the Free Presbyterian Church, St. John's, Newfoundland, 1852–78, when he retired from the ministry and devoted himself to literary and scientific studies, and became popular as a lecturer. He published 'Thoughts on the Poetry and Literature of the Bible' (1853); 'Lectures on the Harmony of Science and Revelation' (1856); 'Newfoundland, the Oldest British Colony' (1883); 'Text-Book of Newfoundland History'; etc. He also contributed articles to the Encyclopædia Britannica on Newfoundland, St. John's, Labrador, and the seal fisheries of the world.

Harvey, William, English physician: b. Folkestone, Kent, April 1578; d. Hempstead, Essex, 3 June 1657; he was graduated at the University of Cambridge in 1593, and later at Padua. He is famous as the discoverer of the circulation of the blood.

Harvey, William Hope, American author: b. Buffalo, Putnam County, W. Va., 16 Aug. 1851. He was educated at Marshall College

(W. Va.), and practised law in 1871–84. He appeared as an author under the pseudonym "Coin" in 'Coin's Financial School' (1894), in advocacy of bimetallism as a currency standard. Other works by him are: 'A Tale of Two Nations' (1894); 'Coin's Financial School Up to Date' (1895); 'Patriots of America' (1895); and 'Coin on Money, Trusts, and Imperialism' (1899).

Harvey, Ill., city in Cook County; on the Cleveland, C., C. & St. L. and the Illinois C. R.R.'s; south of Chicago, about seven miles from Blue Island. It was founded in 1891 and incorporated in 1892. Its proximity to Chicago gives it the advantages of a residential city and its railroad facilities are an aid in the development of its manufactories. Some of the chief industrial establishments are railroad supply shops, an automobile factory, gas-stove factories, machine-shops in which are manufactured ditching and mining machinery. The trade is principally in its manufactures and agricultural products. Pop. (1900) 5,395.

Harveyized Steel. See Steel.

Harwood, Andrew Allen, American naval officer: b. Settle, Pa., 1802; d. Marion, Mass., 28 Aug. 1884. He was a great-grandson of Benjamin Franklin (q.v.). In 1818 he entered the navy and served in the suppressing of the slave trade and piracy in the West Indies; in 1835–7 was with the Mediterranean squadron; in 1848 was given the command of the Cumberland, and in 1855 promoted to the rank of captain. In 1862 he was appointed chief of the bureau of ordnance and hydrography; in 1863 he was made commandant of the Washington navy yard and Potomac flotilla, having the rank of commodore, and retired in 1869 with the rank of rear-admiral. He published 'Law and Practice of United States Navy Courts-Martial' (1867), and 'Summary Courts-Martial.'

Harz (härts) **Mountain** (Ger. *Harzgebirge*), the northernmost mountain range of Germany, extending about 60 miles through Prussia, Brunswick, and Anhalt, between the rivers Weser and Elbe, and occupying an area of about 786 square miles. The range, composed chiefly of Devonian and Lower Carboniferous formations, broken through with granite, is divided into the Upper and Lower Harz, with average elevations of 2,100 and 1,000 feet, respectively, the maximum altitude, 3,745 feet, being reached in the Brocken (q.v.). Woods and fine pastures abound; silver, iron, lead, copper, and zinc are mined, and marble, alabaster, and granite quarried. Traversed by fine roads and accessible by railroads, the range is a favorite touring ground, its interest enhanced by the traditions and weird legends which had their birth in this romantic region.

Has'call, Milo Smith, American soldier: b. Le Roy, Genesee County, N. Y., 5 Aug. 1829; d. Oak Park, Ill., 30 Aug. 1904. He was graduated from West Point in 1852, resigned from the army, practised law in Indiana, entered the Federal army as a private at the outbreak of the Civil War, rose to the grade of brigadier-general of volunteers, distinguished himself at the battle of Stone River, where he saved the day; was present at the siege of Atlanta, and resigned his commission in 1864. Subsequently he was a banker at Goshen, Ind., and a real estate dealer in Chicago.

Hasdrubal, hăs'droo-bal, Carthaginian general. He was the son of Hamilcar Barca, and brother of Hannibal (q.v.), and, on the departure of the latter for Italy 218 B.C., was left in command of the army in Spain. Hanno, who had charge of the province north of the Iberus, was defeated and dispossessed by Cn. Scipio before Hasdrubal could come to his aid. Scipio, reinforced by his brother, now crossed the Iberus, and in 216 defeated Hasdrubal near that river. The Carthaginians then sent a force, intended for the assistance of Hannibal, to the relief of Hasdrubal under the command of his brother Mago. In 212 Cn. Scipio was defeated and killed by the Carthaginians. Publius Scipio was sent into Spain in 211, and after seizing New Carthage defeated Hasdrubal in his camp at Bæcula in 209. Hasdrubal withdrawing to the northern provinces, determined to proceed to Italy, leaving his colleagues, Hasdrubal, the son of Gisco, and Mago, to make head against Scipio. He crossed the Alps in 207, accompanied by Gallic allies, and descended into Italy, and sent messengers to concert a junction with Hannibal in Umbria, but his despatches fell into the hands of the consul, Claudius Nero, who joined his colleague, M. Livius, at Sena, and forced Hasdrubal to give battle on the right bank of the Metaurus. Being outnumbered, and ill-supported by his Gallic allies, he was defeated, after an obstinate engagement, in which both sides suffered severely. When he saw the battle irretrievably lost he rushed into the midst of the enemy, and perished fighting sword in hand. Nero hastened back to Apulia, and is said to have announced to Hannibal the defeat of his brother by causing Hasdrubal's head to be thrown into his camp, 207 B.C.

Haseltine, hā'zĕl-tīn, **William Stanley,** American artist: b. Philadelphia, 11 Jan. 1835. He was graduated from Harvard in 1854, studied art in Düsseldorf and Rome, and has been a member of the National Academy from 1861. Among paintings by him may be named 'Indian Rock, Nahant'; 'Castle Rock, Nahant'; 'Bay of Naples'; 'Ruins of a Roman Theatre.'

Hashish, hăsh'ēsh, an eastern narcotic preparation, made from the tops and tender parts of the cultivated hemp, the variety known as *Cannabis Indica* being chiefly employed. The resin picked from the hemp is kneaded together, or sometimes the drug is obtained by decoction or infusion of the leaves. The resin is taken in the form of pills or pellets, and the leaves are chewed, or smoked in conjunction with tobacco. It is called bhang in India, where it is mixed with sugar and eaten as confectionery. It is as powerful as opium and produces intoxication and hallucinations; sometimes transporting the hashish-eater into an ecstacy, or lulling him into somnolency or torpor. Its after-effects are not so depressing as those of opium, and it is often prescribed medicinally as a soporific or anti-spasmodic.

Haskell, Edwin Bradbury, American publisher and editor: b. Livermore, Maine, 24 Aug. 1837. He entered the office of the Portland (Maine) *Advertiser* in 1854, was a reporter for the *Journal* (1857–60) and *Herald* of Boston, bought an interest in the *Herald* in 1865, and

was editor of that paper 1862–87. He still holds an interest in the *Herald*, as well as in the Minneapolis *Journal*, the St. Joseph (Mo.) *News*, and the Los Angeles *Express*.

Haskell Institute. See INDIAN, EDUCATION OF.

Has'kins, Charles Homer, American historical scholar: b. Meadville, Pa., 21 Dec. 1870. He was graduated from the Johns Hopkins University in 1887, studied also at Paris and Berlin, was instructor in history at Johns Hopkins in 1889–90, and in the University of Wisconsin was successively instructor in history (1890–1), assistant-professor (1891–2), and professor of European history (1892–1902). In 1899–1900 he was a lecturer in history at Harvard, and in 1902 was appointed professor of history there.

Has'sall, Arthur, English historian: b. Bebington, Cheshire, England, 23 Sept. 1853. He was educated at Oxford, where he has been at various times since lecturer, tutor, and examiner. He is one of the recognized authorities upon European history, his published books including 'Life of Bolingbroke' (1889); 'Louis XIV.' (1895); 'Handbook of European History' (1897); 'The Balance of Power 1715–89' (1896); 'Class-book of English History' (1901); 'History of France' (1901); 'The French People' (1901).

Has'sam, Childe, American artist: b. Boston 1859. He studied art in Boston and Paris; he is a member of Ten American Painters, of New York, and of the Société National des Beaux Arts of Paris. He is one of the freshest in style and most original of the American impressionists, and has gained medals at Paris, Munich, Chicago, and Philadelphia.

Hassen Ben Sabbah, the founder of the sect of the Assassins (q.v.).

Hasselquist, häs'sĕl-kwĭst, **Frederick,** Swedish naturalist: b. Ostrogothia 1722; d. Smyrna 9 Feb. 1752. In 1741 he went to the University of Upsala, where his talents and industry drew the attention of Linnæus. In 1747 he published a dissertation 'De Viribus Plantarum.' Wishing to make researches on the spot into the natural history of Palestine he spent some time at Jerusalem, and afterward visited other parts of the country. Returning to Smyrna he brought with him a collection of plants, minerals, fishes, reptiles, insects, and other natural curiosities. The Swedish queen, Louisa Ulrica, purchased the whole of Hasselquist's acquisitions, which were deposited in the castle of Drottningholm. Linnæus, from the papers and specimens of natural history collected by his pupil, prepared for the press the 'Iter Palæstinum, or Travels in Palestine, with Remarks on its Natural History' (1757), which has been translated into English and other European languages.

Hassler, häs'lĕr, **Ferdinand Rudolph,** Swiss-American scientist: b. Switzerland, 6 Oct. 1770; d. Philadelphia, Pa., 20 Nov. 1843. After serving on the trigonometrical survey of Switzerland, he emigrated to the United States. He was appointed acting professor of mathematics at West Point in 1807, and held the post for three years. He was superintendent of the United States Coast Survey in 1815, and from 1832 worked on the same commission until his death.

Hassler Expedition, a scientific expedition of great importance despatched by the United States Government. In 1871 the steamship Hassler was fitted out for coast survey and marine exploration. The personnel of the expedition included Prof. Louis Agassiz, and Mrs. Agassiz; Dr. F. Steindacher, ichthyologist; Dr. Thomas Hill, botanist; Count L. F. de Pourtales, Mr. J. A. Allen, and others. The party left Boston 4 Dec. 1871 and reached San Francisco, August 1872. Deep-sea dredging was carried on at several points in the West Indies and South Atlantic. The glaciers in the neighborhood of the Straits of Magellan were explored. Collections were made at every point of the voyage; the results of the expedition have been published by Agassiz, Lyman, and Pourtales, and much valuable material, zoological, geological and botanical, deposited in the Museum of Comparative Zoology, Cambridge.

Hastings, hās'tĭngz, **Francis Rawdon,** 1ST MARQUIS OF HASTINGS and 2D EARL OF MOIRA, English soldier and statesman: b. 9 Dec. 1754; d. off Naples 26 Nov. 1826. He entered the army as an ensign, served in America during the Revolution, and on 25 April 1781 gained the battle of Hobkirk's Hill, which Lord Cornwallis described as the most splendid of the war. In 1781 he was elected a member of the Irish House of Commons, and two years later he was promoted to the English House of Lords with the title of baron. He was in command of a force which sought to aid the royalists of Brittany in 1793, and in the following year co-operated with the Duke of York in the Netherlands. In 1812 he was appointed governor-general of Bengal and commander-in-chief of the forces in India. His administration was distinguished by successful wars against the Ghurkhas of Nepaul and the Pindarees of Central India, but in 1821 he resigned because certain charges had been brought against him in connection with a banking firm in which he was interested. In 1824 he was appointed governor of Malta.

Hastings, Thomas, American musician: b. Washington, Conn., 1787; d. 1872. He early made sacred music the subject of his careful study; from 1823 to 1832 he edited a religious paper, 'The Recorder,' in Utica, but removed to New York, where he made his fame as a musical instructor and composer. His works include: 'Mother's Hymn Book' (1849); 'History of Forty Choirs' (1854); and 'Dissertation on Musical Taste' (1853).

Hastings, Warren, English soldier and administrator: b. Churchill, Oxfordshire, 6 Dec. 1732; d. Daylesford, Warwickshire, 22 Aug. 1818. An uncle in London sent him at 10 years of age to Westminster School. On the death of his uncle he obtained an appointment in the East India Company's service, and he arrived at Bengal in October 1750. He was appointed to the factory at Cossinbazar, and was taken prisoner by Surajah Dowlah (1756). On obtaining his freedom he joined Clive, under whom he served with distinction as a volunteer in his campaign of 1757. In 1758 he was appointed resident agent of the company at Moorshedabad, in which capacity he continued to act till 1761. It is recorded to his honor that he did not avail

himself of the opportunity of making his fortune in the mode then common among the servants of the company, by "presents" (forced) from the native princes. In 1764 he returned to England, but as a result of a bad investment of his fortune was compelled again to ask for employment from the company; and sailed for India in the spring of 1769. In 1771 the East India Company were contemplating extensive changes in the government of India. The government of Bengal was still carried on in the name of the nabob, although he had become a mere cipher, all his officers being appointed by the company, and they cast their eyes upon Warren Hastings as a fitting instrument to carry out their policy. Clive strenuously supported his appointment to the Calcutta council (1772), with succession as president of the council and governor of Bengal. He now received instructions from the directors to deprive of his offices Mohammed Reza Khan, who had exercised under the company the complete control of the revenues and administration of Bengal, and to bring him to trial for corruption. Mohammed bore a high character, and he was accused by Nuncomar, a man of notoriously bad reputation. Shitab Roy, dewan of Behar, was subjected to similar charges. After a protracted inquiry both Mohammed and Shitab were fully acquitted of all the charges against them. The object of these charges — the reorganization of the judicial and financial administration of the province under the direct control of the company's officers, had in the meantime been carried out by Hastings to the entire satisfaction of the directors. Another important step taken by him was to enter into a treaty with the Nabob of Oude (Treaty of Benares, 7 Sept. 1773), by which he ceded to him the districts of Corah and Allahabad for fifty lacs of rupees, and engaged to hire out the company's troops to him for the reduction of the Rohillas, whose territory the nabob coveted. By the subsequent act of 1773, Hastings was appointed first governor-general of India, and a supreme council was named, of whom three formed a majority unfavorable to Hastings. The natives were encouraged to bring charges against him, and Nuncomar, his old ally, came forward with various charges of bribery. A supreme court of justice had been appointed at the same time with the supreme council of Calcutta. The chief-justice, Sir Elijah Impey, its head, was a friend of Hastings. Nuncomar was brought before this court, charged with forgery, convicted, and executed. This stretch of jurisdiction, which Hastings could easily have prevented, alienated from him public sympathy in England. The directors of the company petitioned the crown on 8 May 1776 for his removal from the council. Hastings had deputed Colonel MacLean, who returned to England in 1776 to insist on certain conditions or tender his resignation. It was accepted, and a successor appointed to take his place in the council, 23 Oct. 1776. General Clavering assumed the title of governor-general, which Hastings still insisted on retaining, as the change had been made without the conditions he had appended to his resignation. The supreme court, which was appealed to, decided in favor of Hastings. To end a dispute between the council and the supreme court of Calcutta, and to bring the chief-justice under the influence of the council, Hastings now appointed Sir Elijah Impey superintendent of the native courts with a salary of £8,000 a year, an appointment regarded by some as equivalent to a bribe. He involved himself in disputes with the Madras government, made demands for a large war contribution upon the Rajah of Benares, and when the rajah resisted arrested and deposed him. He caused the "begums of Oude," mother and grandmother of the Nabob of Oude, to give up extensive estates in land and a large amount of treasure. The House of Commons had passed a resolution (30 May 1782) requiring the directors to pursue all legal and effectual means for his removal. In November 1784 he resigned his post, and in February 1785 elft India. In 1786 articles of impeachment were brought in by Burke against him. The preliminary forms were gone through from 13 to 14 February, and Burke opened the charges against him in a speech of three days' duration, begun on the 15th. He was supported by Fox, Sheridan, and Grey. Hastings began his defense on 2 June 1791, and on 17 April 1795 was acquitted by large majorities on all the charges. His acquittal met with general approval. The legal expenses of his trial amounted to £76,080. The company in 1796 settled on him an annuity of £4,000 a year for 28½ years, and lent him £50,000 for 18 years free of interest. He passed the remainder of his life in retirement. In 1813 he received the degree of LL.D. from the University of Oxford, and in 1814 was created a privy-councillor.

Hastings, Mich., city, county-seat of Barry County; on the Thornapple River, and on the Chicago, K. & S. and the Michigan C. R.R.'s; about 38 miles west by south of Lansing and 32 miles southeast of Grand Rapids. The city is in a fertile agricultural region. The chief manufactures are furniture, pumps, wagons and carriages, hose-reels, car-seats, flour, cigars, felt boots and lumber camp supplies. The principal buildings are the library, the city hall, jail and courthouse. The city owns and operates the waterworks. Pop. (1900) 3,172.

Hastings, Minn., city, county-seat of Dakota County; on the Mississippi River at the mouth of the Vermilion River, and on the Chicago, M. & S. P. railroad; about 15 miles southeast of Saint Paul. Its chief industrial establishments are breweries, a malt-house, flour-mills, grain-elevators, saw and planing-mills, sash, door, and blind factories, carriage and wagon factories, furniture factories, lumber and brick yards. In addition to the trade in manufactured articles, grain, lumber, and live stock are among the important shipments. Pop. (1900) 3,811.

Hastings, Neb., city in Adams County; on the Missouri P., the Burlington & M., the Fremont, E. & M. V., the Saint J. & G. I. R.R.'s; about 25 miles south of Grand Island and 95 miles west of Lincoln. Its first settlers were Eastern people who availed themselves of the benefits of the government "Homestead Act," but the city was not incorporated until 1874. It is in a fertile agricultural section. The chief manufactures are flour, wagons, and agricultural implements. The trade is principally in wheat, corn, and live stock. It is the seat of Hastings College, under the auspices of the Presbyterian Church, and opened in 1882, and of the State asylum for chronic insane. The government is vested in a mayor, who holds office two years,

and in a city council. The present charter is that of 1891. The city owns and operates the electric light plant and the waterworks. Pop. (1890) 13,584; (1900) 7,188.

Hastings-upon-Hudson, N. Y., village in the town of Greensburg, in Westchester County; on the Hudson River, and the New York Central & H. R. railroad; about three miles north of Yonkers and 20 miles from New York. It is largely a residential village; but in the vicinity are marble quarries which add to the industrial wealth of the place. It has some manufactures, chiefly chemicals and cigars; it has a large trade in coal and lumber. It is the seat of the Hastings Commercial and Collegiate Institute, and has several churches and good schools. Pop. (1900) 2,002.

Hastings, Battle of. See SENLAC.

Has'well, Charles Haynes, American engineer: b. New York 22 May 1809. His practical education as marine and mechanical engineer was learned in a steam-engine factory. In 1836 he was appointed chief engineer in the United States navy. He built the first practical steam-launch in 1837 and was the first to use zinc to protect the hulls of iron vessels and boilers from the galvanic action of salt water and copper. After 1898 he was the consulting engineer of the board of public improvements in New York city. His published works include 'The Mechanics' and Engineers' Pocket Book' (1901); 'Mechanics' Tables' (1854); 'Reminiscences of an Octogenarian' (1895).

Hatch, John Porter, American general: b. Oswego, N. Y., 29 Jan. 1822; d. 12 April 1901. He was graduated at West Point and rose through successive grades to lieutenant-colonel of cavalry in 1873. He served in the Mexican War from Palo Alto to the capture of the city of Mexico; and in the Civil War was appointed brigadier-general of volunteers in September 1861, and commanded a cavalry brigade in the Shenandoah Valley and Northern Virginia. He subsequently commanded various districts in the South; and was brevetted major-general.

Hatch, Rufus, American banker: b. Wells, York County, Maine, 1832; d. 1893. He began life as clerk in a grocery store, in Rockford, Ill., in 1854 entered the grain commission business in Chicago, and amassed a fortune. He managed the Chicago and Northwestern railroad combination in 1868 and made a financial failure in the Northern Pacific collapse of 1883.

Hatch, William Henry, American lawyer: b. Georgetown, Ky., 1833; d. 1896. He was admitted to the bar in 1854; served through the Civil War in the Confederate army, and was a member from Missouri in the United States House of Representatives from 1879 to 1895. The Hatch Act which distributed Federal aid to agricultural experiment stations in all the States and Territories was inspired by him.

Hatchee, or **Big Hatchee,** a river which has its rise in the northeastern part of the State of Mississippi, flows north by west into Tennessee, then northwest and west joining the Mississippi River about 30 miles in direct line above Memphis. It is navigable for small steamboats as far as Bolivar, about 100 miles from its mouth, or half its whole length. The area drained by the Hatchee, about 4,000 square miles, is excellent cotton land.

Hatcher's Run (BOYDTON ROAD), **Battle of.** On 27 Oct. 1864, Gen. Grant, with the intention to extend his lines to the South Side railroad, and under the belief that the Confederate works around Petersburg extended only to the Boydton road crossing of Hatcher's Run, and were but feebly manned, moved parts of the Ninth, Fifth, and Second corps, together with Gregg's cavalry division, in all about 38,000 men, in three columns to the left. Gen. Parke, commanding the Ninth corps, moving to surprise the right of the Confederate works, found them strongly held, and made no attack. The Fifth corps, on the left of the Ninth, crossed Hatcher's Run and endeavored to seize the bridge by which the Boydton road crossed that stream, and was repulsed. The Second corps and Gregg's cavalry succeeded in forcing a passage over Hatcher's Run by the Vaughan road, and reaching the Boydton road, moved down it to Burgess' Tavern, near the bridge over Hatcher's Run, some four miles above Armstrong's Mill, where the infantry was checked. Hancock's Second corps having effected the passage of Hatcher's Run, by the Vaughan road, Warren was ordered to cross Crawford's division of the Fifth corps at Armstrong's Mill and, sweeping up the right bank of the stream, endeavor to recross and assault the Confederate line in the rear, while Griffin's division assaulted in front. Hancock was advised of the orders given Warren and authorized to make the attempt to carry the bridge in his front and gain some high ground beyond. At 4.30 P.M., when Hancock was extending his right to connect with Crawford, and was about to assault the bridge, Gen. Heth, with his own division and a part of Mahone's, having crossed Hatcher's Run and penetrated the interval between Hancock and Crawford, vigorously attacked Hancock's right and rear, throwing it into some confusion and capturing many prisoners, but Heth was finally repulsed. At about the same time Hampton, with five cavalry brigades, attacked Hancock's left and rear and Gregg's cavalry, but was repulsed. Crawford, who had crossed at Armstrong's Mill, found great difficulty in moving up the bank of Hatcher's Run, and failed to make connection with Hancock. The object of the entire movement failed, with Hancock still six miles from the South Side railroad. The Union troops were withdrawn during the night and, next day, moved back to the line of entrenchments. The Union loss, the greater part of which fell upon the Second corps, was 1,194 killed and wounded, and 564 missing. The Confederate loss is unknown. Consult: 'Official Records,' Vol. XLII.; Humphreys, 'The Virginia Campaign of 1864–5'; Walker, 'History of the Second Army Corps'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

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Hatcher's Run (DABNEY'S MILL and ARMSTRONG'S MILL), **Battle of.** It was on 5 Feb. 1865 that Gen. Grant put in motion an expedition to interrupt the Confederate line of communication by the Boydton road, running through Dinwiddie Court House to Petersburg. Gregg's cavalry division was directed to march early in the morning by way of Ream's Station to Dinwiddie Court House and strike the road; Warren's Fifth corps was to cross Hatcher's Run and support Gregg; Gen. Humphreys, command-

ing the Second corps, was ordered with two divisions to the crossing of the Vaughan road over the Run, and to Armstrong's Mill, to hold these two points and to keep up communication with Warren, four miles distant, on the one side, and with Miles' division in the Union entrenchments, three or four miles distant, on the other side. After severe skirmishing, Humphreys pushed Motts' division to the south side of Hatcher's Run, and established Smyth's division at Armstrong's Mill on the north side, about 1,000 yards from the Confederate works, where two brigades were brought to Smyth's support. At 5 P.M. parts of A. P. Hill's and Gordon's corps came out of their works and, under cover of the woods, attacked Smyth, but were repulsed. Smyth's line was now further strengthened by Hartranft's division of the Ninth corps and Wheaton's of the Sixth. Gregg captured some wagons and prisoners on the Boydton road, and in the evening fell back to Malone's Bridge on Rowanty Creek, from which he moved up to the Vaughan road crossing, where he arrived early in the morning of the 6th, with Warren, who had been ordered to support Humphreys. About 1 P.M. Warren, with two divisions, moved along the Vaughan and Dabney's Mill roads; Gregg, supported by one of Warren's divisions, going down the Vaughan road to Gravelly Run to observe the left. Gregg was attacked by a part of Pegram's division, but held his ground and, with the support given him by part of Griffin's division, drove Pegram's men back. Warren's leading division (Crawford's) moving on the Dabney's Mill road, also encountered part of Pegram's division, which was forced back to Dabney's Mill, where Evans' division came to Pegram's support, and Crawford in turn was driven back. Three Union brigades were now brought up to Crawford's support and, at the same time, Mahone's division arrived and took position between Evans and Pegram, and the whole Confederate line advanced, driving Warren back in great disorder, but some of his men rallied upon Wheaton's division, which had crossed from the north bank of the stream, and the Confederates were checked. On the morning of the 7th Warren made a reconnoissance, but did not find the enemy in force. The Union works were now extended to Hatcher's Run at the Vaughan road crossing. The Union loss was 1,352 killed and wounded, and 187 missing. The Confederate loss was about 1,500, among the killed being Gen. John Pegram. Consult: 'Official Records,' Vol. XLVI.; Humphreys, 'The Virginia Campaign of 1864–5'; Walker, 'History of the Second Army Corps'; Powell, 'History of the Fifth Army Corps.'

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Hatch'ettite, Adipocerite, or **Mineral Adipocere,** a native hydrocarbon, probably of the nature of a paraffin, occurring in certain parts of England and Scotland, mainly in connection with bogs and coal measures. It is wax-like, and melts at about 115° F. The specific gravity of the natural mineral is about 0.61, but after melting the specific gravity rises to 0.92 or even higher, owing to the elimination of air bubbles. Hatchettite is without odor, and when fresh it is commonly translucent and yellowish. Upon exposure, however, it blackens and becomes opaque.

Hatchie River, or **Davis' Bridge, Battle of.** After Gen. Van Dorn's defeat at Corinth, Miss., 4 Oct. 1862, he retreated and bivouacked for the night at Chewalla. Early on the morning of the 5th he continued his retreat on Pocahontas, but when his advance had crossed Hatchie River, at Davis' Bridge, he was met by Gen. Hurlbut's division, which had been sent by Gen. Grant from Bolivar, Tenn., to Pocahontas to intercept his retreat. Van Dorn's advance was driven back across the bridge, his main body came up, and Gen. Ord, who had arrived on the field from Jackson, took command of Hurlbut's division and attacked Van Dorn vigorously. A severe engagement ensued, in which Ord was severely wounded, and Hurlbut resumed command of the Union troops. Van Dorn, not closely followed from Corinth by Rosecrans, who was 12 miles away, held his position before Hurlbut the greater part of the day and, cut off from his route through Pocahontas, continued his retreat on the east bank of the Hatchie for six miles to Crum's Mill, where he crossed his army on a bridge during the night and continued his retreat to Ripley and thence to Holly Springs. Rosecrans followed as far as Ripley, when Grant ordered him to return to Corinth and Hurlbut to Bolivar. See CORINTH, ADVANCE ON AND BATTLE OF.

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Hatch'ment (a corruption of achievement, coat of arms) a funeral escutcheon, the arms of a deceased person within a black lozenge-shaped frame meant to be placed on the front of his home. If the deceased was unmarried or a widower or widow, the whole field of the escutcheon is black. In the hatchment of a married person the arms of husband and wife are impaled, and only that part is black which adjoins the side of it occupied by the arms of the deceased. Thus, in the hatchment of a husband the dexter side is black, the sinister white; in that of the wife the reverse. In a bishop's hatchment his arms being impaled with that of the see, those of the see have a white background. When the deceased is the last of his race a skull is set above the shield in place of a crest.

Hat'field, James Taft, American German scholar: b. Brooklyn, N. Y., 15 June 1862. He was graduated from the Northwestern University in 1883, from the Johns Hopkins University in 1890; was appointed professor of German language and literature at Northwestern in 1890, and became contributing editor of 'Americana Germanica.' During the Spanish-American War he served from seaman to chief yeoman on board the cruiser Yale. His publications include 'Materials for German Composition' (1896), editions of Freytag's 'Rittmeister von Alt-Rosen' and Goethe's 'Hermann und Dorothea,' and various articles and monographs on subjects of German literature.

Hath'amite, an explosive invented in 1902 by G. M. Hathaway, of Wellsboro, Pa., and remarkable not only for the enormous energy liberated by its explosion, but also for the safety with which the substance may be handled. Hathamite may be pulverized on an anvil with a sledge hammer without exploding, and rifle balls may be fired through it without effect. Lighted matches may also be thrown into it with impunity, and when poured upon a fire it burns

quietly, with the evolution of immense quantities of smoke. Apparently, explosion can be induced only through the agency of a dynamite percussion cap. Hathamite is a coarse powder, of a bluish-gray color, whose composition has not yet been divulged. It explodes with exceeding violence when fired with a suitable percussion cap. In one test a charge of an ounce and a half blew a two-inch hole through a piece of quarter-inch boiler plate, when merely laid upon the plate, and detonated in the open air. In another test a little over eight ounces of the explosive was actually melted and poured into a six-pound shell; and when the charge was afterward detonated, the shell was thoroughly fragmented. One marked advantage of hathamite is, that it will explode even when frozen.

Hath'away, Anne, the wife of Shakespeare. See SHAKESPEARE.

Hats and Hat-making. It is difficult to state just when hats were first worn, but it is a fact that fur-felt hats now form part of the attire of civilized man the world over. There is no record as to when or where the first hat was made. We find head covering in one form or another in vogue in the earliest times referred to in history. The first modern hat, as we now know this article of men's wear, was made in Paris about 1404 by a Swiss manufacturer, but it was not until 49 years afterwards that the French adopted any sort of a head covering. Charles XII., upon his entry in triumph into the city of Rouen in 1453, wore a huge hat made of fur, lined with red velvet, from which protruded a great feather. With royalty as its sponsor the hat at once became a necessary detail of man's wardrobe. The hat is distinguished from the cap or bonnet by its continuous brim. It has been traced back to the "petasus" of ancient Greece, just as the cap has been regarded as the descendant of the brimless "Pileus," also a form of Grecian head attire. These articles, as far as we know, were made almost exclusively of felt.

Felt hats became popular in England during the Norman occupation. In Queen Elizabeth's reign great beaver hats, usually black, were the favorite among the nobility, and they remained in vogue for more than 300 years. About the middle of the 17th century an effort was made to encourage this industry in America. In 1662 the assembly of Virginia, to stimulate activity among the colonists, offered, by special enactment, to give 10 pounds of tobacco for every good wool or fur hat produced in that colony from materials taken from animals native thereto. Hats were then made by hand, and no effort of any consequence was made to improve the primitive conditions until 1820, when the energy of the American inventor produced the first labor-saving machine. Improvement now followed improvement, each one, in its way, tending to economize the cost of making.

In 1810 the silk hat appeared. It was made by hand, and failed in its purpose to supplant the tiled beaver. It was not until 1830 that the silk plush hat was manufactured upon a paying basis.

In 1849 the soft felt hat made its bow in the United States. Its sponsor was the famous Hungarian patriot, Kossuth, who visited America in that year. He was given tremendous receptions everywhere, and won the heart of the great American republic. His great hat seemed to be typical of the vigorous character of the man, and it was not surprising that the "Kossuth" became a general favorite. From that time the soft hat has steadily gained friends, and to-day in many sections it is a predominant type.

While the industry in this country, prior to the Civil War, kept pace with progress in other lines, it was not able to hat the heads of thousands of Americans, and the foreign manufacturer found the States a very profitable territory. But to-day America has become a great exporter of hats. By far the largest share of this foreign trade is controlled by the city of Philadelphia, where the finest grades of hats in the world are made. The other well-known hat centres in America are Orange and Newark, N. J., Danbury, Bethel, and Norwalk, Conn., Brooklyn, N. Y., and Reading, Pa.

The kinds of hats now made are so numerous as to be almost beyond the possibility of listing. There are, however, three principal classifications: the felt hat, which includes the soft and the stiff or derby shape, the silk hat, and the straw hat. All other kinds are but variations in some way of these three. In this article the writer will deal exclusively with the felt hat, concerning which there is the greatest interest. But few people have any conception of the numerous perplexing details and methods which enter into the construction of the hat.

The furs most generally used in manufacturing felt hats are the beaver, which is found in the northwestern part of the United States and Canada; the coypou or nutria, known as the South American beaver; the Saxony and the Russian hare; the Scotch, English and French coney, and muskrats. The finest furs are taken from the nutria, beaver and otter, all water animals, that portion which is taken from the belly being regarded as the choicest. The others are land animals, the fur from the back being regarded as the best. In the more common grades of hats sheep's wool is used, while in the inferior grades wool is mixed with cotton and other vegetable fibres. These, however, cannot be properly termed felt hats, because the materials used are not felted together. They are cemented and are then stiffened by shellac.

Furs for the higher grade hats require the most exhaustive preparation. Upon their arrival at the factory the pelts are first washed with whale-oil soap to remove the superficial fatty matter which clings to the fur. A further purification is necessary, however, and for this purpose "carrotting" is employed. A solution of mercury and nitric acid is applied to the pelts. This chemical, deposited in the cellular tissues, absorbs and thoroughly destroys all animal fats and gives to the fur its felting properties.

After a thorough brushing the fur is next cut from the pelts and is then stored away to mellow and season, for the reason that, like good wine, it strengthens and improves with age. When these furs have become properly seasoned, and are in prime condition, they are subjected to an interesting process for the purpose of removing the hair; a machine, known as a "blower," containing powerful air blasts, accomplishes this work in a very thorough manner. The hair is blown from the fur without harming the latter. This is repeated over and over again, until all foreign matter has been removed. The by-products obtained through these preliminary opera-

tions are extensive. Many of them are used for other purposes than hatting; for instance, the shreds of the skins are used in the manufacture of the highest grades of glue.

The task of selecting the furs and of combining them in proper proportion to produce the best results in a high-grade hat demands the most careful attention of the experienced experts. Many years of experiment have been necessary, in order to learn just how these furs should be mixed, and just what would constitute the correct proportion. The strength and perfection, as well as the beauty of the completed hat, depend largely upon the efforts of those intrusted with this portion of the work.

The next stage in the life of the hat is the forming. Until recently this was a business in itself. Few hat-making firms engaged in it. To-day, however, many of the larger manufacturers are successfully doing their own forming. This work can be accomplished only by experts. It is one of the most interesting features of hat making. The exact quantity of properly mixed fur is carefully weighed and placed upon an endless apron at one end of a box-like machine. At the other end of the machine there is a large perforated cone of sheet copper, revolving rapidly over a funnel, under which there is a powerful suction fan at work. As the attendant carefully feeds the fur to the machine in the proper quantity it is carried by the apron toward the cone. The suction of air attracts this fur and causes it to adhere to the surface of the cone. This continues until the cone is covered with a sufficient quantity of fur to make the hat. The whole operation requires only two or three minutes. As soon as the cone has accumulated the necessary fur a wet cloth is thrown over it, and a second cone, larger in dimension, is placed over that. Both are immersed in a tank of hot water for a few moments. This is the first stage of the felting. It causes the perfect adhesion of the various fibres. The operator slips this conical body from the cone. It is now several times larger than its ultimate size. It has assumed the primary form.

Sizing, as the felting is termed, is the next process. The body, which has just been removed from the cone, is placed in a sizing kettle, where it is shrunk in hot water. Continuous rubbing and rolling reduces it in size almost one-quarter. It still retains its cone shape, but it is now firmly felted. Care as well as skill is required to insure the even shrinking and the uniform distribution of the stock. Failure in any detail will cause streaks and weak spots in the finished article. The hat is now ready for dyeing. It is immersed in a great color vat and dyed to meet the prevailing fashion. Great improvements have been made in this detail during the past few years. The old wood colorings have been discarded, and coal-tar products are now used because they have been found more serviceable and increase the durability of the hat. Up to this point the manufacturing of stiff and soft hats has been along similar lines, but from this time on different methods are used. After dyeing the next step is to stiffen slightly the brim of the soft hat by the application of "water stiff," a solution of shellac. The body is now beginning to assume a definite form. It is stretched, blocked and pulled, and, with the aid of hot water, steam and ingenious machinery, it is given stability of shape and form. The rough surface must now be cut off. This operation requires great care. If too much of the fur is removed all the previous skilled manipulation becomes valueless and the hat is ruined. This operation is known as "pouncing." It was formerly accomplished with a great deal of hand labor. It is now done by a machine and emery paper. This machine is a great time saver, and greatly facilitates the production of the plant. The crown is next given its shape, as demanded by the style. It is stretched over wooden blocks, ironed and re-ironed. It must then be carefully pounced by hand and steamed to tighten the felt. The brim must be treated exactly the same way, although it is not given shape at this time. Only men of skill and experience can engage in this portion of the work. There is a knack about pouncing by hand that can be acquired only by experience.

The hat is next flanged, or, rather, the brim is given its shape. The brim is placed upon a flange of metal or wood so as not to affect the crown. The entire hat resting on the flange is then placed under a huge receptacle containing heated sand and having on the under side a heavy cotton fabric, which comes in direct contact with the felt. After remaining in this position for several minutes the brim of the hat has its correct shape and trimming is in order. The turning up and edging each play an important part in the final process of shaping. In trimming artistic treatment is a necessity. Care must be taken in attaching the bands and bindings to preserve the neatness as well as the character of the design. The insertion of the sweat leather must be carefully done. All these and other details add greatly to the appearance and durability of the finished product.

The stiffening of the derby, better known as "the stiff hat," because of the character of the felting, is an interesting process. The hat body is impregnated with a solution of shellac and alcohol of given density. This substance is carefully worked into the heart of the body, and as a result the felting attains a condition of firmness. The hat is then placed on a wooden block, is immersed in hot water, and is given the proper proportion and shape before the final pressing. At the conclusion of this operation the superfluous gum is cleared away by a soda bath. When dry the hat is rigid throughout. It is then placed in an oven and kept there until it becomes pliable. A mould, to which tremendous pressure is given by mechanical or hydraulic means, completes the pressing after the derby has been pounced or finished. The pouncing of a derby is done upon a lathe. It is placed on a wooden block similar to the moulds used in pressing. Should the operator cut off too much of the surface fur, thus destroying the nap, the stiffening will be exposed and the work of the skilled men who preceded him loses its value. Curling or shaping of the brim is done with a variety of small tools, heat, steam, deftness of fingers and a good eye. The work of some of the experts who develop the stiff hat brims by the eye is little less than marvelous. The trimming, binding, etc., of stiff hats require even greater care in their selection and adjustment than in the case of soft hats.

Among American hat makers Charles Knox was one of the early specialists in beaver and

silk hats in New York. Robert Dunlop, of New York, has also an eminent name in the hat trade of America. The history of the John B. Stetson Company, of Philadelphia, is to a large degree the history of hat making in the United States for the last 39 years. From the small beginning of one room and two mechanics the Stetson factories have been developed to nine immense plants, having a floor space of over ten acres and a force of more than 2,500 employees. When John B. Stetson, in 1865, determined to manufacture hats he was known as the foremost expert in the mixing of furs and as one of the best hat finishers in the trade. He determined to avoid the cheap hat and to make only the highest grade of goods and to make them better than any other manufacturer. His output the first year did not exceed one hundred dozen hats. His capital was not more than $1,000. In 1903 the John B. Stetson Company, with its great force of employees, supplemented by improved machinery, most of the patents for which are owned by the company, produced 105,800 dozens of hats. This company has introduced new machinery, which cheapens the cost of production without a sacrifice in quality, and has carried the fame of the city of Philadelphia to every quarter of the globe. A process has also been perfected whereby pure nutria and beaver fur may be successfully utilized in superfine hat making.

Another important improvement in hat making is that known as the "Boss" raw-edge kettle finished hat. This was introduced in the early seventies. Prior to this time all soft hats were made with bands and bindings, the latter being used to hold the brim in shape. The "Boss" raw-edge hat, as its name indicates, has no binding around the edge. It is shaped in hot water by frequent immersions and by the skillful hand work of an expert. The brim curling is a feature that cannot be accomplished in any other factory. This hat is, beyond question, the most remarkable specimen of headwear the world has ever seen. The John B. Stetson Company has been awarded the grand prize or gold medal at nearly every world's fair since 1876, but it holds as of almost equal value an order which it received from the British government for 10,000 hats for the South African constabulary during the Boer war. Prior to this war a number of American miners and cattlemen drifted into South Africa wearing Stetson's hats. They came in contact with General Baden-Powell, who admired the hats they wore and made inquiries about them. They were made of nutria fur, were better in quality than those produced anywhere in Europe. General Powell requested his government to order 10,000 of these hats, and the Stetson factories made and delivered them within six weeks of the receipt of the order. In 1876 the Stetson Company was awarded a gold medal by the Philadelphia Centennial Exposition. In 1879 it won a medal at Paris. In 1889 and in 1900 it won the grand prix at Paris. The official report making the award at the Paris Exposition in 1900 said, concerning the Stetson exhibit: "The products displayed here are, from every point of view, absolutely remarkable, but very especially the manufacture of soft hats, which is incontestably the acme of perfection of this epoch."

WILLIAM F. FRAY,
First Vice-Pres. John B. Stetson Company.

Hat'teras, Cape. See CAPE HATTERAS.

Hatteras Inlet, Capture of. In the forenoon of 26 Aug. 1861, a Union fleet of 7 vessels carrying 143 guns, under command of Flag-officer Silas H. Stringham, and 3 transports, carrying 930 men and a light battery, under command of Gen. Butler, set sail from Hampton Roads. Next afternoon the fleet arrived off Hatteras Inlet, the entrance to Pamlico Sound, which was guarded by Forts Hatteras and Clark, built by North Carolina on the south end of Hatteras Island, and mounting respectively 25 and 5 heavy guns. The forts, which were garrisoned by over 700 men, were under command of Maj. Andrews. At 10 A.M. of the 28th Stringham began the bombardment of the forts, and a little later about 300 troops, with two howitzers, were landed on the island above the forts. Fort Clark was silenced before noon, the greater part of its garrison retreating to Fort Hatteras, some escaping from the island by boats. At night the fleet withdrew, but renewed the attack upon Fort Hatteras early in the morning of the 29th, drove the gunners from their guns to the shelter of the bomb-proofs, and before noon the fort surrendered, after a loss of 30 killed and wounded. The Union loss was one wounded. Stringham and Butler returned to Hampton Roads, leaving three vessels as a sea-force and detachments of the Ninth and Twentieth New York and the Union coast-guard, under Col. R. C. Hawkins, to garrison the captured forts. The immediate results of the expedition were the capture of the two strong forts with their garrisons of 715 men, 31 heavy guns, 1,000 stand of arms, and the possession of the best sea entrance to the inland waters of North Carolina. Consult: The Century Company's 'Battles and Leaders of the Civil War,' Vol. I.; Maclay, 'History of the Navy,' Vol. II.

E. A. CARMAN.

Hatti-Sheriff, the Turkish name of an edict signed by the sultan, who subscribes it usually with these words: "Let my order be executed according to its form and import." These words are usually edged with gold, or otherwise ornamented. An order given in this way is irrevocable. The firman of 18 Feb. 1856, called usually Hatti humayun, "exalted writing," is the constitutional charter of the Turkish empire. It is a long document, undivided into articles, and prescribing various reforms administrative and financial, etc., but its chief importance consists in its explicit recognition of the principle of religious liberty, already admitted by the hatti of Gulhana, 3 Nov. 1839.

Hattiesburg, Miss., city, county-seat of Perry County; on the Leaf River, and on the Gulf & S. I., the New Orleans & N., the Mobile, J. & K. C., and the Pearl & L. R. R.R.'s; about 65 miles north of Biloxi and 84 miles southeast of Jackson. The Gulf & Ship Island railroad is the shortest route to the Gulf of Mexico. Hattiesburg is the trade centre of a large fertile agricultural region in which an excellent quality of cotton is extensively cultivated. The industries are growing rapidly and its good railroad facilities mean good markets. The chief industrial establishments are saw-mills, planing-mills, cottonseed-oil mills, a cotton compress, a foundry, machine-shops, boiler works, brick-yards,

a naval store factory, railroad shops, an ice-plant, and the electric light and power plant. It has three banks, a number of fine public buildings. Pop. (1900) 4,175; (1903) 7,000.

Hatto, hät'tō, the name of two archbishops of Mainz, both somewhat conspicuous in the history of Germany. The first was chosen archbishop of Mainz in 891, d. 913. The second Hatto (d. 970) was a monk of the monastery of Fulda, and succeeded the celebrated Rabanus Maurus as abbot of the monastery of St. Boniface, about the year 942 and in 968 was raised to the see of Mainz, and continued one of the chief advisers of the emperor. Of his after-life and of his personal character most opposite accounts have been given. By some he is represented as an upright and successful administrator; by others as a selfish and hard-hearted oppressor of the poor; and the strange legend of his being devoured by rats, which Southey has perpetuated in his well-known ballad, is represented as an evidence of the estimate that was popularly formed regarding him. It is quite possible that this legend is of much later date, and that its real origin is to be traced to the equivocal designation of the tower on the Rhine, Mäusethurm, near Bingen, which has been selected as the scene of the occurrence. *Mäusethurm*, "Mouse-tower," is possibly only a corrupted form of *Mauth Thurm*, "Toll-tower," a sufficiently descriptive name; but the modified form of the word might readily suggest a legend of mice or rats. The date at which the Mäusethurm was built is unknown, and it is far from certain that it is not much later than the time of Hatto. See Baring-Gould, 'Curious Myths of the Middle Ages' (1869); Max Beheim, 'Die Mäusethurmsage' (1888).

Hat'ton, Sir Christopher, English statesman: b. at Holdenby about 1540; d. 1591. Lord chancellor of England, a favorite of Queen Elizabeth; was entered a gentleman commoner at Saint Mary Hall, Oxford, but removed without taking a degree, to the Inner Temple in 1560. He was introduced at court some time previous to the middle of the year 1564, and it is said Queen Elizabeth was so much struck with his graceful person and dancing that an introduction to her favor was the result, and gained him the name of "the dancing chancellor." He was a furious enemy of the Jesuits, and did not hesitate to accuse Parry, their defender in Parliament, and secure his execution. He was elected a member of Parliament in 1571, became captain of the Queen's Guard in 1572, vice-chamberlain and a privy-councillor in 1577, lord-chancellor in 1587. He was one of the commissioners for the trial of Mary Queen of Scots, in 1586. His artful speech to the unhappy queen, "If you are innocent you have nothing to fear; but by seeking to avoid a trial you stain your reputation by an everlasting blot," is supposed to have been mainly influential in inducing her to submit to trial. Spenser, whose patron he was, dedicated to him 'The Faerie Queen.'

Hatton, Frank, American journalist: b. Cambridge, Ohio, 28 April 1846; d. Washington, D. C., 30 April 1894. He served through the Civil War in the Army of the Cumberland, being commissioned and was subsequently partner with Robert J. Burdette (q.v.) in the proprietorship of the Burlington *Hawkeye*. He was assistant postmaster-general (1881–4); postmaster-general (1884–5); editor of Chicago *Mail* (1884–8); and editor of the Washington *Post* (1888–94).

Hatton, John Liptrot, English composer: b. Liverpool 1809; d. Margate, Kent, 20 Sept. 1886. Removing to London in 1832 he became famous for his many operas, cantatas, overtures, entr'actes, etc., and was musical director of the Princess Theatre 1853–9. He is now, however, remembered chiefly for his admirable settings of English songs, such as 'Good-bye, Sweetheart,' 'The Tar's Song,' 'The Bait,' etc.

Hatton, Joseph, English journalist, novelist, and playwright: b. Andover 3 Feb. 1841. Beginning journalism on the Derbyshire *Times*, founded by his father, he went to London, where he edited the 'Gentleman's Magazine' (1868–74); and became a newspaper correspondent for the New York *Times* and other journals. Among his numerous novels are: 'Clytie' (1874); 'Queen of Bohemia' (1877); 'John Needham's Double' (1885), dramatized for E. S. Willard; 'By Order of the Czar,' a novel of Russian life; 'Princess Mazaroff'; 'Under the Great Seal'; 'When Greek Meets Greek,' a novel of the French Revolution successfully dramatized; 'When Rogues Fall Out' (1899). Among his miscellaneous publications the best-known are: 'Journalistic London'; 'The New Ceylon'; 'Henry Irving's Impressions of America'; 'Old Lamps and New'; while among his plays may be cited a version of 'The Scarlet Letter' successfully acted in the United States; 'The Prince and the Pauper'; 'Liz'; and 'A Daughter of France.'

Hauck, hâk, Minnie, American vocalist: b. New York 16 Nov. 1852. She appeared in concert in New Orleans at 13, afterward studied with Errani in New York and made her début as an opera singer in 'La Sonnambula' in 1868. She has been uniformly successful both in the United States and Europe, but is best known in the title role of Carmen. She is married to the Chevalier de Hesse-Wartegg.

Haupt, howpt, Herman, American engineer: b. Philadelphia, Pa., 26 March 1817; d. 14 Dec. 1905. He was graduated at West Point in 1855, but became a civil engineer, and joined the staff engaged on the public works of Pennsylvania. For three years he was professor of civil engineering and mathematics in Pennsylvania College but in 1847 became consulting engineer of the Philadelphia Railroad. He was afterward chief engineer of the Hoosac Tunnel and during the Civil War chief of the United States Bureau of Military Railroads. The Royal Polytechnic Society of Great Britain gave him their highest prize for the drilling machine which he invented, and he first made practicable the transportation and distribution of oil from the well side. He wrote 'Hints on Bridge Building' (1840); 'General Theory of Bridge Construction' (1852); 'A Consideration of the Plans Proposed for the Improvement of the Ohio River' (1855); 'Military Bridges' (1864).

Haupt, Lewis Muhlenberg, American engineer: b. Gettysburg, Pa., 21 March 1841. He

was educated at Harvard and West Point. From 1872 to 1892 he was professor of civil engineering in the University of Pennsylvania, and for the year ending 1886 edited the 'Engineering Register.' From 1897 to 1899 he was a member of the Nicaraguan and the Isthmian Canal Commissions. His published works include: 'Working Drawings and How to Make and Use Them' (1881); 'Canals and Their Economic Relation to Transportation' (1890).

Haupt, Paul, American Assyriologist: b. Gorlitz, Germany, 25 Nov. 1858. He was graduated at the Gymnasium Augustum, Gorlitz, in 1876; studied in Leipsic and Berlin, and settled in Göttingen where in 1883 he was appointed extraordinary professor of Assyriology. In the autumn of the same year he accepted the chair of Semitic languages at Johns Hopkins University, Baltimore, Md. He projected and continued to edit the so-called Polychrome Bible. (See BIBLE, POLYCHROME.) Among his many writings in periodical, pamphlet and book form, the most important volumes are 'Das babylonische Nimrod-Epos' (1891); 'Akkadische und sumerische Keilschrifttexte' (1882); 'Prolegomena to a Comparative Assyrian Grammar' (1888).

Hauptmann, howpt'män, **Gerhart,** German dramatist: b. Salzbrunn, Silesia, 15 Nov. 1862. After study at the Breslau Art School, he attended the universities of Jena and Berlin, traveled in Italy and Switzerland, and first appeared in literature with his epic, 'Promethidenlos' (1885). This he followed by a swift succession of dramas — 'Vor Sonnenaufgang' (1889), frankly socialistic and provocative of violent discussion; 'Das Friedensfest' (1890); 'Einsame Menschen' (1891); and 'Die Weber' (1892), a story of an unsuccessful uprising of the Silesian weavers, typifying the hopeless condition of the proletariat. In these works Hauptmann reveals the influence of Tolstoi and Ibsen, and a strong revolt against the conditions imposed, particularly upon the working-class, by a military and plutocratic régime. To this motif he returns in 'Fuhrmann Henschel' (1898). But he strikes a different note in 'Hanneles Himmelfahrt' (1893), a mystic 'dream-poem' as the author styles it, and 'Die versunkene Glocke' (1897; Eng. trans. by Meltzer 1900), which harks back to an indefinite period of the Middle Ages and makes artistic use of the primitive Germanic fairy-lore. In 'Kollege Crampton' (1892), 'Der Biberpelz' (1893) with its inferior sequel 'Der rote Hahn' (1901), and 'Schluck und Jan' (1900) he displays gifts of humor and satire. Other works are 'Florian Geyer' (1895) and 'Michael Kramer' (1900). Hauptmann is the chief figure in modern German drama. He excels less in dramatic structure than in art of characterization, and despite crudity and occasional dulness attains genuine poetic value.

Hauptmann, Moritz, German musician: b. Dresden 13 Oct. 1792; d. Leipsic 3 Jan. 1869. He studied at Gotha; was violinist at the court in Dresden in 1812; in 1815–20 was employed as music teacher in the family of a Russian prince; in 1842 he was appointed cantor of the Thomasschule in Leipsic, and the next year became professor of counterpoint at the Leipsic conservatory, where he was very successful and popular as a teacher. His compositions include motettes, an offertory, and sonatas for violin and piano. In 1853 he published his 'Die Natur der Harmonik und Metrik,' a very important theoretical work.

Haus'mannite, a native manganate of manganese, having the formula $MnO.Mn_2O_3$, and crystallizing in the tetragonal system, with octahedral habit. It is brownish black in color, and opaque with a submetallic lustre. It has a hardness of from 5 to 5.5, and a specific gravity of from 4.72 to 4.86. Hausmannite dissolves in hydrochloric acid, with evolution of chlorine gas. It occurs in Germany, Sweden, and elsewhere, usually in connection with porphyry. It was named in honor of the German metallurgist, J. F. L. Hausmann.

Haussa, how'sä. See HOUSSA.

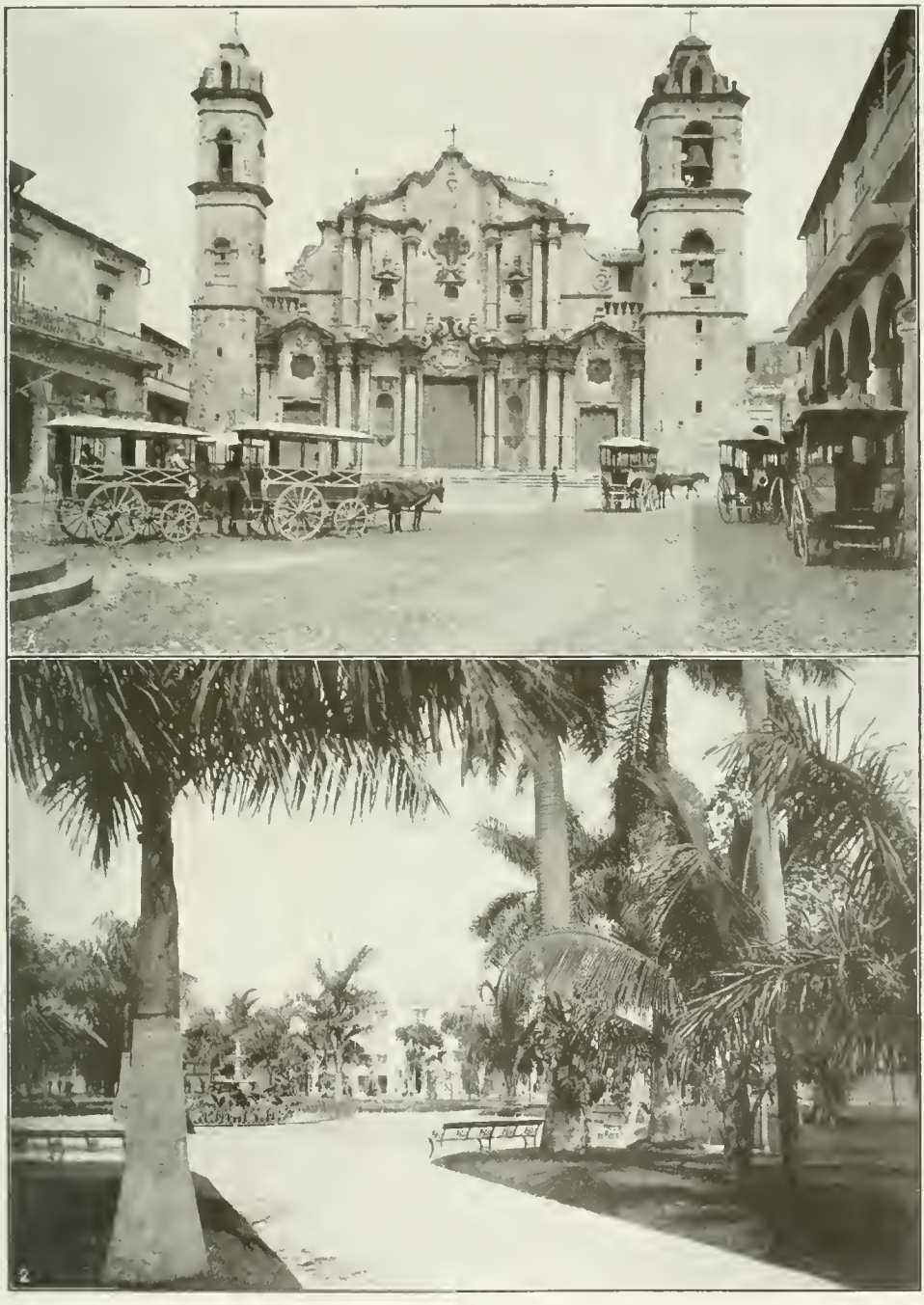
Haussmann, Georges Eugène, zhōrzh ė-zhān ōs-män, BARON DE, French municipal officer: b. Paris 27 March 1809; d. there 11 Jan. 1891. He studied law, and under Louis Philippe was sous-prefect of various places. The February revolution of 1848 caused the forfeiture of his office, but Louis Napoleon in 1853 made him prefect of the Seine, and he applied himself to the improvement and adornment of Paris with such energy that the city became transformed under his administration.

Hautboy, hō'boi (French *hautbois,* "high wood," alluding to its tone); a wooden wind-instrument of two-foot tone, played with a double reed. Also an organ stop, consisting of reed pipes slightly conical, and surmounted by a bell and cap of eight feet pitch. The tone is thin and soft.

Haüy, René Just, ré-nā zhüst ä-ü-ē or ä-wē, French mineralogist: b. St. Just, Oise, 28 Feb. 1743; d. 3 June 1822. He was trained for the Church and took priest's orders, but turned to mineralogy, and acquired a great reputation by a series of important discoveries. Among the chief of these is the geometrical law of crystallization, according to which a given mineral uniformly contains the same primary form as its basis of crystallization. From that time, according to Herschel, mineralogy first ceased to be "a mere laborious cataloguing of stones and rubbish." In 1794 Haüy became keeper of the cabinet of the School of Mines, and in 1802 professor of mineralogy in the Museum of Natural History. His works include: 'Traité de Mineralogie' (1801), and 'Traité de Crystallographie' (1822).

Haüynite, hä'wĭn īt, or **Haüyne,** hä'wĭn, a mineral of the sodalite group, occurring in certain igneous rocks, and notably in the lavas of Mt. Vesuvius. It is a silicate and sulphate of sodium, calcium and aluminum, crystallizing in the isometric system. It is usually translucent with a vitreous lustre, a hardness of from 5.5 to 6, and a specific gravity of about 2.45. Haüynite is commonly blue or green, though red and yellow specimens are also known. It was named in honor of the French mineralogist, R. J. Haüy.

Havan'a (Sp. LA HABANA, lä häbä'nä), Cuba, its capital and the commercial centre of the West Indies, second city of Spanish North America; pop. 242,055. It occupies nine square miles on the west side of the Bay of Havana on the north coast, one of the noblest



1. Cathedral of Havana. 2. Colon Park, Havana

VIEW OF HAVANA FROM CABANAS.

harbors in the world, with deep water up to the quays; entered by a narrow channel ⅛ of a mile long, protected by Punta Castle on the west and Morro Castle and La Cabaña on the east. It is in two sharply distinct sections. The old city, the commercial quarter, was built on the small western peninsula dividing the sea from the harbor, a low plain cut by a small stream on the west, strengthened by a city wall only torn down a generation ago. It is largely, and was entirely till the American occupation, a maze of narrow, crooked lanes traversed by one or two broader streets; the chief of which are the Calle O'Reilly, the main business street, running from the governor's palace to the city wall, and the Calle Obispo (Bishop Street). The new city is on a ring of hills 150 feet high south and west of the old, with the castle of El Principe on the crest, and has a wealth of broad and finely shaded macadamized streets, drives, promenades, parks, plazas, flower-gardens, fountains, statues, etc., which make it one of the handsomest cities in the world. There is no "West End" in Havana, the houses of the wealthy being scattered through every part, usually of classic pattern, with an inner courtyard or patio surrounded by marble or stucco columns, containing a garden of tropical vegetation and a central fountain. The handsomest residence street, next to the new suburb Vedado, is the Cerro, a long thoroughfare running up a hill at the farther end, and bordered by immense old villas in the midst of splendid gardens. The finest drives and promenades are the Malecon, a new thoroughfare along the water front from Prado to the Vedado, the Prado, a boulevard with a double row of shade-trees in the middle, running from Punta Castle outside the old wall, and ending in the largest park in the city, Colón Park or Campo Marte, and the Calle de la Reina (Queen Street) starting west from this park and continued as the Paseo de Tacón to the citadel of El Principe. The Alameda de Paula along the bay is also a favorite promenade.

Among buildings, the most interesting are the palace of the old captains-general, facing the Plaza de Armas near the harbor front, the cathedral, built 1764, and supposed to contain the ashes of Columbus in an urn till it was removed to Spain in 1898 (but the San Domingans claim they have his authentic bones), and the Tacón Theatre, perhaps the largest in the world. There are several other theatres and opera-houses, and many clubs, etc. The chief educational institutions are the University of Havana, founded 1670 by the Dominicans; the Jesuit boys' college de Belén, with a museum, observatory, a library rich in old Cuban history, etc.; College of American Augustinian Fathers, founded 1901. Famous among benevolent institutions are the Casa de Beneficencia, founded by Las Casas for infants. There are three general hospitals, a great lazaretto for lepers, and an insane hospital in the city and vicinity. Over 100 newspapers, etc., are published in the city.

The water supply of the city was installed by a Cuban engineer, Albear, some 40 years ago, and is considered a remarkable specimen of good workmanship. It comes from the Vento by an aqueduct 12 miles long, known as the Canal of Albear. In all other respects the Americans at the conquest found an undescribable state of filth and disease. The city was the prey of yellow fever; the sewers had seldom been cleaned since they were laid down, and some of them were choked with generations of rottenness; the buildings were pest-holes; and in that dungeon of horrors, the military hospital, 70 per cent of the inmates died. The United States forces in their short stay transformed this reeking home of pestilence into one of the healthiest cities in America. In systematic order streets were cleaned, repaved, widened; squads of cleaners were sent from house to house, emptying the Augean stables under them, whitewashing and disinfecting them, and where they were shanties that were nests of infection, tearing them down; the hospital was cleaned, disinfected, and covered deep with whitewash, and turned into a schoolhouse. New business streets were made by widening old lanes; parks were cleared up, and a fine sea-wall along the ocean to the north was built. The average deaths from yellow fever 1887–98 were 440; in 1896 they were 1,262; in 1901, for the first time in its history, only three or four. A Cuban physician of Irish descent, Dr. Carlos Finlay, now chief sanitary officer of Havana, was the originator of the mosquito theory of the yellow fever. Gen. Wood and the American army surgeons, however, deserve much credit for making the theory of practical use.

The climate is not severe. The mean annual temperature is 77°; the range from hottest to coldest 82° to 71°; the highest recorded, 100.6°, the lowest 49.6°. The mean rainfall is 54 inches.

Havana is the market of western Cuba, the head of the island's banking and commercial interests, and the emporium of the West Indies. Besides being the centre of the island railway system and of a great domestic shipping trade, especially with Santiago, it is the focus of a vast foreign commerce with Spain, France, England, and the United States, regular ocean lines running weekly to the first three and semi-weekly to the latter, besides others to the other West Indies. It has excellent covered wharves and a capacious dry-dock to aid this. Regla, on the opposite side of the bay, contains the sugar wharves and railway termini. In 1902 it had exports of about $60,000,000, $43,000,000 to the United States, an increase of $11,000,000 in three years, mainly ours; but its imports had shrunk from $57,000,000 to $45,000,000, most of the reduction from this country, owing to unfavorable customs laws. The entrances and clearances of ocean vessels in that year were over 1,500,000, and of domestic vessels nearly 3,000, with an average tonnage of about 635. The exports are chiefly of sugar, tobacco, cigars, and cigarettes; the imports, flour, rice, lard, and other foods, cotton, and metals. Its manufactures are mainly tobacco products; its cigar factories, of which there are over 100 of the first rank, are the largest in the world, one covering an entire square. It also manufactures confectionery, perfumes, rum, etc. The new electric street railway system is one of the finest of its kind, with 36 miles of track.

Population.— In 1869 it was 242,055, 52,900 being foreign; in 1887 it was about 189,000. About one third were unable to read; and about one third from 5 to 17 attended school.

History.— Havana was founded here (transferred from an older site) by Diego de Velasquez in 1519, and called by him "the key of the

New World." Burnt by buccaneers in 1528, it was rebuilt and made the chief naval station of Spain in this hemisphere, twice sacked in 1555 and 1563, it was a storm centre of wars and piracies for two centuries. In 1762 the English captured it, but restored it to Spain the next year. In 1802 it was partly burnt, but under the famous Governor Tacón, its second founder, commemorated at every turn, it was rebuilt from a straw-thatched wooden town to a city of brick and stone. For its late history, see CUBA. Consult: Norton's 'Handbook of Havana and Cuba' (1900).

Havana, Ill., city, county-seat of Mason County; on the Illinois River, and on the Chicago, P. & St. L. and the Illinois C. R.R.'s; about 39 miles northwest of Springfield. It is situated in an agricultural region and is the trade centre for a large extent of country. The chief manufactures are flour, agricultural implements, drills, gasoline engines, and some factory supplies. Its trade is chiefly in grain, fruit, vegetables, and dairy products. The waterworks are owned and operated by the city. Pop. (1900) 3,268.

Havelock, hăv'ē-lŏk, SIR **Henry,** English soldier; b. Bishop-Wearmouth, near Sunderland, 5 April 1795; d. Dilkusha, India, 24 Nov. 1857. Entering the army, he served with distinction in the Burmese war (1824–6); in 1829 married, became a Baptist, and was distinguished during the remainder of his life by his earnest religious zeal. He participated in the Afghan war, and in the defeat of Mohammed Akbar, 1843. He took part in the Mahratta war, and distinguished himself in the Sikh war of 1845. He commanded a division in the Persian war (1856–7) and on the outbreak of the Indian mutiny was despatched to Allahabad in order to support Sir H. Lawrence at Lucknow and Sir H. Wheeler at Cawnpore. On arriving at Cawnpore he found that Nana Sahib had massacred the prisoners. Pursuing his march to Lucknow, he defeated the rebels at Bithoor, and finally won the battle of Alumbagh. Having captured Lucknow, Havelock and Outram were shut up there until relieved by Sir Colin Campbell 17 Nov. 1857. He was raised to the rank of major-general, made a K. C. B., and (before his death was known) created a baronet. Consult lives by Brock (1858); Marshman (1890); Forbes (1890).

Havemeyer, hăv-ē-mī'ẽr, **William Frederick,** American banker: b. 31 March 1850. He received his education in private schools and entered into commercial business, and as a successful financier became vice-president and director of the National Bank of North America, and of the Queens County Bank of Long Island, and took a place in the board of directors of numerous railroad and banking corporations.

Ha'ven, Alice Bradley, American author: b. Hudson, N. Y., 1828; d. 1863. Her maiden name was Emily Bradley, and while a school girl she sent under the pseudonym of "ALICE G. LEE" many sketches to the Saturday 'Gazette,' then recently established by Joseph C. Neal in Philadelphia. She was married to Mr. Neal in 1846, and at his request assumed and retained the name of Alice. On the death of her husband in 1847, she conducted the 'Gazette' for several years. She published in 1850 'Gossips of Rivertown, with Sketches in Prose and Verse,' and became widely known by her series of juvenile stories, as 'Helen Morton,' 'Pictures from the Bible,' 'No such Word as Fail,' 'Patient Waiting no Loss,' 'Contentment Better than Wealth,' 'All's not Gold that Glitters,' 'Out of Debt Out of Danger,' etc. In 1853 she was married to Mr. Samuel L. Haven.

Haven, Erastus Otis, American Methodist bishop and educator: b. Boston, Mass., 1 Nov. 1820; d. Salem, Ore., 3 Aug. 1881. He was graduated at the Wesleyan University, Middletown, Conn., in 1842, soon after entered the ministry of the Methodist Episcopal Church, was appointed teacher of natural science in the Amenia Seminary, N. Y., and in 1845 was elected principal of that institution. He was professor of Latin and Greek in the University of Michigan 1854–6; editor of 'Zion's Herald' 1856–63, and sat in the Massachusetts Senate 1862–3. He was president of the University of Michigan 1863–7, and of Northwestern University, Evanston, Ill., 1869–72. He was subsequently chancellor of Syracuse University and was elected bishop in 1880. He published 'The Young Man Advised' (1855); 'Pillars of Truth' (1866); 'Rhetoric' (1869).

Haven, Gilbert, American Methodist bishop: b. Malden, Mass., 19 Sept. 1821; d. there 30 Jan. 1880. He was an able writer, and a forceful preacher. In the Civil War he was the first commissioned chaplain in the Federal army. He was editor of 'Zion's Herald' 1867–72, and was elected bishop in the latter year. He published 'The Pilgrim's Wallet, or Sketches of Travel in England, France, and Germany' (1865); 'National Sermons' (1869); 'Life of Father Taylor, the Sailor Preacher' (1871); 'Our Next-Door Neighbor, or a Winter in Mexico' (1875); etc.

Hav'erford College, under the auspices of the Society of Friends founded in 1833 in Haverford, Pa. It was first known as Haverford School, but in 1845 it was suspended for the purpose of collecting an endowment, and in 1856 it was made a college. It was the first collegiate institute in the United States which was founded and conducted entirely within the Society of Friends. Others besides the sons of Friends have been admitted as pupils since 1849. It is well equipped in laboratory requirements and in its library facilities. In 1903 the college reported 20 professors and instructors and 130 students. There were in the library about 37,100 volumes.

Havergal, hăv'ẽr-gal, **Frances Ridley,** English hymn-writer: b. Astley, Worcestershire, 14 Dec. 1836; d. Swansea, Wales, 3 June 1879. She was a frequent contributor to 'Good Words,' and the chief English religious periodicals, and her musical harmonies were praised by the German composer Hiller. Her poems and hymns were collected in several volumes, 'The Ministry of Song' (1870) being the first. Her 'Poetical Works' (1884) appeared under the editorship of M. V. G. Havergal. Of her hymns, which contain her best work and are found in all collections, the most familiar is 'Take my Life and Let it Be.'

Haverhill, hā'vẽr-il, Mass., city in Essex County; on the Merrimac River at the head of navigation, and on the Boston &. M. railroad;

about 30 miles from Boston. It is an important centre of street railway traffic, electric lines radiating from it connecting it with all of the important cities and towns of northeastern Massachusetts and southeastern New Hampshire. Three highway bridges span the river, connecting the city respectively with the Bradford district, with Groveland, and with West Newbury. Haverhill, including Bradford, which was annexed to it, 4 Jan. 1897, is 9 miles long and 3½ miles wide, and covers an area of 32 square miles. Bounding the entire southern length of the original city and separating it from its new adjunct, Bradford, from Groveland, and from West Newbury, flows the Merrimac River, navigable from the sea to the very heart of the city, and affording for freightage or pleasuring a delightful waterway. From the river on both sides the land slopes upward, the lower parts near the river being occupied for manufacturing and commercial purposes, the higher lands for residences. Five large lakes — Kenoza, Round Pond, Saltonstall, Crystal, and Chadwick's Pond — lie entirely within the limits of the city, and three of them, with a large artificial lake at Mill Vale, afford an abundant supply of water for all purposes. The eastern and western parts of the city are known as East Haverhill and West Haverhill, their more thickly settled parts being respectively Rocks Village and Ayers Village; the southern portion, in the Bradford district, is known as Ward Hill.

Government.— The municipal government is administered by a mayor, board of aldermen consisting of seven members, one from each ward of the city, but elected by the votes of the whole city, and 14 councilmen, two from each ward of the city and elected by the votes of the ward. These officials are elected annually and hold office for a single year. The schools are administered by a school board of 21 members, one member being elected annually by each ward and holding office for three years. The administrative officer of the board is the superintendent of schools, and the mayor is, *ex-officio*, chairman of the board. The water board consists of five members, each appointed by the city government for a term of five years; the park commission consists of five members, each appointed by the city government for a term of five years; the trustees of the Public Library, six in number, and the trustees of the City Hospital, five in number, hold office for life, vacancies being filled by the boards of trustees.

Financial.— The assessed valuation of the city, 1 May 1903, was $26,588,292. The tax levy for 1903 was $490,267.94; the state tax, $22,875; the county tax, $28,726.40; and the rate of taxation per $1,000, $17.60. The net bonded debt, 1 Jan. 1904 was: Municipal loans, $470,373.62; water loans, $776,512.43; total, $1,246,886.05. The interests of the business community are served by six national banks, having an aggregate capital of $795,000. There are three savings banks, two co-operative banks with an authorized capital of $1,000,000 each, and a safe deposit and trust company.

Manufactures.— The city has many and varied manufactures, the number of manufacturing establishments of all kinds being (U. S. Census of 1900) 685, with an aggregate capital of $24,937,073. The average number of wage-earners employed is 10,000, to whom is paid an aggregate of $5,035,882. The principal manufactures are those connected with the boot and shoe industry. There are 151 manufactories of boots and shoes, with an aggregate capital of $3,325,717, and an annual production valued at $15,231,440; 98 manufactories of cut stock, aggregate capital, $641,927, value of product, $3,495,433; 22 manufactories of boot and shoe findings, capital, $262,586, value of product, $811,515. The number of cases of shoes annually sent forth is about 450,000, and the market for them is not alone the United States, but England, Germany, Australia, the South American states, and other foreign countries. Other important industries are hat and woolen manufactures, box making, brick making, machine building, etc.

Schools.— The public school buildings are 34 in number, their aggregate value being $649,150. There are 167 teachers employed in the day schools, and an enrollment of 5,552 pupils. There are three parochial schools, Saint James (Irish), with a membership of 921; Saint Joseph's (French), with an enrolment of 372, and the Brothers of the Sacred Heart (French), with an enrollment of 334. Haverhill is also the seat of Bradford Academy, a famous and flourishing school for young ladies, established in 1804.

Board of Trade.— The membership of the Board of Trade includes all of the leading men of business and influence, and its object is "to forward the mercantile interests of Haverhill through the medium of equitable laws and regulations of the General Court and of the municipal government; to procure and spread such information as will conduce to the advancement and elevation of commercial dealings, and the extension of wise and just methods of business."

Parks.— There are 27 public parks in the city. Winnikenni Park, adjacent to Lake Kenoza, is very extensive, diversified, and beautiful, and abounds in delightful drives.

Public Buildings, Institutions, etc.—The Public Library was founded in 1875 by the generosity of E. J. M. Hale, whose gifts to it, including a legacy of $100,000, amounted to more than $175,000. The library contains nearly 100,000 volumes, with an annual circulation of nearly 160,000. There are four branch libraries for the accommodation of the more remote parts of the city, and 12 loan libraries placed in the district schools. Loan libraries are also established in connection with each grammar school, books being sent to and from these schools each week. The Hale Hospital occupies a set of buildings of the most modern type and equipment. The Historical Society occupies the "Buttonwoods," a large old mansion house on Water street, formerly the seat of the Saltonstall family, marking very closely the site of the first settlement of Haverhill. The Whittier homestead, the birthplace of the poet, John Greenleaf Whittier (17 Dec. 1807) and the scene of his poem 'Snow-Bound,' is situated about three miles from the heart of the city on the Merrimac road. The house, with the grounds surrounding it, is owned by the Whittier Association, and it is visited annually by many pilgrims. The Y. M. C. A. occupies a magnificent set of buildings, including a thoroughly equipped gymnasium. The Pentucket Club occupies an elegant mansion, formerly the Duncan residence, more than a century

old, designed by the celebrated architect, Haviland, but harmoniously enlarged to meet the needs of the social club now occupying it. The local military organization is Company F, of Eighth Regiment, M. V. M., organized in 1869, and attached to the Second Brigade. Among the numerous fraternal and other organizations may be mentioned seven Masonic bodies, maintaining a Freemason's Hall Association, with a capital of $50,000; eight lodges of Odd Fellows, maintaining an Odd Fellows' Hall Association, with a capital of $100,000; Elks, Foresters, G. A. R., Sons of Veterans, Woman's Relief Corps, Red Men, Daughters of Pocahontas, Knights of Malta, American Workmen, Knights of Pythias, Patrons of Husbandry, Royal Arcanum, Boot and Shoe Workers' Union, Shoe Workers' Protective Union, etc., while two literary clubs, the Monday Evening Club and the Fortnightly Club, are noteworthy.

History.— The first settlement of Haverhill was made in June 1640, by twelve men from Newbury and Ipswich, the new settlement being known as Pentucket. In the following year (1641) the Rev. John Ward came from Ipswich to be the minister and leader of the colonists, and so pleased were they with his character, attainments, and zeal that they named the place Haverhill from the older Haverhill in England, which was his birthplace. In 1642 title to the tract of land, 14 miles in length, was obtained by purchase and deed from the Indians, Passaquo and Saggahew. In 1660 the first public school was established, its teacher, Thomas Wasse, his salary £10 a year. For many years Haverhill was a frontier town, and suffered from the forays of the Indians. On 15 March 1697 the savages attacked the house of Thomas Duston, carrying away his wife Hannah, her infant child and her nurse, Mary Neff. The child was soon killed, but Mrs. Duston, taken to an island in the Merrimac River above Concord, N. H., in the night, with the assistance of her nurse and a captive youth, killed the Indians who were guarding her, as they lay asleep, scalped them, and escaped in a canoe, carrying the scalps as proof of her deed. A monument to her in City Hall Park commemorates her heroism. On 29 Aug. 1708 the Indians made a murderous foray upon the centre of the town, setting fire to the church and the houses, killing the Rev. Benjamin Rolfe and 15 others, carrying away about 20 captives, but leaving about 30 of their own number dead. These are the more notable among many Indian attacks upon the place. At the outbreak of the Revolution Haverhill contributed to the patriot cause her quota of men, 74 of her sons being engaged in the battle of Bunker Hill. On 4 Nov. 1789 George Washington visited the town, remaining over night at Harrod's tavern, on the site where the City Hall now is, and paying delightful compliments to the town and its beautiful location. In 1793 a stage coach line was established between Boston and Haverhill, "fare, 3d. a mile," running twice a week. 6 Sept. 1793 the first newspaper printed in the town was published. It was called 'The Guardian of Freedom,' and was issued weekly at nine shillings a year. In 1794 the first bridge across the river was erected. In 1827 the Haverhill Academy was opened, one of the students, John G. Whittier (q.v.), writing an ode for the dedication. In 1828 the Rocks Bridge was completed, and in the same year the steamer Merrimac, the first on the river, began running between Haverhill and Newburyport. In 1837 the railroad, now the Boston & Maine, was extended from Andover to Haverhill. In 1842 certain citizens of Haverhill presented to Congress, through John Quincy Adams (q.v.), the famous petition for the dissolution of the Union, the object being to rebuke the Congressional agitators. In the civil war Haverhill contributed to the Union cause about 1,300 men, her first troops leaving for the front on the day when the Massachusetts Sixth was attacked in Baltimore. To those who fell in that war she erected in 1869 on one of her principal squares a beautiful soldiers' monument. Haverhill became a city in 1869. The old place has suffered from several disastrous fires, one in 1775 which destroyed 17 buildings in the little town; one in 1873, which burned out 35 business houses, and the most disastrous one of 17 Feb. 1882, which burnt out about 300 business firms and destroyed about $2,000,000 worth of property. On 6 Nov. 1888 the City Hall, built in 1861, was gutted by fire, but it was immediately rebuilt.

The shoe and leather industry of Haverhill dates back almost to the time of the first settlement, for in 1643 Job Clement established a tannery, and at about the same time Andrew Greeley practised the trade of shoemaker for the little settlement. In 1679 Benjamin Webster and Samuel Parker were permitted to live in the town and to follow the trade of shoemaker. In 1812 Moses Atwood sent a wagon-load of shoes to Philadelphia, probably the first export of this product from the town. In 1818 a special two-horse wagon was regularly run between Haverhill and Boston for the transportation of shoes, and in 1835 the traffic employed 40 horses and two yoke of oxen. The coming of the railroad to Haverhill in 1837 furnished a better means of transportation and gave new impetus to manufacturing. In 1850 about 50,000 cases of shoes were sent out; in 1860 about 94,000, valued at about $3,750,000. The change in 1870 from town government to city government was coincident with an awakening to new life. Old residential streets were changed to manufacturing centres, old farms and pastures became thickly covered with residences, and in manufacturing the city rapidly grew to be one of the three cities leading in the output of shoes. To-day fully 10 per cent of the total output of shoes in the United States and nearly one-fourth of the total number produced in Massachusetts is made in the Haverhill factories. In 1890 Haverhill celebrated the 250th anniversary of its settlement amid a great gathering of distinguished sons and guests, the address being by the Rev. Samuel H. Duncan, the historical poem by Dr. John Crowell, and the beloved and distinguished son of the town, the poet Whittier, sending as a tribute his beautiful poem, "Haverhill."

Population.— The population of Haverhill (U. S. Census of 1900) is 37,175, an increase from 27,412 in 1890. A part of this increase is due to the annexation of Bradford, the population of which in 1895 was 4,736. Of the present population those born in Canada number 4,054; in Ireland, 2,144; in England, Scotland, and Wales, 671; in Russia, 574; in Italy, 444; and in other foreign countries, 643.

ALBERT L. BARTLETT.

Haverhill, N. H., village, county-seat of Grafton County; on the Connecticut River, and on the Boston & M. railroad; about 70 miles northwest of Concord. The town contains several villages, the largest of which is Haverhill. The surrounding region is largely devoted to agriculture, but the granite quarries in the vicinity add to the industrial wealth of the village. Some of the manufactures are flour, lumber, wagons, furniture, whetstones, made from the stone found nearby, and dairy products. Pop. (1890) 2,545; (1900) 3,414.

Havers, Clopton, English anatomist and physician: b. 1650; d. 1702. After study at Cambridge he proceeded to Utrecht, where he graduated M.D. in 1685. He established himself as a practising physician in London, and acquired a reputation by his profound studies on bone structure, which are exhaustively summarized in his 'Osteologia Nova' (1691). His name is perpetuated in osteology by the technical term "Haversian canals." Among his other works are: 'Researches on the Lachrymal Gland' (1691); 'Survey of the Microcosm' (1695); and 'Discourse on the Concoction of Food' (1699).

Haverschmidt, Francis, Dutch poet: b. Leeuwardien 1835; d. Schiedam 1894. Educated for the Church, he completed his studies at Leyden. He became known as "Piet Paaltjens," the pseudonym under which he published 'Snikken en Grimlachjes' (1867), a collection of poems, six editions of which were sold in two years. He published also 'Familie en Kennissen' (1876), a collection of prose essays.

Haversian (hă-vėr'zian) **Canals.** See BONE.

Hav'erstraw, N. Y., village in Rockland County; on the Haverstraw Bay, a part of the Hudson River, and on the West Shore and the New Jersey & N. Y. R.R.'s; about 30 miles north of New York and 35 miles south of West Point. The first settement was made by the Dutch, who established here, about 1710, a trading post. It became a precinct in 1719, but the town was not incorporated until 1854. A short distance north of the village of Haverstraw, and near West Haverstraw, is the "Old Treason House," the house owned in Revolutionary days by Thomas H. Smith, and the place where Arnold and André met in September 1780, and made all arrangements for the surrender of West Point. Except the addition of a wing, the house is to-day about as it was when Arnold visited it. From the room in which the final arrangements were made, may be seen the Hudson and the opposite shore along which André journeyed toward Tarrytown. The "Haverstraw Community" was organized in Haverstraw in 1825, but remained in existence as a community only a few years. The chief industry of the village is brickmaking. Other manufactures are dynamite, baskets and brickmaking machinery. The village has an excellent high school and a public library. Pop. (1900) 5,935.

Havestad, Bernard, German Jesuit and missionary: b. Cologne 1715; d. Munster 1778. In 1748 he was sent as a missionary to Chile, where he rapidly learned the native dialect. He traveled through the lesser known parts of the country, visiting the Araucanians, the Cuenches, the Huillichos, the Guaicurus, etc., and collected a great mass of interesting information on the customs, the natural productions, statistics, etc., of the region. On the expulsion of his order in 1768, he was arrested and conducted to Lima. He escaped death from shipwreck, and returned to Germany, where he published 'Chilidugu, sive Res Chilenses' (1777).

Havet, Ernest Auguste Eugène, French scholar and philosopher: b. Paris 11 April 1813; d. 1889. As a brilliant student, he received several educational appointments, and in 1840 was called to Paris as professor of Greek literature on the staff of the normal school. In 1855 he was appointed professor of Latin eloquence in the College de France. The chief of his many learned works is 'Christianisme et ses origines' (4 vols., 1871–84).

Hav'iland, John, American architect and engineer: b. England 15 Dec. 1792; d. Philadelphia 28 March 1852. He studied architecture with Elmes in London, subsequently went to Russia with a view of entering the imperial corps of engineers, and in 1816 emigrated to the United States. The Pittsburg penitentiary, one of his earliest works, introduced the radiating form of constructing prisons, which was extensively adopted in the United States and in Europe. Among the principal edifices built after his plans are the halls of justice, better known as the "Tombs" (q.v.), in New York, rebuilt in 1902; the United States naval asylum in Norfolk, Va.; the State penitentiaries of New Jersey, Rhode Island, and Missouri; the United States mint, and the deaf and dumb asylum in Philadelphia; the Pennsylvania insane hospital at Harrisburg, besides numerous churches.

Haviland, William, British soldier: b. Ireland 1739; d. 1784. He served in Ireland during the rebellion of 1845. During the years 1757–8 he fought under Abercromby at Ticonderoga, and also under Amherst. In 1760 he fought his way at the head of 34,000 men through the French lines at Lake Champlain to join Murray and Amherst, who were converging on Montreal. After the capture of Montreal he served in the West Indies and was present at the conquest of Havana in 1762. He was made general in 1783.

Havre, ä-vr, **Le,** France (formerly **Le Havre-de-Grace,** lä-vr-dė gräs), an important commercial and seaport town in the department of Seine-Inferieure, on the north side of the estuary of the Seine, 108 miles by rail northwest of Paris. The town, comparatively modern, is built of brick or stone, with regular, straight, wide and well-cleaned streets. The public buildings include the Church of Notre Dame, in bastard architecture, partly Gothic; the townhouse, formerly the governor's palace; the Palais de Justice; the round tower of Francis I.; the theatre, arsenal, exchange, library, and barracks. Havre has a large commerce, for which it possesses great advantages.

Its harbor is entered by a narrow channel, formed by two long jetties stretching from east to west, and kept clear by constant dredging. This channel leads to the outer harbor, an irregular expanse of no great extent, which is left dry at ebb-tide. Within the *avant port* are

capacious wet-docks, lined with fine quays and extensive warehouses. Havre commands the greater part of the import and export trade of Paris, and of the more important towns in the north of France; importing vast quantities of colonial and other produce, among which cotton holds a most important place; and exporting numerous articles of French manufacture. It is the second port in France, being exceeded only by Marseilles. The average annual tonnage arriving from foreign ports is about 2,260,000, the number of vessels being about 2,200. The manufactures consist of paper, starch, lace, oil, refined sugar, cables, and other marine cordage, sulphuric acid, earthen and stone-ware. There are also breweries, gun factories and electrical works. A government tobacco factory employs 300 workmen; and from the building-yards a great number of sailing vessels and steamers are annually fitted out. In the 15th century Havre became of importance to form a new harbor in consequence of the silting up of that of Harfleur. The project was conceived, and some progress made in it, by Louis XII.; but Havre continued little more than a fishing village till the time of Francis I., who erected numerous works, and at immense expense gained the greater part of the present site of the town from the sea. A citadel was afterward built; and Havre, as a place of strength, became the object of repeated contests between French and English. Pop. (1901) 130,196.

Havre de Grace, hăv'ĕr dē grās, Md., city in Harford County; on the Susquehanna River, near its entrance into Chesapeake Bay; and on the Philadelphia, W. & B. and the Baltimore & O. R.R.'s; about 36 miles east-northeast of Baltimore. It is the south terminus of the Tidewater canal. A small settlement was made here in about 1670. The chief manufactures are flour, sash, doors and blinds, lumber, and canned fruits. The fisheries, especially shad and herring, are important. The trade is principally in the manufactured articles, coal, and fish. A government fish hatchery is located on Battery Island. Pop. (1900) 3,423.

Haw, Battle of the, in the Revolution, 21 Feb. 1781. Henry Lee had been commissioned by Greene to prevent Tory reinforcements coming to Cornwallis, who had taken position at Hillsboro and ordered all good citizens to assist him; and in the course of the movement attempted to surprise Tarleton, whose body of troops was much like his own, with cavalry and infantry. Tarleton had moved; but hearing that about 400 Tories under Col. Pyle were on their way to join him, Lee determined to pass off his own "legion" as Tarleton's and capture them all. Forcing two captured British officers to keep up the deception, he moved forward, with Pickens' and Oldham's companies following, and met two young men who had been sent by Pyle to find Tarleton's camp; he was presented to them as Tarleton, and directed them to have Pyle's men drawn up beside the road while his "weary veterans" passed,—his object being to capture and disarm them all, sending them home unless they wished to join him. The plan succeeded perfectly till, just as he had taken Pyle's hand, part of the Tories discovered Pickens' militia and saw the trap, and at once fired on the American rear; the latter poured in a volley that killed 90 of the enemy at the first fire, and in the melée, despite appeals for quarter, a great number of the rest were killed and the majority wounded. Pyle escaped badly hurt, and the rest of the body dispersed unpursued.

Hawaii, a Territory of the United States; geographically the HAWAIIAN (formerly SANDWICH) ISLANDS, the northeasternmost group of the Pacific, lying in the Tropics (lat. 18° 54′ to 22° 15′ N., lon. 154° 50′ to 160° 30′ W.), 2,100 miles southwest of San Francisco (see HONOLULU for various distances). It consists of seven inhabited islands — Hawaii, Maui, Lanai, Molokai, Oahu, Kauai, and Niihau — and one recently deserted, Kahulaui, with 12 islet rocks and coral reefs visited for eggs and guano. They extend in a line 390 miles northwest from the largest, Hawaii, which contains 4,004 square miles of their total 6,538 (one third of the entire land area of Polynesia). The next, Maui, has 721.9; the third, Oahu, 597.8, is the richest per acre, and contains the capital and chief seaport, Honolulu. Pop. (1900) 153,727.

Topography.— The islands are entirely volcanic, the summits of eruptions from the ocean bed, which sinks from their shores to 3½ miles deep near by; and their surface is a mass of overlapping lava-flows. The volcanic action subsided from the northwest: the last but one southeast, Maui, still shows the vast extinct crater of Haleakala, 10,032 feet above sea-level, 30 miles in circumference, and 3,000 feet deep; and Hawaii, the last, composed largely of three great volcanoes,—one of them, Mauna Kea, 13,805 feet high, the loftiest peak in the Pacific, has one still active, in two places 16 miles apart. Kilauea, with an oval crater nine miles in circumference, 6,000 feet above the sea, is the largest active volcano in the world; and Mauna Loa is one of the largest, with a circular crater 8,000 feet in diameter, and nearly vertical walls 500 to 600 feet high on the inner side. The headlands of the islands are sometimes cliffs overhanging the water even to 2,000 feet high; but there are some plains between the mountains and the sea. The shores are mostly lined with coral reefs, which have to be cut through to make entrance for shipping. The only first-rate harbor is Pearl Harbor north of Honolulu, which, owing to the limitations of the latter, is likely to be utilized. The streams are merely mountain brooks.

Climate and Rainfall.— With thousands of miles of even-temperatured water all around it, the climate of Hawaii, though in the zone of warmth, is also equable and mild; the more calculable that it lies in the region of the northeast trade-winds, blowing nine to ten months in the year. These vapor-laden winds have their moisture precipitated by the huge mountain flanks, so that on the northeast coast there is rain sometimes to the amount of 150 to 200 inches a year; the slopes on that side are heavily forested and swampy, and contain enormous reservoirs of water in volcanic hollows; while the opposite sides are arid. From the different elevations and exposures of the islands, there is enormous variety in the conditions of the different islands, and even different elevations of the same plantation: Oahu averages 42 inches; Honolulu upon it, 19; Hawaii, 120, etc.; and one sugar plantation on a mountain side will have perhaps 80 inches at the top and 15 at the bottom.

Production and Industries.— Hawaiian manufactures, from the lack of coal and metals, are mainly confined to local implements and necessities and the making of sugar. The latter is practically the only manufacture for export, though the one cannery put up 6,200 cases last year. But of $24,992,662 total product in 1899–1900, though $1,107,030 in foundry work was turned out, and about $800,000 in rice and coffee cleaned and milled — nearly all for local use, as well as the carpentering, mason-work, carriages, clothing, etc. — $19,254,773 was in sugar, and $1,150,625 in fertilizers made from sugar dregs. The power for the sugar mills is obtained wholly from burning the bagasse or cane refuse; as no other sugar manufacture in the world can do as much, it makes the Hawaiian the most profitable of all — added to the fact that the juice goes so completely to sugar that no molasses is made, the remainder being thrown into fertilizer, and that the yield per acre is the greatest in the world. Only Japan and Cuba have a greater gross product — 720,553,357 pounds exported in the year ending 30 June 1902. Out of a total export of $24,793,735, only $873,622, or a trifle over 3½ per cent, was of other products than sugar. (These, in order of importance, were coffee, wool, hides and tallow, bananas and pineapples, and rice.) Hence the prosperity of the islands advances or declines with the price and market for this one article. In 1902, though the export increased nearly 30,000,000 pounds, the price had fallen off so that there was a money decrease of some $3,000,000. But the acreage of sugar plantations had risen from 66,673 to 78,618; and extensive irrigation systems are employed. On Oahu there are over 200 artesian wells, pumping 44,000,000 gallons a year; and on Hawaii and Maui flumes have been run from huge natural reservoirs in volcanic pits on the mountains, blasted out with dynamite. The future of the industry and the islands, however, is menaced by a peculiar cause: the apparent impossibility henceforward of obtaining cheap labor, a problem which political and social convictions in the United States at present make an *impasse*. The Hawaiian native will not work; the Anglo-Saxon and most Europeans are too expensive; and the earlier plantations were built up on Portuguese labor, imported from the Azores on three-year contracts. These expired, the Portuguese would not generally re-engage; the Polynesians experimented on were too much like Hawaiians; and then low-grade Japanese and Chinese were engaged — the latter for this purpose the ideal workman, all things considered. After the proclamation of the republic in 1894, the Japanese poured in, to the number of some 50,000 in the next six years. But with the annexation of the islands to the United States, its Chinese exclusion laws were made to apply also to Hawaii; and the treaty of this country with Japan in 1899 shut off that stream of immigration also within a year, almost entirely. Barred out from these supplies, the planters have taken to importing Porto Ricans, but cannot obtain enough. Meantime the older Chinese are dying off or re-emigrating; the planters have advanced wages, but even so the laborers, knowing that the masters dare not discharge them, grow lazy and insubordinate. The planters or their representatives have repeatedly petitioned the United States to allow the Chinese entrance as laborers, agreeing to deport them as soon as they cease to be such; but the act of 29 April 1902, extending specifically the exclusion act to all territory owned by the United States, is an answer that seemingly puts an end to hope.

Meantime steps are being taken to diversify the too limited products. Much of the area is occupied by mountain sides or barren lava-plains, and the rains have washed the soil largely from the upper levels, leaving it fit only for grazing ground. Of the 4,164,000 acres, only 2,600,613 in 1900 were in nominal farms: of these, 717,764 were forest land — a valuable asset, the koa-tree furnishing a beautiful cabinet-wood equal to mahogany, though the once famous sandalwoods are exterminated — 1,597,304 untouched natural grazing ground, and only 294,545 improved. But the coast-plains and valleys have an exceedingly deep rich soil, and under this temperate warmth and plentiful moisture an extraordinary variety of products is cultivable. The one specialty, however, has absorbed the foreign capital which alone can develop industries here; and it is one which demands large capital, while the smaller men have been checked from going into side industries by the slender local market, the same labor difficulties, and till recently the political uncertainty — now exchanged apparently for a much worse certainty. High-grade rice is raised to a great amount, but nearly all consumed by the Chinese on the island. Coffee of the best quality is grown, but not largely; tea is a successful experiment, but only such as yet. The Territorial Bureau of Agriculture and Forestry has introduced the hemp culture, but as yet there are slender returns; ramie or vegetable silk does well, but lacks suitable machinery. The castor-oil bean grows wild, and successful attempts have been made to cultivate it; it has produced as high as 275 gallons of oil an acre, worth 80 to 90 cents a gallon in San Francisco. Fruits and vegetables should have a large future. Bananas and pineapples are already exported; the alligator pear makes a delicious salad dressing, and the mango is valuable for chutney sauce. The orange, lemon, and lime, sour-sop and tamarind, and others, are also promising. A very important product for native use is the taro-root, out of which *poi* is made; and another is the *ti*, from which they make an intoxicating drink. The cattle and sheep raising on the upland pastures is increasingly absorbed in local use, though some hides and wool are exported. Honey and wax are also sent out.

Commerce.—The exports have already been mentioned. The imports are mainly of coal, machinery and hardware, lumber, clothing and its materials, and foodstuffs. Over three fourths are from the United States. In 1900, 665 vessels cleared from Hawaiian ports, aggregating 867,905 tons, against 386 with 447,997 tons in 1886.

Transportation.— For steamship lines, see Honolulu. There are about 150 miles of railroad on the islands, in three lines: the chief is the Oahu Railway and Land Company, out from Honolulu, the others on Hawaii and Maui. The three have also telegraph systems, and there is a cable between Hawaii and Oahu. The Marconi system was installed in 1901. Honolulu has telephones, and excellent electric street railways.

Finances.— The United States assumed the most of the Hawaiian debt on annexation. The remainder, on 1 Jan. 1903, was $939,970.31. The assessed valuation varies with the profits of the sugar industry, but was $121,172,929 in 1902, an increase from about $33,000,000 in 1892. The taxes are on real and personal property (limited to 1 per cent), a 2 per cent income tax, and internal revenue and customs dues. The total revenue is upward of $2,500,000 a year; the expenditures included $376,496.26 for schools, and $106,077.25 for judiciary.

Education.— There is a good free-school system, graded, with compulsory attendance from 6 to 15; and there are night, industrial, and high schools. The instruction is in English. Clergymen are ineligible for school commissioners. In 1902 there were 143 public schools, with 380 teachers and 17,518 pupils, and 54 private schools, with 229 teachers and 4,329 pupils. Of the teachers, 329 were American, 56 British, and 149 Hawaiian and mixed blood. The private schools are generally endowed, as Oahu College, or managed by religious orders, as St. Louis College (Catholic). The educational problem is complicated by the extraordinary mixture of races: there were 4,903 Hawaiian children, 2,869 half-breed, 4,124 Portuguese, 1,993 Japanese, 1,395 Chinese, 812 American, 596 Porto Rican, and 337 German.

Charitable Institutions.— The chief is the leper settlement, on a peninsula of Molokai; there are about 900 lepers here, but they are decreasing. Part of them are self-supporting (the settlement manages its own internal affairs), but the government maintains the rest.

Religion.— The Chinese and Japanese retain their own religions; the natives are nominally Christians, but little more than nominally, either in beliefs or morals. The Portuguese are Catholic; the rest of the Europeans and the Americans mainly Protestant. There are some 4,000 Mormons.

Population.— The United States estimates for 1890 and 1900 were as follows:

	1900	1890
Hawaiians	29,834	34,436
Part Hawaiians	7,835	6,186
Caucasians	28,533	21,300
Chinese	25,742	15,300
Japanese	61,122	12,360
Polynesians	407	409
Negroes	254	.....
Total	153,727	89,991

The actual returns in 1900 raise these figures to 154,001; males, 106,369; females, 47,632. The Caucasians consisted of 12,061 born in Hawaii, 4,068 in the United States, 12,357 in other countries, 6,512 being Portuguese. Of the islands, Hawaii had 46,843; Oahu (including the city of Honolulu, 39,306), 54,504; Maui, 25,416; Kauai and Niihau, 20,734; Molokai and Lanai, 2,504. The Hawaiian natives have steadily diminished. Cook in 1778 estimated them at 400,000, not now credited; the missionaries in 1823, 142,000; in 1872 (local census), 49,044; 1900, 29,834.

History.— The islands, though scatteringly seen by white men since 1542, were first discovered and made known as a group by Capt. James Cook in 1778, and named the Sandwich Islands. Their inhabitants were in the feudal stage of semi-civilization. In 1792 Vancouver brought them cattle and taught them ship-building; and early in the 19th century the American fur-ships from the Pacific coast started a great sandalwood trade with them, which furnished them firearms and enabled Kamehameha I. of Hawaii to conquer the other islands. He founded a dynasty only just ended. His widow abolished the heathen rites about 1820; and just then American missionaries introduced Christianity, the Ten Commandments being proclaimed 1825. In 1840 a constitution was granted; in 1846 feudalism was abolished; in 1852 a legislature and full suffrage established, again restricted by a royal proclamation in 1864. In 1872 the direct royal line became extinct. In 1874 Kalakaua was chosen king by the legislature; he headed a native reaction to restore heathenism, and in 1887 the civilized element forced him to sign a new constitution. He and his sister Liliuokalani intrigued to overturn it by violence, and were defeated. In 1891 Liliuokalani succeeded him, and bent her energies to abrogating the constitution and restoring heathen rites; in January 1893 the civilized party dethroned her, by aid of the United States minister, John L. Stevens, who placed the islands under the protection of the United States. President Harrison sent an annexation treaty to the Senate; President Cleveland withdrew it, and sent a commissioner, James H. Blount (q.v.), to the islands, on whose report negotiations were opened to restore the queen; but her own vindictiveness made it as impossible as it was on other grounds undesirable, and on 4 July 1894 Hawaii was proclaimed a republic with Sanford B. Dole President. Negotiations for annexation were renewed; on 7 July 1898 Congress passed a resolution in its favor, and on 12 August it became a part of the United States. On 14 June 1900 it was organized as a Territory, with S. B. Dole Governor. Its difficult political future is shown by the table of populations, though the situation is even worse: of 79,607 adult males in 1900, not above 10,000 or 12,000 are fit for suffrage.

Haweis, hois, **Hugh Reginald,** English author and Anglican clergyman: b. Egham, Surrey, 3 April 1839; d. London 29 Jan. 1901. He was graduated at Cambridge University, in 1859; served under Garibaldi at the siege of Capua and in 1860 became curate of Saint James' Church, Marylebone, London. Here began his striking and somewhat eccentric career as an educational theorist, who sometimes seemed in danger of sacrificing his professional pledges to secularism. His influence was rather that of an intellectualist than of a dogmatic teacher of Christianity, but his sane views of social and moral obligation, his sympathetic philanthropy, his rare literary gifts and powers of exposition did much to quicken the pulse of spiritual life in London and elsewhere. He often lectured at the Royal Institution, and was Lowell lecturer in Boston, Mass., in 1885. His versatile and discursive mind is reflected in the range of his works. He wrote: 'Music and Morals' (1871), which was widely circulated in America; 'American Humorists' (1883); 'Christ and Christianity' (1887); 'The Broad Church' (1891); 'Travel and Talk' (1897); 'Old Violins' (1898); etc.

Hawes' Shop, Cavalry Engagement Near. Gen. Grant had crossed to the south bank of

the North Anna, in Virginia, and finding Gen. Lee too strongly posted to be attacked, and his own army in a false and critical position, he withdrew, on the night of 26 May 1864, to the north bank, and moved down the north bank of the Pamunkey to turn Lee's right. Torbert's and Gregg's divisions of cavalry, under Sheridan, together with the Sixth corps, led the advance. Torbert crossed the Pamunkey at Hanover Ferry on the 27th, after considerable skirmishing in which he took about 60 prisoners, and the two cavalry divisions, supported by Russell's division of infantry, pushed on to Hanover Town and bivouacked for the night. On the morning of the 28th Sheridan was directed to make a demonstration and discover the enemy's position. Gregg's division, advancing on the Mechanicsville road, encountered the two cavalry divisions of Wade Hampton and Fitzhugh Lee and Butler's South Carolina cavalry brigade about a mile beyond Hawes' Shop. The Confederate cavalry was dismounted and had thrown up a barricade of rails covering the road. Gregg attacked, and there ensued one of the most severe cavalry engagements of the War, which continued several hours, neither side yielding ground. Finally, late in the day, Custer's brigade of Torbert's division came up, dismounted, took position in the centre of Gregg's line, formed in close column of attack, the whole line charged and, after a hard struggle at close quarters, the Confederates were driven from position and retreated upon their infantry at the Totopotomoy. Gregg's loss was 256 killed and wounded; the entire Union loss was 44 killed and 306 wounded. The Confederate loss is not known. Consult: 'Official Records,' Vol. XXXVI.; Humphreys, 'The Virginia Campaign of 1864–5'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

E. A. Carman.

Hawesville, hâz'vĭl, Ky., city, county-seat of Hancock County; on the Ohio River, and on the Louisville, H. & S. T. L. railroad; about 65 miles above Evansville, Ind.; and 80 miles west by south from Louisville. It is situated in an agricultural and coal-mining region. Its chief manufactures are flour, lumber, and furniture. It has a number of tobacco factories or stemmeries, and its trade is chiefly in tobacco, coal, articles of home manufacture, and agricultural products. Pop. (1900) 1,041.

Haw'finch, one of the largest of European finches (*Coccothraustes vulgaris*), so called in England from the belief that it subsisted principally on the fruit of the hawthorn. It resembles the chaffinch in color, but is distinguished by its enormous beak and larger size. It feeds on all kinds of berries.

Hawk, a general name for diurnal birds of prey not eagles or vultures. See Falcon, and the names of various groups and species, as Hen-hawks, Sparrow-hawk and the like: also Falconry.

Hawk-moths, a family of large moths forming the family *Sphingidæ*. They have stout bodies, large heads with prominent eyes, and thick spindle-shaped antennæ, ending in a hook. The fore-wings are long, narrow, more or less pointed, and always much longer than the hind-wings. They are insects of rapid flight, and dart about in the twilight; some species also during the day. Their caterpillars are hairless, smooth, often green, with transverse stripes on the sides and nearly always a horn on the back of the second last segment, and always have ten prolegs. They are leaf-eaters and often greatly destructive to cultivated plants, the tomato-worm (q.v.) being a prominent example. They change to pupæ either on the surface of the ground or in a cell underground, but make no cocoon. Some of the South American species resemble humming-birds so closely, especially when poising before a flower on whirring wings and sucking its nectar, that they can hardly be distinguished, and popular belief asserts that the one is transmutable into the other. A great number of forms exist in all parts of the world, the United States having about 100 species. All are plainly dressed in grays and browns, and one of the most remarkable is the death's-head (q.v.).

Hawkbit, a genus (*Leontodon*) of composite plants closely related to the dandelion, from which they differ in having feathery pappus. The name is due to the peculiar shape of the lacerations of the leaves. Several species are natives of Europe and Russian Asia.

Hawke, Edward, Lord, English sailor: b. London 1705; d. Sunbury-on-Thames 17 Oct. 1781. Early in 1720 Hawke entered the navy and was appointed in 1733 to the command of the Wolf. Being promoted to the command of a squadron in 1847 he totally defeated the French fleet off Belle Isle. In 1759 he was sent in pursuit of the Brest fleet, which he came up with in Quiberon Bay, and signally defeated. He now received a pension of £2,000, and in 1768 became admiral of Great Britain and commander-in-chief of the fleet. From 1766 to 1771 he was first lord of the admiralty. In 1776 he was advanced to a seat in the House of Lords by the style of Baron Hawke of Towton.

Haw'ker, Mary Elizabeth, English novelist: b. 1865. Under the pseudonym of "Lanoe Falconer" she has written the well known novel 'Mademoiselle Ixe' (1890); which was followed by 'The Hotel d'Angleterre' (1891) and 'Cecilia de Noel' (1891).

Hawkesbury, hâks'ber-ĭ, Canada, village in Prescott County, Ontario; on the Ottawa River, and a terminus of a branch of the Canada Atlantic Railway, 50 miles west of Montreal. It has ferry communication with Grenville, across the river. Its chief industrial establishments are flour mills, a woolen factory, and large saw and planing mills. It has an extensive lumber trade. Pop. (1901) 4,150.

Hawk'eye State, Iowa — so named after a famous Indian warrior.

Hawking. See Falconry.

Haw'kins, Anthony Hope, English novelist, known by the pen-name "Anthony Hope"; b. London 9 Feb. 1863. He was educated at Balliol College, Oxford, was admitted to the bar at the Middle Temple in 1887, and practised until 1894 on the London and Midland circuit. He contested South Bucks as a Liberal in 1892, but unsuccessfully. In 1894 he achieved a striking literary success with his 'Prisoner of Zenda,' with scene in an imaginary independent state of South Germany. Other books of his are: 'The Dolly Dialogues' (1894), cited as models of keen if somewhat shallow repartee;

'The Chronicles of Count Antonio' (1895); 'Rupert of Hentzau' (1898); and 'The Intrusions of Peggy' (1902).

Hawkins, Hamilton Smith, American military officer: b. South Carolina 1834. He entered the army in 1861, was made captain in the 6th infantry in 1863, and brevetted major in October 1865. In 1888 he became commandant at West Point, and in 1894 was promoted colonel. When war was declared against Spain (1898) he went to the front as a brigadier-general of volunteers. He led the desperate and now historic charge at San Juan, Cuba, 2 July 1898, and was made major-general of volunteers, 8 July 1898.

Haw'kinsville, Ga., village, county-seat of Pulaski County; on the Ocmulgee River, at the head of navigation, and on a branch of the Macon & B. railroad; about 48 miles south of Macon. It is situated in a fertile agricultural region. It has a cotton factory, cotton compresses, cotton gins, cottonseed-oil mills, barrel factories, carriage and wagon works. Its trade is chiefly in cotton, lumber, fruits, and vegetables. Pop. (1900) 2,103.

Hawksbeard, a perennial composite plant allied to hawkweed, but of the genus *Crepis,* about 150 species of which are known in the northern hemisphere. Several are European weeds which have become naturalized in the United States, and there are several native species. The flowers are dandelion-like and yellow or orange.

Hawksbill, a great marine turtle (*Chelone imbricata*) allied to the green turtle, but which has the plates of the shell overlapping; and these plates form the tortoise-shell (q.v.) of commerce. The flesh is not good for eating, but the eggs are good. The animal inhabits the Indian Ocean, the Pacific, and the warmer parts of the Atlantic. This is one of the sea-turtles called "caret," but that term belongs more properly to the loggerhead. See TURTLE.

Hawkweed, or **Rattlesnake Weed,** a genus (*Hieracium*) of composite plants with mottled, radical leaves, tall hairy stems and yellow or orange flowers. One species, the European orange hawkweed (*H. aurantiacum*) is frequently cultivated for the sake of its fine orange flowers. The name "hawkweed" in English, and various similar names in use among the peasants of continental Europe, are based on an ancient belief that birds of prey used the juice of the species to strengthen their vision. Several species grow numerously in the United States, where they are called "rattlesnake weeds" and are believed to be of value in curing the poison of snakes.

Hawk'wood, SIR **John de,** English soldier: b. Hedingham Sibil, Essex: d. Florence, Italy, 17 March 1394. He was styled by Hallam the first distinguished commander who had appeared in Europe since the destruction of the Roman Empire. It is said that he fought at Crécy and Poitiers, and for his bravery was knighted by Edward III. However that may be, in 1359 he was the leader of a troop of free lances, preying upon France and northern Italy. With this band, the "White Company," he served the Marquis of Montferrat, later the Republic of Pisa, and still later Florence, upon whose side he oftenest fought in the civil disturbances of Italy. As commander-in-chief he directed the successful war against Milan (1390-2). He was pensioned by the Florentines and entombed with great ceremony in the Duomo.

Haw'ley, Gideon, American missionary to the Indians: b. Stratfield, now Bridgeport, Conn., 5 Nov. 1727; d. Marshpee, Mass., 3 Oct. 1807. He was graduated at Yale College in 1749, and commenced his labors at Stockbridge in 1752, opening a school at that place, in which he instructed a number of Mohawk, Oneida, and Tuscarora families. In 1754, under the patronage of Sir William Johnson, he began a mission among the Iroquois, or Six Nations, on the Susquehanna River; but in 1756 was obliged by the disturbances of the French war to leave that region, when he became a chaplain in the army marching against Crown Point. The campaign being over, he re-engaged in his missionary work at Marshpee, where he was installed as pastor in 1758, and there passed the remainder of his life in his benevolent labors.

Hawley, Joseph, American statesman: b. Northampton, Mass., 1724; d. 10 March 1788. He was graduated at Yale College, and followed the profession of law at Northampton, in which he rose to eminence. At the time of the disputes between Great Britain and America, he took a prominent part in advocating the cause of the colonies. "We must fight," he wrote to the delegates of Massachusetts, "if we cannot otherwise rid ourselves of British taxation. The form of government enacted for us by the British parliament is evil against right, utterly intolerable to every man, who has any idea or feeling of right or liberty." He was several times elected a member of the council, but declined, preferring to enter the State legislature, of which he was a member 1764–6.

Hawley, Joseph Roswell, American politician and legislator: b. Stewartsville, N. C., 31 Oct. 1826; d. Washington, D. C., 17 March 1905. He was graduated at Hamilton College, Clinton, N. Y., 1847, and began the practice of law at Hartford, Conn., in 1850. The Republican party in Connecticut was organized in the office of the *Charter Oak,* of which he was the editor. He afterward became editor of the Hartford *Evening Post,* the new Republican paper. When the Civil War broke out he recruited the first company of volunteers raised in the State — Company A of the 1st Connecticut regiment — of which he took command. He saw service throughout the whole war and was mustered out in 1866 with the brevet rank of major-general. He was elected governor of Connecticut the same year. In 1872 he was elected to Congress; at the end of the term, 1879–81, was sent to the United States Senate, to which he was re-elected 1887, 1893, and 1899.

Hawley, Pa., borough in Wayne County; on the Lackawaxen River, and on the main line or branches of the Pennsylvania, the Delaware & H., and the Erie R. R.'s; about nine miles south-southeast of Honesdale. Its chief manufacturing establishments are a glass-factory, a glass-cutting factory and a silk-factory. In addition to its trade in home manufactures, it has an extensive coal trade, and ships a considerable quantity of farm products. Pop. 2,128.

Haworth, Adrian Hardy, English naturalist: b. at Hull in 1767; d. there 16 Jan. 1833. He was educated for the law, but did not

practice, devoting his time to entomology and botany. He was the founder of the Entomological Society of London, a member of the Linnæan Society, and the Hull Botanical Gardens were planned by him, and laid out under his direction. His collections were large and important and his works are still standard. He wrote: 'Observations on the Genus Mesembryanthemum' (1794); 'Prodromus Lepidopterorum Britannicorum' (1802); and 'Synopsis Plantarum Succulentarum' (1812); and many minor papers.

Haworth, hâ'wêrth, **Joseph,** American actor: b. Providence, R. I., 1855; d. 29 Aug. 1903. His first appearance was as a member of Ellsler's stock company at Cleveland, Ohio, and subsequently he supported Edwin Booth, Lawrence Barrett, and John McCullough. From 1883 he toured for several years as a star in 'The Bells,' 'The Leavenworth Case,' 'Hamlet,' and other productions; in 1896–8 was Macbeth to Modjeska's Lady Macbeth, and later Storm in Caine's 'Christian,' Vinicius in Stange's adaptation of Sienkiewicz's 'Quo Vadis,' and Cassius in the Mansfield presentation of 'Julius Cæsar.'

Hawser, a manila or wire rope used in mooring or towing boats, etc., over four or three inches in circumference respectively. The name is now usually applied to all large ropes, though formerly it signified ropes "hawser-laid," that is, with three "plain-laid," three-stranded ropes laid up left-handed, now usually called a cable-laid rope.

Hawthorn, or **White Thorn** (*Cratægus oxyacantha*), a small spiny European tree, rising sometimes to the height of 20 to 25 feet, much admired for the beauty of its foliage. The leaves are smooth, shining, more or less deeply lobed, and of a beautiful green color; the flowers are white, sometimes with a reddish tinge, disposed in corymbs, and possess an agreeable perfume. The species of *Cratægus* are about 50 in number, all shrubs or small trees, spiny, with red fruit resembling in miniature that of the apple, from which plant they are distinguished chiefly by their seeds, and are arranged with it in the family *Rosaceæ*. Fifteen species are recognized in North America. When young the hawthorn springs up rapidly, a shoot of a single year being sufficient for a walking-stick. It thus, if well pruned and kept down, quickly grows into a thick and intricately woven hedge.

Hawthorne, hâ'thôrn, **Julian,** American novelist and journalist, son of Nathaniel Hawthorne (q.v.): b. Boston, Mass., 22 June 1846. He was graduated from Harvard University in 1867 and afterward studied civil engineering in Dresden, but soon forsook this occupation for literature. His first successful story was 'Bressant' (1872), the forerunner of a long list of novels, of which may be particularized 'Garth' (1875); 'Sebastian Strome' (1884); 'Archibald Malmaison' (1884); 'A Fool of Nature' (1896). He has also published 'Saxon Studies' (1876); and 'Nathaniel Hawthorne and His Wife' (1885). His best work suggests more than one element that distinguishes his father's stories. There is a psychologic accent, the touch of mystery, and the avoidance of the stock properties of romance.

Hawthorne, Nathaniel, American novelist: b. Salem, Mass., 4 July 1804; d. Plymouth, N. H., 19 May 1864. The founder of the family in America was William Hathorne (as the name was then spelled), a typical Puritan and a public man of importance. John, his son, was a judge, one of those presiding over the witchcraft trials. Of Joseph in the next generation little is said, but Daniel, next in descent, followed the sea and commanded a privateer in the Revolution, while his son Nathaniel, father of the romancer, was also a sea captain. This pure New England descent gave a personal character to Hawthorne's presentations of New England life; when he writes of the strictness of the early Puritans, of the forests haunted by Indians, of the magnificence of the provincial days, of men high in the opinion of their townspeople, of the reaching out to far lands and exotic splendors, he is expressing the stored-up experience of his race. His father died when Nathaniel was but four and the little family lived a secluded life with his mother. He was a handsome boy and quite devoted to reading, by an early accident which for a time prevented outdoor games. His first school was with Dr. Worcester, the lexicographer. In 1818 his mother moved to Raymond, Maine, where her brother had bought land, and Hawthorne went to Bowdoin College. He entered college at the age of seventeen in the same class with Longfellow. In the class above him was Franklin Pierce, afterward 12th President of the United States. On being graduated in 1825 Hawthorne determined upon literature as a profession, but his first efforts were without success. 'Fanshawe' was published anonymously in 1828, and shorter tales and sketches were without importance. Little need be said of these earlier years save to note that they were full of reading and observation. In 1836 he edited in Boston the 'American Magazine for Useful and Entertaining Knowledge,' but gained little from it save an introduction to 'The Token,' in which his tales first came to be known. Returning to Salem he lived a very secluded life, seeing almost no one (rather a family trait), and devoted to his thoughts and imaginations. He was a strong and powerful man, of excellent health and, though silent, cheerful, and a delightful companion when he chose. But intellectually he was of a separated and individual type, having his own extravagances and powers and submitting to no companionship in influence. In 1837 appeared 'Twice Told Tales' in book form: in a preface written afterwards Hawthorne says that he was at this time "the obscurest man of letters in America." Gradually he began to be more widely received. In 1839 he became engaged to Miss Sophia Peabody, but was not married for some years. In 1838 he was appointed to a place in the Boston custom house, but found that he could not easily save time enough for literature and was not very sorry when the change of administration put him out of office. In 1841 was founded the socialistic community at Brook Farm: it seemed to Hawthorne that here was a chance for a union of intellectual and physical work, whereby he might make a suitable home for his future wife. It failed to fulfill his expectations and Hawthorne withdrew from the experiment. In 1842 he was married and moved with his wife to the Old Manse at Concord just above the historic

bridge. Here chiefly he wrote the 'Mosses of an Old Manse' (1846). In 1845 he published a second series of 'Twice Told Tales'; in this year also the family moved to Salem, where he had received the appointment of surveyor at the custom house. As before, official work was a hindrance to literature; not till 1849 when he lost his position could he work seriously. He used his new-found leisure in carrying out a theme that had been long in his mind and produced 'The Scarlet Letter' in 1850. This, the first of his longer novels, was received with enthusiasm and at once gave him a distinct place in literature. He now moved to Lenox, Mass., where he began on 'The House of Seven Gables,' which was published in 1851. He also wrote 'A Wonder-Book' here, which in its way has become as famous as his more important work. In Dec. 1851 he moved to West Newton, and shortly to Concord again, this time to the Wayside. At Newton he wrote 'The Blithedale Romance.' Having settled himself at Concord in the summer of 1852, his first literary work was to write the life of his college friend, Franklin Pierce, just nominated for the Presidency. This done he turned to 'Tanglewood Tales,' a volume not unlike the 'Wonder-Book.' In 1853 he was named consul to Liverpool: at first he declined the position, but finally resolved to take this opportunity to see something of Europe. He spent four years in England, and then a year in Italy. As before, he could write nothing while an official, and resigned in 1857 to go to Rome, where he passed the winter, and to Florence, where he received suggestions and ideas which gave him stimulus for literary work. The summer of 1858 he passed at Redcar, in Yorkshire, where he wrote 'The Marble Faun.' In June 1860 he sailed for America, where he returned to the Wayside. For a time he did little literary work: in 1863 he published 'Our Old Home,' a series of sketches of English life and planned a new novel, 'The Dolliver Romance,' also called 'Pansie.' But though he suffered from no disease his vitality seemed relaxed: some unfortunate accidents had a depressing effect, and in the midst of a carriage trip into the White Mountains with his old friend, Franklin Pierce, he died suddenly at Plymouth, N. H., early in the morning, 19 May 1864.

The works of Hawthorne consist of novels, short stories, tales for children, sketches of life and travel, and some miscellaneous pieces of a biographical or descriptive character. Besides these there were published after his death extracts from his notebooks. Of his novels 'The Scarlet Letter' is a story of old New England: it has a powerful moral idea at bottom, but it is equally strong in its presentation of life and character in the early days of Massachusetts. 'The House of Seven Gables' presents New England life of a later date: there is more of careful analysis and presentation of character and more description of life and manners, but less moral intensity. 'The Blithedale Romance' is less strong: Hawthorne seems hardly to grasp his subject. It makes the third in what may be called a series of romances presenting the molding currents of New England life: the first showing the factors of religion and sin, the second the forces of hereditary good and evil, and the third giving a picture of intellectual and emotional ferment in a society which had come from very different beginnings. 'Septimius Felton,' finished in the main but not published by Hawthorne, is a fantastic story dealing with the idea of immortality. It was put aside by Hawthorne when he began to write 'The Dolliver Romance,' of which he completed only the first chapters. 'Dr. Grimshaw's Secret' (published in 1882) is also not entirely finished. These three books represent a purpose that Hawthorne never carried out. He had presented New England life, with which the life of himself and his ancestry was so indissolubly connected, in three characteristic phases. He had traced New England history to its source. He now looked back across the ocean to the England he had learned to know, and thought of a tale that should bridge the gulf between the old world and the new. But the stories are all incomplete and should be read only by the student. The same thing may be said of 'Fanshawe,' which was published anonymously early in Hawthorne's life and later withdrawn from circulation. 'The Marble Faun' presents to us a conception of the old world at its oldest point. It is Hawthorne's most elaborate work, and if every one were familiar with the scenes so discursively described, would probably be more generally considered his best. Like the other novels its motive is based on the problem of evil, but we have not precisely atonement nor retribution, as in his first two novels. The story is one of development, a transformation of the soul through the overcoming of evil. The four novels constitute the foundation of Hawthorne's literary fame and character, but the collections of short stories do much to develop and complete the structure. They are of various kinds, as follows: (1) Sketches of current life or of history, as 'Rills from the Town Pump,' 'The Village Uncle,' 'Main Street,' 'Old News.' These are chiefly descriptive and have little story; there are about twenty of them. (2) Stories of old New England, as 'The Gray Champion,' 'The Gentle Boy,' 'Tales of the Province House.' These stories are often illustrative of some idea and so might find place in the next set. (3) Stories based upon some idea, as 'Ethan Brand,' which presents the idea of the unpardonable sin; 'The Minister's Black Veil,' the idea of the separation of each soul from its fellows; 'Young Goodman Brown,' the power of doubt in good and evil. These are the most characteristic of Hawthorne's short stories: there are about a dozen of them. (4) Somewhat different are the allegories, as 'The Great Stone Face,' 'Rappacini's Daughter,' 'The Great Carbuncle.' Here the figures are not examples or types, but symbols, although in no story is the allegory consistent. (5) There are also purely fantastic developments of some idea, as 'The New Adam and Eve,' 'The Christmas Banquet,' 'The Celestial Railroad.' These differ from the others in that there is an almost logical development of some fancy, as in case of the first the idea of a perfectly natural pair being suddenly introduced to all the conventionalities of our civilization. There are perhaps twenty of these fantasies. Hawthorne's stories from classical mythology, the 'Wonder-Book' and 'Tanglewood Tales,' belong to a special class of books, those in

which men of genius have retold stories of the past in forms suited to the present. The stories themselves are set in a piece of narrative and description which gives the atmosphere of the time of the writer, and the old legends are turned from stately myths not merely to children's stories, but to romantic fancies. Mr. Pringle in 'Tanglewood Fireside' comments on the idea: "Eustace," he says to the young college student who had been telling the stories to the children, "pray let me advise you never more to meddle with a classical myth. Your imagination is altogether Gothic and will inevitably Gothicize everything that you touch. The effect is like bedaubing a marble statue with paint. This giant, now! How can you have ventured to thrust his huge disproportioned mass among the seemly outlines of Grecian fable?" "I described the giant as he appeared to me," replied the student. "And, sir, if you would only bring your mind into such a relation to these fables as is necessary in order to remodel them, you would see at once that an old Greek has no more exclusive right to them than a modern Yankee has. They are the common property of the world and of all time" ('Wonder-Book,' p. 135). 'Grandfather's Chair' was also written primarily for children and gives narratives of New England history, joined together by a running comment and narrative from Grandfather, whose old chair had come to New England, not in the Mayflower, but with John Winthrop and the first settlers of Boston. 'Biographical Stories,' in a somewhat similar framework, tells of the lives of Franklin, Benjamin West and others. It should be noted of these books that Hawthorne's writings for children were always written with as much care and thought as his more serious work. 'Our Old Home' was the outcome of that less remembered side of Hawthorne's genius which was a master of the details of circumstance and surroundings. The notebooks give us this also, but the American notebook has also rather a peculiar interest in giving us many of Hawthorne's first ideas which were afterwards worked out into stories and sketches.

One element in Hawthorne's intellectual make-up was his interest in the observation of life and his power of description of scenes, manners and character. This is to be seen especially, as has been said, in his notebooks and in 'Our Old Home,' and in slightly modified form in the sketches noted above. These studies make up a considerable part of 'Twice Told Tales' and 'Mosses from an Old Manse,' and represent a side of Hawthorne's genius not always borne in mind. Had this interest been predominant in him we might have had in Hawthorne as great a novelist of our everyday life as James or Howells. In the 'House of Seven Gables' the power comes into full play: 100 pages hardly complete the descriptions of the simple occupations of a single uneventful day. In Hawthorne, however, this interest in the life around him was mingled with a great interest in history, as we may see, not only in the stories of old New England noted above, but in the descriptive passages of 'The Scarlet Letter.' Still we have not, even here, the special quality for which we know Hawthorne. Many great realists have written historical novels, for the same curiosity that absorbs one in the affairs of everyday may readily absorb one in the recreation of the past. In Hawthorne, however, was another element very different. His imagination often furnished him with conceptions having little connection with the actual circumstances of life. The fanciful developments of an idea noted above (5) have almost no relation to fact: they are "made up out of his own head." They are fantastic enough, but generally they are developments of some moral idea and a still more ideal development of such conceptions was not uncommon in Hawthorne. 'Rappacini's Daughter' is an allegory in which the idea is given a wholly imaginary setting, not resembling anything that Hawthorne had ever known from observation. These two elements sometimes appear in Hawthorne's work separate and distinct just as they did in his life: sometimes he secluded himself in his room, going out only after nightfall; sometimes he wandered through the country observing life and meeting with everybody. But neither of these elements alone produced anything great, probably because for anything great we need the whole man. The true Hawthorne was a combination of these two elements, with various others of personal character, and artistic ability that cannot be specified here. The most obvious combination between these two elements, so far as literature is concerned, between the fact of external life and the idea of inward imagination, is by a symbol. The symbolist sees in everyday facts a presentation of ideas. Hawthorne wrote a number of tales that are practically allegories: 'The Great Stone Face' uses facts with which Hawthorne was familiar, persons and scenes that he knew, for the presentation of a conception of the ideal. His novels, too, are full of symbolism. 'The Scarlet Letter' itself is a symbol and the rich clothing of Little Pearl, Alice's posies among the Seven Gables, the old musty house itself, are symbols, Zenobia's flower, Hilda's doves. But this is not the highest synthesis of power, as Hawthorne sometimes felt himself, as when he said of 'The Great Stone Face,' that the moral was too plain and manifest for a work of art. However much we may delight in symbolism it must be admitted that a symbol that represents an idea only by a fanciful connection will not bear the seriousness of analysis of which a moral idea must be capable. A scarlet letter A has no real connection with adultery, which begins with A and is a scarlet sin only to such as know certain languages and certain metaphors. So Hawthorne aimed at a higher combination of the powers of which he was quite aware, and found it in figures and situations in which great ideas are implicit. In his finest work we have, not the circumstance before the conception or the conception before the circumstance, as in allegory. We have the idea in the fact, as it is in life, the two inseparable. Hester Prynne's life does not merely present to us the idea that the breaking of a social law makes one a stranger to society with its advantages and disadvantages. Hester is the result of her breaking that law. The story of Donatello is not merely a way of conveying the idea that the soul which conquers evil, thereby grows strong in being and life. Donatello himself is such a soul growing and developing. We cannot get the idea without the fact, nor the fact without the idea.

This is the especial power of Hawthorne, the power of presenting truth implicit in life. Add to this his profound preoccupation with the problem of evil in this world, with its appearance, its disappearance, its metamorphoses, and we have a clue to Hawthorne's greatest works. In 'The Scarlet Letter,' 'The House of Seven Gables,' 'The Marble Faun,' 'Ethan Brand,' 'The Gray Champion,' the ideas cannot be separated from the personalities which express them. It is this which constitutes Hawthorne's lasting power in literature. His observation is interesting to those that care for the things that he describes, his fancy amuses, or charms or often stimulates our ideas. His short stories are interesting to a student of literature because they did much to give a definite character to a literary form which has since become of great importance. His novels are exquisite specimens of what he himself called the romance, in which the figures and scenes are laid in a world a little more poetic than that which makes up our daily surrounding. But Hawthorne's really great power lay in his ability to depict life so that we are made keenly aware of the dominating influence of moral motive and moral law.

Bibliography.—Hawthorne's life has been written by G. P. Lathrop (library edition of his works), by Henry James ('English Men of Letters'), and by Moncure D. Conway ('Great Writers' Series'). Consult also: 'Memorials of Hawthorne,' by Rose Hawthorne Lathrop. Criticism will be found in G. W. Curtis, 'Literary and Social Studies'; T. W. Higginson, 'Short Studies of American Authors'; Leslie Stephen, 'Hours in a Library'; W. D. Howells, 'My Literary Passions'; J. T. Fields, 'Yesterdays With Authors'; R. H. Hutton, 'Essays in Literary Criticism.'

Edward Everett Hale, Jr.,
Professor of English, Union College, Schenectady, N. Y.

Hawtrey, Charles Henry, English actor, playwright, and manager: b. Eton, 1858, son of Rev. John Hawtrey. He was educated at Rugby and Oxford, becoming an actor when he was twenty-three years old. His greatest success was in 'The Private Secretary,' adapted from Von Moser's 'Der Bibliothekar,' first produced in Cambridge in 1883, and played 844 consecutive times. Other plays in which he has been unusually successful are 'Jane,' 'Mr. Martin,' 'A Message from Mars,' and 'The Man from Blankley's.' With the last two plays he several times visited the United States. For several years he has controlled the Comedy and Avenue theaters in London.

Haxo's System, a style of fortification introduced by Baron François Nicolas Benoit Haxo, a French military engineer, employed by Napoleon and put in command at the siege of Antwerp in 1832. His casemated batteries have earthen parapets along their front, and their arches are mantled with earth. The apertures in front of the guns open into embrasures formed in an extension of the parapet at these points beyond its ordinary retired position. Being open in the rear the circulation of air obviates the inconvenience of confined smoke. This method of construction is now pretty generally adopted.

Hay, George, Scottish artist: b. Edinburgh. At 17 he entered the architectural profession, which he afterward abandoned for painting, and has been a prolific genre painter since he first attracted attention by his 'Barber's Shop in the Time of Elizabeth' (1863). Other works by him are: 'A Visit to the Spaewife' (1872); 'Caleb Balderston's Ruse' (1874); and 'A Scene at Chatsworth' (1899).

Hay, John, American statesman: b. Salem, Ind., 8 Oct. 1838; d. near Newbury, N. H., 1 July 1905. He was graduated from Brown University in 1858, and on leaving college entered the office of Abraham Lincoln in Springfield, Ill., to study law. In 1861 he was admitted to the bar, but did not practise, as in that same year he went with Lincoln to Washington as one of the President's private secretaries. During the Civil War period he was also Lincoln's adjutant and aide-de-camp, and served in the field for some time under Generals Hunter and Gillmore. He was brevetted lieutenant and lieutenant-colonel.

After the death of Lincoln he was made secretary of legation at Paris, remaining there till 1867, when he became *chargé d'affaires* at Vienna. After holding this post for a year he resigned and returned to the United States, but was sent almost immediately to Madrid as secretary of legation, where he remained till 1870.

During his service abroad he gained a valuable knowledge not only of the language and literature of the chief European nations, but also of foreign diplomacy and politics. On his return to the United States he took up journalism, was for a time on the editorial staff of the New York *Tribune*, and published, mostly in its columns, his 'Pike County Ballads.' After about five years of service on the *Tribune*, he married a daughter of Amasa Stone of Cleveland and went to that city to live. He devoted himself mainly to literary work, and occasionally took part in politics, writing and speaking in presidential campaigns. In 1879 he accepted an offer from President Hayes to become first assistant secretary of state under Mr. Evarts. He held this position till the end of the Hayes administration in March 1881; then he took charge of the *Tribune* during Whitelaw Reid's absence in Europe, and conducted it with marked success through the trying period of Garfield's assassination and death.

In March 1897 President McKinley appointed him United States minister to England, and the selection was declared by all without distinction of party, to be most suitable. In London he was well received, and did much to bring about friendly understanding between England and the United States. His London experience was also most valuable training for the important position to which he was appointed in August 1898, when he became secretary of state. Very few of those who had been at the head of the State Department had dealt with so many important questions as Secretary Hay, and probably none had been more thoroughly trained diplomats. At the time of the Boxer outbreak in China, he was successful in obtaining justice for the Chinese, and preserving the integrity of the Chinese Empire. in 1899 he directed the United States ambassadors at London, Berlin, St. Petersburg, and Paris to propose that each of these governments make a declaration in favor

of the "open door" policy in China. They were invited to give assurances: first, that there would be no interference with any treaty port or vested interest; second, that the existing Chinese customs tariff would be continued without discrimination and administered by Chinese officials; third, that there would be no discrimination in harbor dues and railroad rates. Italy and Japan were afterward included in the negotiations. No treaties were exchanged, but all the governments approached pledged themselves by definite promises to the "open door" policy. He also negotiated and signed the Hay-Pauncefote treaty (q.v.), and several reciprocity treaties, including one with Cuba; gave support to The Hague Conference (q.v.), and induced the Powers demanding indemnity from Venezuela to refer the question to The Hague tribunal; and, in 1903, signed within forty-eight hours of each other a treaty with the Colombian government granting right of way for the Panama canal, and a treaty with Great Britain providing for the submission of the Alaskan boundary question to arbitration. During McKinley's first administration, also, Secretary Hay's position was of peculiar significance, because, owing to the death of Vice-President Hobart, Hay would have become McKinley's successor had the President died or resigned before the end of the term.

Secretary Hay was known as an author also, his publications including 'Pike County Ballads' (1871) and other poems; 'Castilian Days,' one of the best books on Spain in the English language, and 'Life of Abraham Lincoln' (1890), written in collaboration with J. G. Nicolay (q.v.), and ranking as the most comprehensive and authoritative biography of Lincoln.

Hay-Pauncefote Treaty, signed 18 Nov. 1901, which replaced the Clayton-Bulwer Treaty (q.v.) as an Anglo-American agreement of policy regarding an isthmian canal, then supposed to be fixed as across Nicaragua. It was drawn up by John Hay, secretary of state, and Sir Julian Pauncefote, ambassador from Great Britain. Public feeling for some years had been growing so sore over the Clayton-Bulwer Treaty's restriction on the independent action of the United States, that there was grave fear lest Congress might abrogate it by open violence, a great blow to future amicable action. President McKinley voiced the feeling by the declaration, in his annual message for 1898, that the canal had become a national necessity. Fresh negotiations were opened with Great Britain; that country had no wish beyond that of neutralizing the canal, and sent one of her best diplomats with very liberal instructions, to concede whatever did not nullify that essential principle. The draft treaty was sent to the Senate by the President 5 Feb. 1900. It provided that a canal might be constructed by the United States, or under its direction; should be permanently neutralized on the basis of the Suez Canal agreement — to be kept open at all times, either of war or peace, to all vessels, without discrimination, and no fortifications to be constructed commanding the canal or the waters adjacent, and that other powers should be invited to join in this guaranty of neutrality. The provisions excited intense hostility, and Senator Davis offered an amendment adopted by the committee on foreign affairs, canceling the very features for which it was drawn up, and which made the spirit of the previous one. It provided that the neutralization clause should not prevent the United States from any measures it thought needful for its own defense or the preservation of order, declared the Clayton-Bulwer Treaty specifically abrogated, and struck out the third clause inviting the concurrence of other powers. In this form it was ratified by the Senate 20 Dec. 1900, but Great Britain refused to accept the transformed treaty, and it expired by limitation on 5 March 1901. Undiscouraged, the two diplomats set to work on a compromise, which was signed by them 18 Nov. 1901, sent to the Senate by President Roosevelt, and ratified by them 16 December. The chief differences were in dropping as far as possible all specific guaranties, requirements, or prohibitions, leaving its interpretation and application to the chapter of fate and the certainty that the strong hand would decide in any event. The neutrality of the canal is not guaranteed at all except by the terms of the agreement, the Clayton-Bulwer Treaty is abrogated by name, and the United States is not forbidden to construct fortifications, nor required to keep the canal open in time of war.

Hay, or Forage, the stems and leaves of grasses and other plants cut for fodder and dried in the sun. In haymaking the object of the farmer is to preserve the hay for winter use in the condition most nearly resembling the grass in its natural state. Of the various ingredients which compose grass, those portions which are immediately soluble in water are the most fitted for the purposes of nutrition; and therefore the mowing should be done when the plants contain the largest amount of sugar and other soluble matter. During the latter part of the process of fructification, when the seeds have arrived at maturity, the stem and leaves begin to decay; so that if the grass is not cut when in flower, a great amount of nutriment will be wasted. On the third day after mowing, if the weather is fine, the newly-made hay will be ready for gathering into large windrows for carrying and stacking; but otherwise it will have to be put up into large cocks, and the carrying deferred until the next day. It is not desirable that grass should be too rapidly made into hay under a burning sun, as it is liable to scorch and lose its nutritive value. Great care must also be taken to preserve the hay from dew and rain, as water washes away the soluble salts and other matters, and when in the stack will cause fermentation, which, if excessive, destroys some of the most valuable properties of the hay. Some farmers salt their hay in stacking; others do not. Salt is generally commended. A good plan, when the hay harvest has been accompanied by wet weather, is to place a few layers of straw in the stack at intervals to absorb the moisture from the heating hay. On large farms the spreading out of the hay after it is cut down is performed by a haymaking machine drawn by a horse, which will do the work of twelve or fifteen haymakers, and distribute the grass more thinly and evenly as it crosses the field. It is only for the haymaking of the true grasses, however, that it is adapted, as clover must not be shaken so violently. To be transported to markets at a distance, hay is now compactly pressed into bales by presses worked by hand or power. In fact baled hay has increased the importance of haymaking, owing to the readiness with which it can be transported by

rail or water. On the Pacific Coast, especially in California, hay cut from alfalfa grass is very productive and profitable, and as many as three crops a year are frequently obtained. In the United States 61,691,166 acres of land were utilized in cultivating hay and forage in 1900, the entire crop amounting to 84,011,299 tons, valued at $484,256,846.

The average value per acre of the hay and forage crop is $8. Included in the above estimate were 4,759,353 tons of cornstalks which were cut from fields cultivated mainly for the grain. These figures for 1900 show an increase in area since 1889 of 8,742,369 acres, or 16.5 per cent, and in production of 12,420,466 tons or 18.6 per cent.

Of this total area, 6.7 per cent was devoted to clover, 50.7 per cent to tame and cultivated grasses other than clover, 6.3 per cent to grains cut green for hay, 5.1 per cent to forage crops, 3.4 per cent to alfalfa or lucerne, 2.8 per cent to millet and Hungarian grasses, and 25.1 per cent to wild, salt, and prairie grasses.

The North Central division contained 57.8 per cent of the total hay and forage acreage of the country, the North Atlantic 21.0 per cent, the Western 11.4 per cent, the South Atlantic 3.5 per cent, and the South Central 6.3 per cent.

The rate of increase in area devoted to hay and forage since 1889 was greatest in the South Central division, being 103.0 per cent. The Western division shows an increase of 91.4 per cent, the South Atlantic of 12.2 per cent, and the North Central of 10.7 per cent. The North Atlantic division shows a decrease of 2.2 per cent.

The total value of the hay and forage crop of 1900 averaged $135 per farm. The average yield per acre, exclusive of cornstalks, was 1.28 tons, and the average value per ton $6.11. The average yield per acre of the various classes was as follows: Forage crops, 2.62 tons; alfalfa, or lucerne, 2.49 tons; millet and Hungarian grasses, 1.64 tons; grains cut green for hay, 1.28 tons; clover, 1.26 tons; tame grasses other than clover, 1.14 tons; and wild, salt, and prairie grasses, 1.12 tons. In 1902, the United States exported hay to the value of $2,580,622.

Hay Fever, a nervous affection of the mucous membranes of the eyes, nose, mouth, pharynx, larynx, and bronchi, characterized by a profuse flow of secretion from the nose, and of tears from the eyes, and accompanied in some cases by asthma. It is induced by the inhalation of the pollen of the *Gramineæ,* is prevalent during the hay season, but subsides at its close, and varies in its severity according to certain atmospheric conditions and the amount of pollen in the air. The occurrence of catarrhal symptoms in summer separates it from an ordinary "cold in the head"; while their combination with difficulty of breathing prevents it being mistaken for spasmodic asthma, in which there is seldom any catarrh. There are three combining causes of this affection, which is largely nervous: First, a predisposing cause in some nervous disease, with a probable lesion in the fourth ventricle of the brain. Second, deformity, such as a deviating septum, in the nasal region. Third, inhalation of a special pollen. Removal to the seashore or the mountains is beneficial in some cases. Arsenic, iodides, bromides, and other nerve specifics benefit others. For the asthma, iodide of potash, 5 grains with 5 minims of tincture of belladonna in syrup of orange-peel should be taken every two hours. Inhalations of nitre-paper, stramonium leaves, etc., with wine of cocoa internally, are also useful.

These remedies are, however, merely palliative, and scientific men have been for some time making investigations which may eventually lead to the discovery of a radical cure.

Prof. Dunbar, of Hamburg, who has been studying the subject for seven years, is one of those who hold out the hope of curing hay fever by a rational treatment.

According to him, the disease is caused by the pollen of grasses, but not by mechanical irritation. He has extracted from the pollen a poison, or toxin, which is insoluble in ether and alcohol, but soluble in water and weak saline solutions, tears, the mucus of the nose and the serum of blood. A solution of this toxin dropped into the eye or nose at once produces the characteristic symptoms of hay fever. The same symptoms in an aggravated form occur when the solution is injected hypodermically.

This discovery suggested treatment by the serum method and Dr. Dunbar set to work to produce a curative serum by inoculating animals with pollen toxin, and a serum was eventually obtained which, when dropped into the eye or nose together with pollen toxin, completely prevented the attack which the latter alone would have caused.

Experiments looking to the cure of the disease began in the latter part of January of 1903, and there is good reason to believe that the disease can be checked in its earliest stage by applying the serum to the external mucous surfaces. Hypodermic injection of the serum would probably be necessary if considerable quantities of pollen toxin had already passed into the blood.

It is noteworthy that rye, barley, wheat, rice, maize, and every kind of grain and grass which Dr. Dunbar has investigated yield a toxin which causes hay fever, while, on the other hand, he has not succeeded in obtaining such a toxin from any plant not of the grass family (*Gramineæ*).

Hay River, a stream which rises in the Rocky Mountains in Athabasca, Canada, and flows northeast into Great Slave Lake. It is navigable for about 140 miles from its mouth; its entire length is about 360 miles. The two Alexandra Falls (named after Princess Alexandra, now Queen Alexandra of England) are found in the upper course; they average about 250 feet in height and 900 feet in width.

Hay-worm, the caterpillar of a medium-sized pyralid moth (*Pyralis costalis*), injurious to clover hay, and to other hay when mixed with clover. Its depredations can be prevented by keeping the hay dry and well ventilated, as the insect preferably breeds in moist or matted material such as is to be found in the lower parts of stacks; here the hay becomes filled with webbings of the "worms" and their excrement, rendering it unfit for feeding. The webbed material should be burned, and the place thoroughly cleaned.

Hay'den, Ferdinand Vendeveer, American geologist: b. Westfield, Mass., 7 Sept. 1829; d. 22 Dec. 1887. He was graduated from Oberlin College, Ohio, studied at the Albany Medical College, and during the greater part of 1853–62 was employed in surveys in the northwest. He

served as surgeon in the Union army during the Civil War, and was professor of mineralogy and geology in the University of Pennsylvania 1865–72. In 1867–9 he made a geological survey of Nebraska, and was afterward director of the geological survey of the Territories of the United States, until in 1879 the various national surveys were combined in the geological survey of the United States. Till 1886 he remained at the head of the Montana division. He published many papers, besides numerous and valuable government reports, and was a member of many scientific societies at home and abroad.

Haydn, hā'dn (Ger. hī'dn), **Franz Joseph,** Austrian musical composer: b. Rohau, on the borders of Hungary and Lower Austria, 31 March 1732; d. Vienna 31 May 1809. He was sent to school at Hamburg at 6, where he learned reading, writing, singing by note, and to play on such instruments as his childish strength would admit of his handling. His voice attracted the notice of the parish priest, who recommended him as a choir-boy to the chapel-master of St. Stephen's in Vienna, and at 8 Haydn was received into the choir. With exception of some Latin and much practical music he seems here to have been taught nothing; in the theory and science of the art he received but two lessons from his master in eight years. At last in his 16th year, his voice began to break, and he lost his place and took up his abode in an attic in the Austrian capital, intending to live by his art. At that time the first six sonatas of Emmanuel Bach fell into his hands. "I could not leave my instrument," he said in his old age, "until I had played them through; and any one who knows me must perceive how much I owe to Emmanuel Bach, that I studied him carefully, and comprehended him." After a time he became acquainted with Metastasio, the greatest operatic librettist of the time. The poet had charge of the education of a Signora Martinez, and Haydn was employed to give her elemenary instructions in music. This afforded him an opportunity for mastering Italian, and what was of more immediate importance, procured him board and lodging. Metastasio introduced the struggling young artist to Porpora, a celebrated Italian musician, then in Vienna. As Porpora's accompanist he attracted the attention of Gluck and other masters, and his prospects from this time onward grew steadily brighter. He was often engaged to play at the musical entertainments given by the Austrian nobles, was appointed organist of two churches, sang tenor parts in the choir of another, and pupils became rapidly more numerous. He wrote a short comic opera, 'Der hinkende Teufel' (The Limping Devil), which was given three nights with applause, but owing to the satirical character of the libretto was forbidden by the police. Having now the means, Haydn purchased and studied the theoretical works of Emmanuel Bach, Mattheson, and Fux. In 1759 Count Morzin engaged him as music composer and director at a salary of 200 florins, with free lodgings and table with his secretaries and other officials. In 1761 he was appointed "chapel-master" or musical director to Prince Nicholas Esterhazy, in whose service he remained 30 years. Anything like a catalogue of his compositions during this time is impossible; much was destroyed on three separate occasions when his house was burned down, and much was scattered; but we know of 163 pieces for the baryton, an obsolete instrument in size between the viola and the violoncello; about 120 symphonies for full orchestra; more than 100 works of chamber music of the higher forms; and 12 Italian operas performed in his patron's private theatre. On the death of Esterhazy, in 1790, Haydn visited London, where the musical world received him with the greatest enthusiasm, and where he stayed 18 months. Here he produced an opera, the 'Orfeo,' nine symphonies, six quartettes, 11 sonatas, several songs and canzonets, and the accompaniments to more than 100 Scotch songs. He visited London a second time in 1794, his stay lasting a like period, and on his return to Vienna set about composing the music of an oratorio, the 'Creation,' the words adapted by Linley from Milton's 'Paradise Lost.' Haydn thought the text too long, and being not thoroughly acquainted with English, had it translated and curtailed by Baron von Swieten. It was produced 19 March 1799, when its author was in his 66th year. It obtained a great success, and he was induced to undertake the music of another text prepared from Thomson's 'Seasons.' This work wants the freshness and vigor of the previous work; which may have resulted in some measure from the barren unpoetical text. Consult: Pohl, 'Joseph Haydn' (1875); 'Mozart and Haydn in London' (1867); Karajan, 'Joseph Haydn in London' (1861); Reissmann, 'Joseph Haydn' (1879).

Haydn, hā'dn, **Hiram Collins,** American clergyman: b. Pompey, N. Y., 11 Dec. 1831. He was graduated from Amherst in 1856, from the Union Theological Seminary in 1859, held pastorates at Meriden, Conn., and Painesville, Ohio, was pastor of the First Congregational Church of Cleveland, Ohio, in 1874–80 and again from 1884. He was also president of Western Reserve University in 1888–90, and published 'Lay Effort'; 'Death and Beyond'; 'The Bible and Current Thought'; 'The Face Angelic,' and other works.

Haydon, hā'dŏn, **Benjamin Robert,** English painter: b. Plymouth 26 Jan. 1786; d. London 22 June 1846. He had a passion for great historical subjects, and covered immense areas of canvas, but seldom rose beyond mediocrity excepting by exaggeration. His work was, however, admired by many of his contemporaries, including the poet Keats. Among his pictures may be mentioned: 'Judgment of Solomon' (1814); 'Christ's Entry into Jerusalem' (1820), now in Philadelphia; 'The Raising of Lazarus'; 'The Mock Election in the King's Bench'; 'Napoleon at St. Helena'; 'Alexander and Bucephalus'; 'Alfred and the Trial by Jury'; 'Uriel and Satan'; 'The Burning of Rome.' See Life by Taylor (1853).

Hayes, Augustus Allen, American chemist: b. Windsor, Vt., 1806; d. Brookline, Mass., 21 June 1882. He began his studies under Dana, and was successful throughout his career in improving the resources of applied chemistry to a remarkable extent. He was the first to extract the alkaloid sanguinarin from the blood root, *Sanguinaria Canadensis.* He also improved the common method of reducing pig to malleable iron and discovered new processes in copper-smelting. His researches led him also to a new

formula for the production of chloroform. He was for many years employed by the State of Massachusetts as assayer.

Hayes, Isaac Israel, American arctic explorer: b. Chester County, Pa., 5 March 1832; d. 17 Dec. 1881. He was graduated in medicine at the University of Pennsylvania in 1832, and began his arctic experiences as surgeon in the second Grinnell expedition sent out under Captain Kane in 1853, in search of Franklin. Becoming convinced of the existence of an open polar sea, he was enabled to obtain funds for the expedition on which he sailed in the ship United States from Boston in 1860. He had two astronomers on board and according to their observations reached lat. 81° 35′ N., lon. 70° 30′ W., the farthest point north hitherto recorded in any voyage. In 1869 he made a voyage to Greenland. He received gold medals from the geographical societies of Paris and London. His published works comprise 'An Arctic Boat Journey' (1860); 'The Open Polar Sea' (1867); 'Cast Away in the Cold' (1868); and 'The Land of Desolation' (1872).

Hayes, Rutherford Birchard, 19th President of the United States: b. Delaware, Ohio, 4 Oct. 1822; d. Fremont, Ohio, 17 Jan. 1893. His early education was obtained in the common schools of Fremont and the academy at Norwalk, Ohio. At 16 he entered Kenyon College, from which he was graduated in 1842 as the valedictorian of his class. In 1843, he entered the law school of Harvard University and completed the course in 1845. He was admitted to the bar at Marietta, Ohio, and opened an office at Fremont; but, his health failing, he was compelled to go South, establishing himself later at Cincinnati (1849). His ability and industry soon gained recognition and secured him an excellent practice. He was city solicitor of Cincinnati from 1858 until April 1861, an office which brought him prominently before the people.

Hayes' military career began at the outbreak of the Civil War, when he was elected captain of a company formed from the old Literary Club of Cincinnati. A few months later, June 1861, he was appointed major in the 23d Ohio Volunteer Infantry, of which W. S. Rosecrans was colonel and Stanley Mathews, lieutenant-colonel. After the promotion and transfer of these two officers, the regiment was put under his command, and ordered at once to West Virginia; it took part in all of the important battles of Sheridan's campaign. In the battle of South Mountain he was severely wounded in the arm but soon recovered and returned to duty again. At the battle of Winchester, he made the famous charge across the swamp and saved the day. Many fell in that charge, but the day was won. He was no less courageous at Fisher's Hill and Cedar Creek. For meritorious service he was promoted to the rank of brigadier-general of volunteers and later brevetted major-general. He was nominated for Congress in his home district at Cincinnati, and in the fall of 1864, elected by a majority of 2,400; in 1866 he was re-elected. In 1867 he was nominated for governor of Ohio, by the Republicans; at that time a strong reaction against many of the policies of this party was felt in several States of the North, and the party itself in Ohio was divided into two factions. Hayes was one of the few men who could unite these factions, and he was elected by a small majority; and again chosen governor in 1869. At the close of his second term, he returned to Cincinnati determined to retire from public life; and in 1873 he moved to his old home at Fremont. In 1875, however, he was nominated for governor, and was with difficulty induced to accept the nomination. The great issue of the campaign was the money question, which though properly a national issue had been forced into State politics. There were those who believed and publicly contended that all that was needed to make money was the stamp of the government of the United States, that it was not necessary to have back of it any intrinsic value. Hayes, however, stood for "sound money," and after an active campaign won the election, thus becoming governor of Ohio for a third time.

When the National Republican Convention met at Cincinnati in 1876, a number of prominent leaders were candidates for the presidency. It soon became evident that none of the recognized candidates could be nominated and a "dark horse" was looked for. Thus it happened that Governor Hayes was nominated on the seventh ballot. The campaign which followed proved to be one of the most hotly contested in the history of the nation. The results were uncertain, and for the first time in our national life, a commission was created to pass upon the validity of the certificates which had been returned by the different States. This commission refused to go behind the returns of the different governors; and the votes of the Republican electors were therefore admitted from all of the doubtful States. This gave Mr. Hayes a majority of one in the electoral college, and he became the nineteenth President of the United States. (See ELECTORAL COMMISSION.) Two things were uppermost in his mind: the one, the improvement of the political condition of the South; the other, "the restoration of the civil service to the system established by Washington and followed by the early Presidents." In both of these, he was opposed by the machine politicians of his own party. In spite of this opposition, however, the troops were gradually withdrawn from the South and self-government re-established; the people were slow to see the need of civil service reform, and without effective support, the President could do little. He preserved his attitude in regard to sound money, and by his veto prevented dangerous financial legislation.

At the close of his administration, Mr. Hayes returned to private life. His interest in education was shown by the work done as a member of the boards of trustees of the Ohio Wesleyan University at Delaware and the Ohio State University at Columbus. Hayes' Hall at the latter institution bears his name because of his devotion to the cause of manual training. He was also president of the John F. Slater Educational Fund and gave much time to its proper distribution. As president of the National Prison Reform Association he did much to educate the public to a more humane way of thinking about the treatment of convicts, many of his public utterances have become maxims in prison management, and his work along these lines has been exceedingly valuable and permanent in its results.

Hayes River, called Hill River in the upper part of its course, rises near Lake Winnipeg, in Canada, and flows northeast through

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Oxford or Holy Lake, Knee Lake, and several other lakes, into James Bay, near the mouth of the Nelson River. The largest tributaries are the Shamattawa and the Fox. The length of the Hayes is about 300 miles.

Hayesine, hā'zĭn, a hydrous borate of calcium, occurring as a sediment consisting of snowy-white, silky flakes, in the waters of hot springs in Chile. It is a somewhat uncertain species, and is perhaps to be referred in part to bechilite, and in part to ulexite. In the United States, specimens are reported from Bergen Hill, N. J. (Named in honor of A. A. Hayes (q.v.), an American chemist.)

Hay'good, Atticus Green, American Methodist bishop: b. Watkinsville, Ga., 19 Nov. 1839; d. Oxford, Ga., 19 Jan. 1896. He was educated at Emory College, Ga., of which he was president 1876–90, becoming in the last named year bishop of the Methodist Church South. He became bishop in 1890. He wrote: 'The Monk and the Prince,' a study of Savonarola and Lorenzo de Medici; 'Our Brother in Black' (1881); 'Pleas for Progress' (1889); etc.

Hay'market Square Massacre, the murder of several policemen in Chicago, 4 May 1886, by a bomb thrown by an anarchist. The labor troubles had long been exploited by the "practical" anarchists (with whom the philosophic anarchists disclaim connection), who denounced the efforts for shorter hours and better wages as tending merely to aggravate capitalistic slavery, and urged instead the general seizure of property and the murder of its owners. In February 1886 the McCormick Reaper Works had been closed on account of a demand for the expulsion of some non-union men, but had reopened. Meantime a great eight-hour strike had left some 50,000 unemployed workmen in the city, and in view of an almost certain conflict with the police, George Engel proposed at a meeting in Bohemian Hall on 2 May, and the meeting indorsed, a plan to blow up the police stations, shoot the emerging police, cut the telegraph wires, fire buildings to engross the service of the fire department, and make a general jail delivery, that the prisoners might aid in a social revolution. The next day August Spies and others incited a meeting of the Lumber-shovers' Union, 16,000 or more, principally Germans and Bohemians, to assail the McCormick Works in order to furnish an opportunity for carrying out this plan, though the works had no connection with this union. The mob attacked the works with stones and revolvers, but were driven off. No one was fatally injured, but Spies immediately issued a circular headed "Revenge!" asserting that six workingmen had been killed, and calling their brethren to arms. He also published a fierce article in his paper, the *Arbeiter Zeitung*, repeating the falsehood, and declaring that there had been a "massacre" to terrorize the workingmen, who should have had dynamite bombs instead of stones. In the evening a meeting was held at Greif's Hall, at which Engel's plan was adopted. Spies, Albert R. Parsons, Samuel Fielden, and Oscar W. Neebe spoke for a mass-meeting to further the plan above mentioned; at Adolf Fischer's suggestion it was fixed for next evening in Haymarket Square, that the dusk and the room for a great crowd might furnish more confusion and better means of escape. Rudolph Schnaubelt wished to have all socialists in other cities notified, so that there might be a general revolution. The signal was to be "Ruhe" (Peace), which was printed in next afternoon's *Arbeiter Zeitung*. Meantime Louis Lingg and others worked all day preparing bombs, of which the newspaper office was found to be an arsenal, along with firearms, and with a confederate carried a satchel of them to a place where others helped themselves. The air was full of rumors of intended violence, and the mayor (Carter Harrison, Sr.) ordered the police to mix with the meeting, and disperse it if incendiary language were used, and 176 were concentrated at the nearest station. Spies and Parsons spoke first, but the mayor was in the crowd, and they used mild language, till his suspicions were lulled and he left. Then Fielden began a frenzied and bloodthirsty harangue, calling for the "extermination" of the capitalists. The crowd grew so wild that shortly after 10 the police in four divisions appeared and covered the street, and while Fielden was speaking, Capt. Ward ordered the crowd to disperse. Fielden called out "We are peaceable" (curiously like "Peace"), and a bomb was at once thrown into the midst of the police, which exploded and caused frightful carnage, killing or mortally wounding eight policemen and injuring a great number more. The mob instantly followed it up with a volley from rifles and revolvers, proving that they had been expecting the signal, but the police, with a nerve as fine as that of trained soldiers, at once rallied and charged the mob, dispersing it in disorder. Most of the leaders who had been urging destruction either did not attend or ran away. Of the police, besides those killed, 68 were wounded by shot or bombs, many maimed for life. Spies, Parsons, Fischer, Engel, Lingg, Fielden, Michael Schwab, and Neebe were arrested and tried as accessories before the fact: the first four were hanged 11 Nov. 1887; Lingg shattered his jaw in prison with a bomb and died; Fielden and Schwab were sentenced to prison for life, and Neebe for 15 years. The last three were pardoned by Gov. Altgeld in 1893, many prominent men of Chicago and throughout the country having petitioned for their release on the ground that the evidence did not connect them with the actual throwing of the bomb, which was true, the evidence pointing strongly to Schnaubelt.

Hayne, Isaac, American patriot: b. South Carolina 23 Sept. 1745; d. Charleston, S. C., 4 Aug. 1781. He was a wealthy planter who took up arms after the invasion of the colony by the English forces, and after the capitulation of Charleston was paroled with the proviso that he might not be ordered to bear arms against his countrymen. He was summoned, however, to the English standard and refusing compliance as a violation of the compact, hastened to the American camp. Being shortly after taken prisoner by the English, he was tried and hanged.

Hayne, Paul Hamilton, American poet: b. Charleston, S. C., 1 Jan. 1830; d. Grovetown, Ga., 6 July 1886. He was a nephew of R. T. Hayne (q.v.) and was educated at the Charleston College, studied law and engaged in journalism. He served in the Confederate army till forced to resign on account of ill health, and lost nearly all his property through the bombardment of Charleston and the subsequent pillage. With the little left to him he retired to Copse

Hill, Grovetown, Ga., where he spent the rest of his life, a partial invalid. His verse is marked by grace and melody and he ranks almost the first among distinctively southern poets. He published 'Poems' (1855); 'Sonnets and Other Poems' (1857); 'Legends and Lyrics' (1872); etc. A complete edition of his poems appeared in 1882.

Hayne, Robert Young, American statesman: b. Colleton District, S. C., 10 Nov. 1791; d. Asheville, N. C., 24 Sept. 1839. After studying law he was admitted to the bar in 1812; and served in the second war with Great Britain, returning at its close to his practice in Charleston. He was a member of the State legislature 1814–18, and became Speaker, was attorney-general of the State in 1818–22, and a United States senator 1823–32. He vigorously opposed protection, and in 1832 boldly supported in Congress the doctrine of nullification. Daniel Webster's reply to Hayne upon this theme is classed among the former's ablest speeches. In November 1832 South Carolina adopted an ordinance of nullification, in December Hayne was elected governor, and the State prepared to resist the Federal power by force of arms. A compromise, however, was agreed to, and the ordinance was repealed. Hayne was mayor of Charleston in 1834.

Hayne, William Hamilton, American poet: b. Charleston, S. C., 11 March 1856. He is the son of Paul Hamilton Hayne (q.v.). He received a secondary education, from 1879 contributed extensively to various periodicals, and published 'Sylvan Lyrics and Other Verses' (1892).

Haynes, hānz, **Arthur Edwin,** American mathematician: b. Van Buren, N. Y., 23 May 1849. After graduation from Hillsdale College, Mich., in 1875 became instructor of mathematics and physics there in the same year; and was professor, 1877–90. He held the same position in Michigan Mining Schools in 1890–3, and was professor of mathematics at the University of Minnesota, 1893–6, and in its engineering department 1896–1901. He has published 'The Desirability of Uniformity in the Use of Mathematical Symbols and Terms'; etc.

Haynes, John, American colonial governor: b. Old Holt, Essex, England; d. Hartford, Conn., 1 March 1654. He came with Hooker and his company to Boston in 1633, was soon after chosen assistant, and in 1635 governor of Massachusetts. In 1636 he removed to Connecticut, being one of the prominent founders of that colony. In 1639 he was chosen its first governor, and every alternate year afterward, which was as often as the constitution permitted, till his death. He was one of the five who in 1638 drew up a written constitution for the colony, which was finished in 1639, the first ever formed in America, and which embodies the main points of all our subsequent state constitutions, and of the Federal constitution.

Hays, Isaac, American physician and editor: b. Philadelphia 5 July 1796; d. there 12 April 1879. He was graduated from the University of Pennsylvania in 1816 and from its medical school in 1820. In addition to his long service as general practitioner he was for 52 years on the staff of the 'American Journal of the Medical Service.' In 1843 he established a monthly, the 'Medical News,' and in 1874 the 'Monthly Abstract of Medical Science.' He edited: 'Wilson's American Ornithology' (1828); 'Hoblyn's Dictionary of Medical Terms' (1846); 'Lawrence on Diseases of the Eye' (1847); and 'Arnott's Elements of Physics' (1848). He was president of the Philadelphia Academy of Natural Sciences (1865–9) and connected with many scientific societies at home and abroad.

Hayes, William Jacob, American painter: b. New York 8 Aug. 1830; d. there 13 March 1875. He studied art under John Rubens Smith, and his 'Dogs in a Field,' exhibited in the Academy of Design in 1850, won him the reputation of an animal painter of remarkable fidelity to nature and spirit in design. He studied the bison in the upper waters of the Missouri and the deer in Nova Scotia. His 'Bison Bull at Bay' and 'Herd of Caribou in Nova Scotia' are characteristic pictures.

Hays, William Shakespeare, American song-writer and composer: b. Louisville, Ky., 19 July 1837. In 1857 he became a reporter for the Louisville *Democrat,* subsequently was clerk and captain of steamboats on the Ohio and Mississippi, and became marine editor of the Louisville *Courier-Journal* and *Times.* He wrote and composed more than 300 songs, among them 'Nora O'Neil,' 'Write Me a Letter from Home,' and 'Shamus O'Brien'; and published 'Poems and Songs.' His songs have sold very extensively in the United States and England.

Hays, Kan., city, county-seat of Ellis County; on Big Creek, and on the Union P. railroad; about 222 miles west of Topeka. It is in a fertile agricultural region. The chief manufactures are flour, dairy products, and machinery. It has grain-elevators, and there are large annual shipments of grain, flour, and live stock. It is the seat of a Normal school and of a State agricultural experiment station. The experiment station is connected with the State Agricultural College, which owns near Hays 2,000 acres of land. Pop. (1900) 1,136.

Hayti. See HAITI.

Hayward (properly "haw-ward," keeper of the haws or hedges, and still so pronounced, or rather as "howard," in country districts; the family name Howard as well as Hayward is from this), a town officer in old New England, whose duty was to keep the cattle on the roads from breaking through the hedges or fences into enclosed grounds and to impound them if they did so. The title came to be generic for a cattle-ward, and the hog-reeve was frequently known as a "hog howard."

Hayward, Wis., town, county-seat of Sawyer County; on the Namakagon River, and on the Chicago, St. P., M. & O. railroad; about 63 miles by rail southwest of Ashland. It is in the vicinity of the lumber region of the State, and the chief industry is lumbering. It has a government Indian school, a public library, and four churches. Pop. (1900) 2,720.

Hazard, hăz'ard, **Caroline,** American college president: b. Peacedale, R. I., 10 June 1856. She was educated in Providence and in Europe, and in 1899 was appointed president of Wellesley College, Mass., receiving the degrees of M. A. and Litt. D. from the University of Michigan and Brown University the same year. She is a

granddaughter of R. G. Hazard (q.v.) and has published 'The Narragansett Friends' Meeting in the 18th Century' (1899); 'Thomas Hazard: a Study of Life in Narragansett in the 18th Century.'

Hazard, Ebenezer, American author: b. Philadelphia 15 Jan. 1744; d. there 13 June 1817. He was graduated from Princeton in 1762, in 1782–9 was postmaster-general, and from 1791 was in business in Philadelphia, where he assisted in the establishment of the North American Insurance Company. He published 'Historical Collections' (1792–4) and 'Remarks on a Report Concerning Western Indians.'

Hazard, Rowland Gibson, American manufacturer and philosopher: b. South Kingston, R. I., 9 Oct. 1801; d. Peacedale, R. I., 24 June 1888. He was a successful business man, being long engaged in the woolen manufacture in Peacedale. He also wrote on philosophical subjects; his works including 'Language, its Connection with the Constitution and Prospects of Man' (1836); 'Essays on the Resources of the United States' (1864); 'Causation and Freedom of Willing' (1869).

Haze, a condition of the atmosphere which deadens the blueness of the sky, and obscures the sharp outlines of distant objects. Haze is due to fine dust in the air or to extreme heat, the latter being known as heat-haze. In certain parts of China the haze is like a thin fog. Extensive forest fires create a smoke-haze, of a dense, blue color, which drifts like rain clouds hundreds of miles from the scene of the fire. Volcanic eruptions throw fine dust into the air in enormous quantities, forming a haze which is carried many hundreds of miles. See DUST.

Hazel-nut, or **Filbert,** a genus (*Corylus*) of shrubs and trees of the order *Cupuliferæ,* confined to the northern hemisphere. The male flowers are in long cylindrical aments or catkins; and the fruit, a nut, is marked at its base with a large cicatrix. The inflorescences of the hazel are developed in the year preceding their appearance; the male flowers last over the winter, naked; the female inflorescence is enclosed in a bud. In early spring the male catkins elongate and produce an abundance of dry pollen, while the female inflorescences are distinguishable from the leafbuds only by their larger size and projecting red stigmas. The nut is enveloped at the base by a sheath of succulent bracts.

The European hazel (*C. avellana*), from cultivation, has produced several varieties, differing in the size, shape, and flavor of the nuts, which are commonly known under the name of filberts. It grows in all situations, and is easily cultivated, but a light and tolerably dry soil is the most suitable. The best nuts come from Spain, where they are baked in large ovens before export, in order to ensure their preservation. Other species occur in southern Europe and Asia. The American hazel (*C. americana*) very much resembles the European, but is lower in stature. It is common in most parts of the eastern United States, but has not been cultivated. A second species (*C. rostrata*) occurs in California.

The oil which is obtained from hazel-nuts by pressure is little inferior in flavor to that of almonds, and chemists employ it as the basis of fragrant oils artificially prepared and used by perfumers, because it easily combines with and retains odors. In many parts of England hazels are planted in coppices and hedge-rows for several useful purposes, but particularly to be cut down periodically for charcoal, poles, fishing-rods, etc. In brewing, the dried twigs were used as a substitute for yeast when they were soaked in fermenting liquor. Being extremely tough and flexible, the branches are used for making hurdles, crates, and springles to fasten down thatch. They are formed into spars, handles for implements of husbandry, and when split are bent into hoops for casks. Charcoal made from hazel is much in request for forges, and when prepared in a particular manner is used by painters and engravers to draw their outlines. The roots are used by cabinet-makers for veneering; and in Italy the chips of hazel are sometimes put into turbid wine for the purpose of fining it. Finally forked twigs of the European hazel were formerly used by diviners to determine the position of water, gold, etc.

Hazeltine, hā'zĕl-tĭn, **Mayo Williamson,** American journalist and literary critic: b. Boston, Mass., 24 April 1841. He graduated from Harvard, studied also at Oxford, practised law until 1878, and was then appointed literary editor of the New York *Sun.* He became widely known as a critic for his reviews in the *Sun,* and has published in book-form: 'Chats about Books' (1883); 'British and American Education'; 'The American Woman in Europe.'

Ha'zen, Marshman Williams, American lawyer and author: b. Beverly, Mass., 1845. He was graduated from Dartmouth in 1866, from 1873 was a manager for the publishing firms successively of Ginn & Company and D. Appleton & Company, in 1882 was admitted to the Massachusetts bar, and in 1885 began the practice of law in New York. His publications include, besides a series of 21 school text-books: 'Observation, Thought, and Expression'; a 'History of the United States'; and 'Government.'

Hazen, William Babcock, American soldier: b. West Hartford, Vt., 27 Sept. 1830; d. Washington, D. C., 16 Jan. 1887. He was graduated at West Point in 1855, went to the front in the Civil War in command of 41st regiment of Ohio volunteers, which he himself had recruited in 1861, served actively in Ohio, Kentucky, and through the Atlanta campaign and in Sherman's march through Georgia, and in 1865, took command of the Fifteenth army corps. He observed the Franco-Prussian war on French territory, and was at Vienna as military attaché to the United States legation during the Turko-Russian war. Appointed chief signal officer in 1880, with the rank of brigadier general, he employed scientists as observers, introduced «cold wave» signals, and suggested the standard-time meridians at present in use. He published: 'The School and the Army in Germany and France, with a Diary of Siege Life at Versailles' (1872); 'Our Barren Lands' (1875); and 'A Narrative of Military Service' (1885).

Ha'zleton, Pa., a city situated in Luzerne County; on the Pennsylvania and the Lehigh Valley R.R.'s; about 24 miles south of Wilkes-Barre. The city was settled in 1820, incorporated as a borough in 1840, and chartered

as a city in 1890. It is situated in the anthracite coal region, and its industrial interests are largely connected with the mining and shipping of coal. Its chief manufactures are foundry and machine-shop products, carriages, lumber, beer, baking-pans, cattle-powder, cigars, coffins and caskets. It has knitting mills, silk mills, three daily and eight weekly newspapers. It contains a State hospital for miners, 30 churches, three banks, a convent, high school, and Saint Gabriel's Academy. The government is vested in the mayor, who holds office three years, and in the council. The subordinate officials are appointed by the mayor, subject to the approval of the council. Some are elected by the council. Pop. (1890) 11,872; (1900) 14,230.

Hazlitt, hăz'lĭt, **William,** English critic and essayist: b. Maidstone, Kent, 10 April 1778; d. Westminster 18 Sept. 1830. In 1793 he became a student in the Unitarian College at Hackney. He devoted more time, however, to literature and art than to theology, and upon leaving college resolved to become a painter. He painted portraits with only tolerable success, and finally renounced art, and in 1805 opened his literary career with an essay 'On the Principles of Human Action,' in which much metaphysical acumen was displayed. In 1811 he settled in London, deriving his principal support from his contributions of political articles and theatrical and art criticisms to the newspapers, and his occasional lectures and publications. In 1813 he delivered at the Russell Institution a course of lectures on 'English Philosophy,' and subsequently delivered courses of lectures on the English poets generally, the comic poets, and the Elizabethan poets. Later in life he contributed to the 'Edinburgh Review' and some smaller magazines. He was a good art critic, but his tendency to prejudice and paradox, and his almost contemptuous regard for the productions of contemporary genius, render him a less safe authority than his knowledge and talents would lead us to expect. It is as a literary critic and essayist that Hazlitt achieved his chief success. Saintsbury has said that "long before Sainte-Beuve, Hazlitt had shown a genius for real criticism." He has probably not been surpassed by any English critic. Yet his recognition, in view of this fact, has been singularly inadequate to his merits. His judgment was, it is true, often marred by prejudice and by his paradoxes. But in the main it was discriminating and duly appreciative. His equipment might not now be thought adequate, but it was almost certainly in most respects superior to that of his Georgian contemporaries. He was able to write interestingly of a wide range of topics. He was bitterly attacked, after the custom of the times, by writers, particularly journalists, of adverse political views. But as a controversialist he was more than the equal of any of these, bold in epigram and invective. His style has been highly praised for its combination of vigor and ease, its rhythm, its clearness, and the aptness of its epithets. Not only in critical analysis, but as well in narrative and description it is excellent. Hazlitt also lectured in 1818–21 at the Surrey Institute. Northcote states that had he continued his art work he would have become a great painter. The best of his essays for the 'Examiner' appeared in 1817 under the title 'The Round Table.' The 'Spirit of the Age, or Contemporary Portraits,' also a significant work and by some critics considered his best, was published in 1825. Further essays are grouped in 'The Plain Dealer' and 'Sketches and Essays.' Among other well-known works of Hazlitt are: 'Characters of Shakspere's Plays' (1817); 'A View of the English Stage' (1818); 'Lectures on the English Poets' (1818); 'Lectures on the English Comic Writers' (1819); 'Lectures on the Elizabethan Age' (1821); 'Life of Napoleon Bonaparte' (4 vols. 1828). There is an edition of the 'Works' by Henley (1902); and a 'Life' by Berrell (1902).

Hazlitt, William Carew, English author: b. London 22 Aug. 1834. He is a grandson of William Hazlitt (q.v.). He was at first a civil engineer, relinquished that profession for journalism, and finally took up that of literature. Among his works are: 'History of the Venetian Republic' (1860); 'Bibliographical Collections and Notes' (1876–92); 'Memoirs of William Hazlitt' (1897); 'Four Generations of a Literary Family' (1897); 'Leisure Intervals,' poems (1897); 'Ourselves in Relation to a Deity and a Church' (1897); 'Coins of Europe' (1893–7).

Hazor, or **Chazor** (Heb., enclosure), the name of several places in ancient Palestine, the best known of which was the seat of Jabin, a Canaanitish king of considerable power, who, with his allies, was defeated by Joshua (Josh. xi. 1–13). Though it recovered and oppressed Israel, it was conquered a second time by Barak (Judges iv.) and remained in the possession of Israel until the invasion of Tiglath-pileser. Solomon made it a northern frontier fortress (1 Kings ix. 15). Its site has been variously placed, by many at Tell Hara, 2½ miles southeast of Kadesh. Consult the 'Journal of Sacred Literature' for 1866, p. 245.

Hazzard, David, American politician and jurist: b. Broadkiln Neck, Sussex County, Del., 18 May 1781; d. 8 July 1864. He served as an ensign in the War of 1812, was elected governor on the American Republican ticket in 1829, and subsequently was State senator and an associate judge. During his administration as governor, a constitutional convention was held at Dover, Del., by which among various revisions, the governor's term was changed from three to four years. Hazzard was a member of the constitutional convention of 1852.

Head, Barclay Vincent, English numismatic scholar: b. Ipswich, Suffolk, 2 Jan. 1844. In 1864 he became an assistant in the British Museum, where in 1893 he was made keeper of the department of coins and medals. He was also appointed joint-editor of the 'Numismatic Chronicle.' His chief work is the 'Historia Nummorum' (1887), a valuable study, and the standard one in its department. Among further publications by him are: 'History of the Coinage of Bœotia' (1881), and 'Guide to the Coins of the Ancients' (1881).

Head, Sir **Edmund Walker,** English colonial administrator and author: b. near Maidstone, Kent, 1805; d. London 28 Jan. 1868. He was educated at Oriel College, Oxford, became a fellow of Merton, studied law, was a poor-law commissioner in 1841, and in 1847–54 lieutenant-governor of New Brunswick. From 1854 to his

retirement in 1861 he was governor-general of Canada. During his administration Ottawa was chosen as the capital of Canada, the Victoria bridge at Montreal was constructed, and the seigniorial tenures (see CANADA — SEIGNIORIAL TENURE) and the clergy reserves (see CANADA — THE CLERGY RESERVES) were abolished. In 1863 he was appointed a civil-service commissioner and in 1867 a privy councillor. He was an art critic of some importance, and published a 'Handbook of Painting of the German, Dutch, Spanish, and French Schools' (1848), and other works. His poetical contributions to 'Fraser's Magazine' appeared in 1868 in book-form.

Head, SIR **Francis Bond,** English colonial administrator and author: b. near Rochester, Kent, 1 Jan. 1793; d. Croydon, Surrey, 20 July 1875. Educated at Woolwich, he became first lieutenant of engineers in 1811, was at Waterloo and at Fleurus, retired from the army in 1825, and went to South America as a prospector in gold and silver mines. Of some of his experiences there he gave an account in 'Rough Notes of a Journey in the Pampas and Andes' (1828). In 1835 he was appointed lieutenant-governor of Upper Canada. His administration was a decidedly unfortunate one. Unfamiliar with the political status of the country, he opposed the union of the provinces, and endeavored to conduct the government without the assistance of a council. This state of affairs may be regarded as the chief cause for the part taken by Upper Canada in the insurrection of 1837. His numerous publications include: 'Bubbles from the Brunnen of Nassau' (1833); 'The Defenceless State of Great Britain' (1850); 'The Horse and His Rider' (1860); 'The Royal Engineer' (1869).

Head, SIR **George,** English writer of travels, etc.: b. Higham Parish, Kent, 1782; d. 1855. He held various posts in the army, and was present at most of the great battles of the Peninsular. In 1814 he proceeded to Canada to be chief of the commissariat of a proposed navy on the Canadian lakes, and subsequently published his experiences in 'Memoirs of an Assistant Commissary-General' and 'Forest Scenes and Incidents in the Wilds of North America.' He was knighted in 1831 by William IV. He also wrote 'Rome, a Tour of Many Days'; 'A Home Tour Through the Manufacturing Districts of England,' and 'A Tour Through Various Parts of the United Kingdom' and other works.

Head, Natt, American politician: b. Hookset, N. H., 20 May 1828; d. there 12 Nov. 1883. He became a railroad and general building contractor, sat in the State legislatures of 1861 and 1862, was adjutant-general of the State in 1864–70, and in that capacity published a four-volume military record of New Hampshire during the Civil War. In 1876 and 1877 he was elected to the State senate and in the latter year was its president. He was governor in 1879–80.

Head, the anterior part of the body of an animal when it is marked off by a difference in size, or by a constriction. The presence or absence of a head was formerly much used as a character in classification. But this line of classification is artificial. The mouth and principal nervous organs are the guides to the anterior end of the body, where the head, when recognizable, is situated. In the protozoa, infusoria, and cœlenterates, such as the hydra and corals, there is no nervous ganglion, and the mouth is not surrounded by special structures. In the inferior vermes the anterior end becomes marked by the presence of ganglia. The so-called head of parasitic animals, such as the tapeworms, is only the end of attachment, but neither mouth nor ganglia exist in it. In the polyzoa, lampshells, ascidians, and lamellibranch mollusks mouth and ganglia exist, but they are not surrounded by special structures. But in the worms proper, the articulated animals, the land and fresh-water gasteropods and the cuttlefishes a head proper is found. That is, the mouth and the anterior nervous ganglia are placed in a segment of the body which, by structure, is different from the rest. Thus in the worms and articulated animals some of the rings or articles of which the body is made up are fused together, the appendages being not walking limbs, but modified into jaws or jaw-like organs. Thus the common shoreworms possess a structural head, though it is not apparent. The head is best defined in the insects. The snail's head has its cavity shut off by a diaphragm from the rest of the body cavity. The cuttlefishes have, in addition, a remarkable cartilaginous box, which, like a skull, protects the ganglia and gives support to the muscles. The head of the vertebrated animals presents a regular series of increasing complexity from the amphioxus upward. In that fish the most anterior part of the nervous cord is lodged in a canal scarcely distinct from that which contains the rest of it. Ascending in the series, it becomes evident that as the anterior nervous mass enlarges, and its ganglia increase in complexity, the anterior vertebræ change their character; as the brain becomes specialized, so does the brain-case or skull. In man the brain attains its highest development and the head its greatest complexity, the difference between skull and face being now most pronounced. The vertebrate theory of the skull, first propounded by Goethe, is now accepted to this extent, that the skull or cranium consists of three vertebræ, which are recognizable in the fish, and that the facial bones are not vertebræ, but developed from cartilage which did not form an original part of the vertebral column. A vertebra consists of a body or centre, from which two processes arch upward and close in the spinal canal with its contents, the spinal cord. The posterior cranial vertebra is the occipital, consisting of a centre, two lateral pieces, and a superior, the next is the parietal, of which the basisphenoid is the centre, and the great wings of the sphenoid and the parietals the lateral arches; the most anterior is the frontal, with its centre, the presphenoid, and its arch, formed by the orbital plates of the sphenoid and the frontals. The centres of the spinal vertebræ are ossifications around a fibro-cartilaginous rod, the *chorda dorsalis*, which ends in the basisphenoid. So far spinal column and skull have a common base; but the spinal vertebræ were preceded by and are in fact modifications of primitive vertebræ, and no representatives of these appear in the development of the skull. It is therefore open to question whether the three divisions just mentioned are really vertebræ, or should not rather be called cranial segments. There is the more reason for this that in fishes the basisphenoid and pre-

sphenoid are represented by a single bone, the parasphenoid, which underlies the skull, but disappears in the higher vertebrates, and that the presphenoid is not properly connected with the chorda dorsalis, but rather belongs to the series of facial bones. The pituitary body which projects from the lower surface of the brain lies in front of the end of the chorda dorsalis: from this latter rod and its surroundings a plate of cartilage passes forward on either side of the pituitary body, and these (the *trabeculæ*) meeting in front of that body, form the cartilaginous axis around which the vomer, ethmoid, and other facial bones are developed, while the presphenoid is an ossification in this axis just where the two portions meet in front of the pituitary. The sense organs, the ear and the eye, are, so to speak, lodged in capsules of bone which are inserted, the ear between the occipital and parietal, the eye between the parietal and frontal segments. They are accidental, not essential parts of the cranium. The hyoid apparatus and the lower and upper jaws are developed from the cartilaginous walls of the embryonic skull, and the jaws come in a secondary manner to take part in the composition of the face. (See RESPIRATORY ORGANS.) The increasingly globular form of skull in the vertebrates is due to the greater increase of the cerebral hemispheres relatively to that of the base of the brain and axis of the skull; hence the brain comes in man to overhang the face. Of course it is to be remembered that while in the vertebrated animals the head is divided by its axis (commencing at the middle line of the upper jaw, and passing backward through the basisphenoid to the vertebral centres) into an upper chamber, lodging the brain, and a lower, lodging the first part of the alimentary canal; in the lower animals the cavity is a single one, the œsophagus piercing the nervous system so as to reach the surface of the body, and thus coming to be surrounded by a pair of ganglia above and a pair below, with the filaments connecting these ganglia. In the vertebrate the head is curved downward, the basisphenoid being the pivot point, so that the mouth is pushed to the lower surface; in the lower animals the under surface of the body curves upward, so as to carry a part of the nervous system past the mouth toward the upper surface. The eyes and feelers of a crab are in fact modified limbs which are thus carried upward; the jaws and sense organs of a vertebrate are entirely distinct from the limbs and other appendages of the trunk.

DIAGRAM, ILLUSTRATING GOETHE'S THEORY OF THE VERTEBRATE HEAD.

NASAL.	FRONTAL.	EYE.	PARIETAL.	EAR.	OCCIPITAL.	
Nose. Ethmoid and Prefrontal.	Frontals. Orbitosphenoids.		Parietals. Alisphenoids.		Supraoccipital. Exoccipitals.	*Arches.*
Vomer.	Presphenoid.	*Pituitary.*	Basisphenoid. Parasphenoid.		Basioccipital.	*Centra.*
Mouth. Upper jaw. Lower jaw.	Suspensorium.		Hyoid.			

Head-hunting. See DYAKS.

Head Money, an immigration tax of 50 cents levied by act of Congress 3 Aug. 1882 on every foreigner brought to the United States. Before the passage of this act the State of New York levied a "head tax" on all immigrants arriving at New York, the funds going to the support of the State board of immigration. A test of the legality of the tax being made in the courts, a decision was rendered that the New York statute was void because it infringed on the prerogatives of national government. Subsequently the act of Congress imposing the tax was questioned in the United States Supreme Court, and a decision affirming the constitutionality of the law was made. The national act provides that the tax shall be paid by the master or owner of the vessel bringing the immigrants, to the collector of the port, and by him turned over to the treasury of the United States, to be used by the secretary to defray the expenses of regulating immigration and to relieve immigrants in distress. See IMMIGRATION.

Headache, pain in the head, the result of a variety of causes. It may arise from overfulness of blood, from deficiency of blood or debility, from excited or inflammatory action, from the nerves, etc. If a person who suffers from headache is of full habit generally; if he is sleepy, dull, the vessels of his face full; overfulness is the probable cause, and reduction of the diet, with occasional doses of saline medicine, exercise, bathing the head with cold water, will be beneficial. If the urine is deficient, cream of tartar in some form may be taken with advantage. The above species of headache may also be occasioned by whatever impedes the circulation, such as affection of the heart or liver; when the latter is the case, the pain is frequently most severe at the back of the head. When, on the other hand, headache occurs in a person of weak constitution; when it is produced or aggravated by mental over-exertion; when there is listlessness both of mind and body rather than oppression — the face pale, the pulse weak — debility is the probable cause. This form of headache is often accompanied with indigestion, and is common in students and anxious men of business. Anything like abstraction of blood will certainly prove injurious. Exercise, attention to the state of the bowels, care in diet, rest, and change of scene and air, will be most useful. Headache from excitement or inflammatory causes is such as occurs in the first stages of inflammation of the brain and in some forms of fevers, or it follows violence to the head. Of all kinds of headache that arising from some disorder of the stomach is, however, the most common. The presence of indigestible food in the stomach almost certainly causes dull pain in the forehead; and too acid a condition of the contents of the organ produces the same effect. The various symptoms of indigestion will generally point to the cause. In the first some aperient, such as a saline draught, will probably remove the disorder. When acid eructa-

tions, heartburn, etc., indicate the presence of superabundant acid, a dose of soda, potash, or magnesia will correct the cause. There is a form of headache which consists in throbbing and pain of one part, or sometimes over one side of the head. This is called hemicrania (the migraine of French and the megrim of old English writers), and is often of a distinctly intermittent character. For its permanent cure quinine is in common use; a mustard poultice on the nape of the neck is also of service; and antipyrin has proved of value in affording relief. It should be well understood that the habitual use in headache of strong and swiftly working drugs is likely to undermine the nervous system, and increase liability to attack. Exercise, moderation and cheerfulness are the best preventives.

Headley, hĕd'lĭ, **Joel Tyler,** American historian: b. Walton, N. Y., 30 Dec. 1813; d. Newburg, N. Y., 16 Jan. 1897. Graduated from Union College in 1846, he took a course in theology at the Auburn Seminary, was pastor at Stockbridge, Mass., and in 1846 became assistant editor of the New York *Tribune.* In 1856–7 he was secretary of state for New York. His works, written in a popular vein, had great currency in their day, and include: 'Napoleon and his Marshals' (1846); 'Washington and his Generals' (1847); 'The Adirondacks' (1849), said to be the first book to advocate that region as a health-resort; 'Grant and Sherman, their Campaigns and Generals' (1865); and 'The Great Rebellion' (1864).

Headley, Phineas Camp, American Congregational clergyman: b. Walton, N. Y., 24 June 1819; d. Lexington, Mass., 1903. He was a brother of J. T. Headley, the historian (q.v.). He was admitted to practice at the bar in 1847, but studied theology at Auburn Seminary, held pastorates in various Presbyterian and Congregational churches, and contributed to the New York 'Observer' and *Tribune,* and many other newspapers and magazines. Among his works are: 'Women of the Bible' (1850); biographies of the Empress Josephine (1851), Kossuth (1852), Lafayette (1853), Mary, Queen of Scots (1856), Ericsson (1863), Farragut (1864), and others; 'Half-Hours in Bible Lands' (1867); 'Court and Camp of David' (1868); and 'Public Men of To-day' (1882).

Healy, George Peter Alexander, American painter: b. Boston 15 July 1808; d. Chicago 24 June 1894. He went to Paris about 1836, where he remained several years, alternating his residence there with occasional visits to the United States. Among works executed by him abroad are portraits of Louis Philippe, Marshal Soult, and Gen. Cass. At home he painted Calhoun, Webster, Pierce, and other prominent American statesmen. He occasionally produced large historical pictures, of which 'Webster's Reply to Hayne,' illustrating a well known scene in American legislative history, completed in 1851, now hangs in Faneuil Hall in Boston. At the exhibition of Paris in 1855 he exhibited a series of 13 portraits and a large picture representing Franklin urging the claims of the American colonies before Louis XVI., for which he received a medal of the 2d class. Portraits by him of Buchanan and Lincoln are in the Corcoran Gallery at Washington.

Healy, Timothy Michael, Irish political leader: b. Bantry, County Cork, Ireland, 17 May 1855. He was elected to Parliament for Wexford in 1880, County Monaghan in 1883, South Londonderry in 1885, North Longford in 1887, and County Louth, North, in 1895. In 1884 he was called to the Irish bar. He became known as a leader of the Irish Nationalist party, was a founder of the Dublin 'National Press' (later combined with the 'Freeman's Journal'), and was repeatedly in difficulties because of his public utterances on political matters. He made a lecture tour of the United States with Dillon and Parnell in 1880, and in 1881 participated in the Land League convention at Chicago, when $250,000 were contributed to the Irish cause. The 'Healy Clause' of the Land Act of 1881, providing that no tenant should pay rent on improvements made by him, was introduced by him. He wrote 'A Word for Ireland' (1886).

Heap, David Porter, American engineer: b. San Stefano, Turkey, 24 March 1843. He studied at Georgetown (D. C.) College, was graduated from the United States Military Academy in 1864, served in the Civil War with the engineer corps of the Army of the Potomac, and was brevetted captain for his services. In 1895 he attained the grade of lieutenant-colonel of engineers. He was for years employed in the construction of fortifications and the improvement of harbors, and in 1881 was military representative of the United States at the Paris congress of electricians. In addition to a 'Report on the International Exhibition of Electricity at Paris' (1884), he published: 'Ancient and Modern Light-Houses' (1889); 'Electrical Appliances of the Present Day'; 'Engineer Exhibit, Centennial Exhibition' (1882); and 'History of the Application of Electricity to Lighting the Coasts of France' (1885).

Heard, Franklin Fiske, American jurist: b. Wayland, Mass., 17 Jan. 1825. He was graduated at Harvard in 1848; was admitted to the bar in 1850; and practised in Middlesex County and later in Boston. He attained a reputation as an authority on pleading, and in 1861–6 was an editor of the 'Monthly Law Reporter.' His publications include: 'Libel and Slander' (1860); an edition of 'Stephen on Pleading' (1867); standard books on 'Criminal Pleading' (1879) and 'Civil Pleading' (1880); 'Heard on Criminal Law' (2d. ed. 1882); 'Shakespeare as a Lawyer' (1883); 'Precedents of Equity Pleadings' (1884); 'Precedents of Pleadings in Personal Actions in the Superior Courts of Common Law' (1886).

Hearing, one of the five senses, the physical organ of which is the ear. (See Ear, Acoustics.)

Hearn, hèrn, **David William,** American Roman Catholic clergyman and educator: b. Boston, Mass., 21 Nov. 1861. He was graduated at Boston College in 1880; took postgraduate courses in literature, science and philosophy for five years, and theological courses for four; entered the Society of Jesus, and was ordained priest of the Roman Catholic Church. He was successively professor in Georgetown University, vice-president of Boston College, and vice-president of the College of Saint Francis Xavier, New York. In 1900 he became president of Saint Francis Xavier.

Hearn, Lafcadio, American author: b. Santa Maura (Leucadia), Ionian Islands, 27 June 1850; d. Tokio, Japan, 26 September 1904. Educated in England and France, he came to the United States in 1869, was a journalist in Cincinnati and New Orleans, in 1887–9 was at Saint Pierre, Martinique, French West Indies, and in 1890 went to Japan. He became a Japanese subject with the name Yakumo Koizumi, and was appointed lecturer in English literature at the Imperial University of Tokio. His 'Stray Leaves from Strange Literature' (1884), and 'Some Chinese Ghosts' (1887), were succeeded by 'Chita: A Memory of Lost Island' (1889), story of the destruction of "L'Ile Dernière," once the watering-place of Louisiana fashion, which attracted attention by its descriptive powers; and 'Two Years in the French West Indies' (1890), which gained new interest through the Martinique disaster of 1902. Among his further works, dealing almost exclusively with things Japanese and revealing a thorough comprehension of and sympathy with the art, myth, tradition, and philosohy of the Orient, are: 'Out of the East' (1894); 'Glimpses of Unfamiliar Japan' (1895); 'Kokovo' (1896); 'Gleanings in Buddha-Fields' (1897); 'Exotics and Retrospections' (1898); and 'Kottō, or Japanese Curios' (1902).

Hearst, Phoebe Appersin, American philanthropist: b. 1840. She was for a time a teacher, and in 1861 married George F. Hearst of California. She has been active in charitable and philanthropic enterprises and has given largely, especially to educational institutions. In San Francisco she has established kindergarten classes for the children of the poor, and a manual training school, and has organized a number of working girl's clubs. She has also given money to build a National Cathedral School for girls; has made donations to the American University at Washington; has established and given largely to public libraries in the mining towns of the West; and maintained a school for mining engineers at the University of California. In 1896 she offered to pay the expenses of an international competition of architects to obtain a suitable plan for a campus and buildings for the University of California, and to erect two buildings in accordance with this plan. See CALIFORNIA, UNIVERSITY OF.

Hearst, William Randolph, American newspaper publisher: b. San Francisco. He was graduated from Harvard, and on leaving college took charge of the publishing of the San Francisco *Examiner*, formerly owned by his father, Senator Hearst of California. In 1895 he bought the New York *Journal*, the name of the morning edition of which he later changed to the *American*; in 1900 he started the Chicago *American*; in 1904 the Boston *American* and the Los Angeles *Examiner*. In 1902 he presented the Greek Theatre to the University of California. From 1903–5 he represented the 11th Congressional District (New York) in Congress. In 1905 he was defeated for the office of Mayor of New York on the Municipal Ownership platform.

Heart, The. The heart and the blood-vessels constitute the mechanical means for maintaining the circulation of the blood. In many respects this system is the most readily understood of any in the body, in that it is largely mechanical. There are, however, certain factors not existing in an ordinary system of hydraulics which, while essential to the proper performance of the function in the human body, render the understanding of the subject more difficult. The heart is merely a pump, or rather two pumps fused, for convenience, into one. It derives its power through contraction of the red muscle which forms its wall. It is hollow, alternately filling and emptying, receiving blood from one set of tubes filling its cavities, then emptying its contents into other tubes by contraction of its walls and momentary obliteration of its cavities. The action is analagous to that of the ordinary bulb syringe. The proper direction of the flow of the blood is maintained by valves, similar in structure and like in function to the valves in an ordinary pump.

The heart is about the size of the closed fist. The average dimensions of the adult organ are: length 85–90 millimetres in the male, 80–85 mm. in the female; breadth, 92–105 mm. in the male, 85–92 mm. in the female; thickness, 35–36 mm. in the male, 30–35 mm. in the female. The average weight in men is 300 grams; in women 250 grams. The heart is cone-shaped with the base uppermost. It lies within the cavity of the bony chest, a small portion of its anterior surface being in contact with the chest-wall, the rest covered by the overlapping lungs. The apex of the cone, or "apex," as it is technically called, is in the space between the fifth and sixth ribs on the left side, about 2 centimetres to the inside of a vertical line drawn through the left nipple. The heart reaches no lower and no farther to the left than this. From this point it reaches upward to the second rib, two thirds of its mass being to the left of the middle line of the body, one third to the right. Its long axis is neither vertical nor horizontal but is inclined to an angle of about 30 degrees to the horizontal, hence 60 degrees to the vertical. Therefore it is nearer horizontal than vertical. The position of the apex of the heart can be readily determined by placing the finger in the interspace mentioned and feeling the beat. In the healthy individual when not under excitement of the emotions or exercise no motion of the heart can be felt by the finger upon the chest-wall except at the apex.

Of secondary importance only to the heart is the system of tubes conveying the blood: arteries, capillaries, veins. The arteries are thick-walled, elastic tubes, dividing and subdividing into smaller tubes, but the total sectional area increases as the vessels become smaller in diameter. These end in a fine network of very small, thin-walled tubes called from their resemblance in size to hairs, capillaries. These in turn become veins, enlarging their diameter and diminishing their number, thus reversing the process in the arteries. Veins have very thin walls in proportion to the diameter of the bore and are provided with valves to prevent a back flow of blood.

This arrangement of the blood-vessels may be likened to two cones, base to base, one apex representing the largest artery leaving the heart, the other apex the largest vein entering the heart, and the bases of the cones the wide capillary system. The flow of blood will be naturally fastest in the larger arteries and veins, slower in the smaller arteries and veins, and slowest in the capillaries, due to the fact already men-

tioned that as vessels divide although the branches are smaller in diameter the combined sectional area is larger. The condition is quite like that of the flow of water in a river, the current being swiftest where the banks approach each other, slowest where the river widens into a lake or pond, again to become swifter as the width of the stream lessens.

The two pumps which compose the heart as a single whole are called the right heart and left heart. This designation takes its origin from the fact that one is more to the right side of the body, the other to the left side. Ordinarily the two parts are spoken of as the right side and the left side. The left side is by far the more powerful pump, having a very thick wall, its function being to force the blood under considerable pressure through most of the body, the so-called systemic circulation. The right heart has merely to force the blood through the lungs, a relatively short distance and under low pressure.

Each half of the heart has two cavities, a thin-walled one called the auricle for receiving the returning blood poured into it from the veins, and a thick-walled one called the ventricle which receives the blood from the auricle through an orifice guarded by a valve. The function of the ventricle is to force the blood by contraction of its muscular wall into the arteries through a connecting orifice also guarded by a valve. These four chambers are called the right auricle, right ventricle, left auricle and left ventricle. The walls of the auricles are composed of red muscle and are quite thin, the work required of them being but slight, that is, they force the blood under slight resistance. The walls of the ventricles are also made up of red muscle fibres, the outer surface being smooth, the inner surface crossed by a network of beams of muscle called the trabeculæ. The thickness of the wall of the right ventricle between the trabeculæ is from 2 to 3 millimetres; of the left ventricle 7 to 10 millimetres. The capacity of each ventricle is about 100 cubic centimetres, that is, it forces out about this amount at each contraction.

The function of the valves is to permit the flow of liquid in one direction and to prevent its flow in the opposite direction; in other words, their presence enables a pump to maintain a flow of liquid in one direction with little or no back flow.

The heart has four valves, one between each auricle and ventricle, and one in each ventricle at its point of connection with its outgoing artery. The valve between the auricle and ventricle of the left heart is called the mitral, from its resemblance to a bishop's mitre; that between the right auricle and right ventricle is called the tricuspid from its having three folds or cusps. The left ventricle is connected with the systemic circulation by the great artery called the aorta, its guarding valve is called the aortic valve. The right ventricle is connected with the circulation through the lungs by the pulmonary artery, its valve is called the pulmonic valve. The aortic and pulmonic valves are each composed of three cups of thin, flexible tissue fastened to the inner wall of the blood-vessel, their edges hanging free, and capacious enough to meet in the middle of the orifice they guard. When the ventricles contract, the blood within them under pressure tends to escape through any orifice, it presses upon these cups, forcing them against the walls of the orifice leading to the aorta and pulmonary artery respectively, leaving an opening of full size. In other words they offer no obstruction to the flow of blood in this direction. When, however, the muscle-wall by its contraction has emptied itself of blood through the orifices just mentioned it begins to relax, thus enlarging the cavity of the ventricle. Were there nothing to prevent, the blood just forced into the aorta and pulmonary artery under considerable pressure would flow back again into the relaxing ventricle, and so it does to a very slight degree, but this very back flow fills these three cups with blood, causing them to meet in the middle of the orifice, thus completely blocking it so far as any return of blood is concerned, and what blood has been forced into the aorta and pulmonary artery remains there to be carried on still further with the next contraction of the heart.

The mitral and tricuspid valves are simply flat folds or curtains attached to the edges of the orifices between auricles and ventricles. They are thrown back upon the inner walls of the ventricles while the blood is flowing from the auricles into the ventricles, offering little or no resistance to the flow, but when the flow of blood is in the opposite direction, that is, when the ventricles contract, they are floated upward till the free edges come in contact, thus blocking the orifice. The flaps are prevented from going too far by delicate tendinous cords attached to the free edge of the valves at one end and to the inside of the heart wall at the other end. They play the same part that sheets do for a sail. It will thus be seen that while one set of valves — mitral and tricuspid — is closed, the other set — aortic and pulmonic — will be open, and vice versa.

The period of active contraction of the ventricles is called the systole, and its time is often spoken of as the systolic period. The period of dilatation of the ventricles, the time during which they fill with blood from the auricles, is called the diastole or diastolic period. In time the two are nearly equal, the diastole being somewhat longer.

The cause of the heart beat is a matter of great interest. Inasmuch as the skeletal muscles require for contraction a stimulus carried to them through nerves, it was thought that heart muscle required a similar nerve impulse. It was known to physiologists that the heart of a frog severed from its connections went on beating in spite of there being no nerves attached to it to convey an impulse from without. Then certain nerve ganglia were found in portions of the heart wall and it was inferred that these gave out the necessary stimulus. But finally it was found that isolated portions of the heart wall in which there were no nerve ganglia continued to beat if they had a blood supply. Hence it was concluded by Gaskell that the beat of the heart must be due to an inherent rythmical power of the ventricle; the stimulus to the muscle probably residing in some chemical substance in the blood coming to the part. At any rate the ganglion theory is no longer held, while the latter is considered the probable one.

The sounds associated with the periods previously described are readily heard by anyone placing the ear over the heart of another person, or with a stethoscope the individual may hear

his own heart sounds. The contraction of the ventricles occurs at the time the impulse is seen and felt over the apex of the heart in the fifth interspace. It is associated with a booming sound, loud and distinct. Then comes a short period of silence corresponding to the time when the heart muscle ceases its contraction and begins to relax. Then comes a very short, sharp, flapping sound due to the closure of the valves which prevent the return of the blood from the aorta and pulmonary artery to the ventricles. Then follows a longer period of silence and again a repetition of the same set of sounds. The time from the beginning of the first sound to the beginning of the second sound, that is, the time of the "boom" and its short silence, is the systole of the ventricle. The time from the beginning of the second or short, sharp sound through the period of silence following it is the diastole of the ventricle. The whole period occupied from the beginning of the first of the sounds described to its repetition is called a cycle of the heart. Of these there are on an average in an adult 72 per minute. When the successive cycles occupy the same length of time the rhythm is said to be "regular." When the times are unequal the term "irregular" is used. When a beat is dropped the term "intermittent" is applied.

If, when the ear is placed over the heart, the finger be placed over the artery in the wrist, an impulse or beat will be felt in the latter, occurring at a slightly later time, about one sixth of a second, than the apex beat. This is the pulse wave corresponding to that individual heart beat. It varies in frequency, in volume and in tension according to the number of heart beats, the volume of blood thrown into the arteries from the heart, and the tension or tone of the arterial wall. The latter point will be explained later.

The course of the blood after leaving the left ventricle is through the aorta and its branching arteries to the arms and legs and to all the organs of the body, except the main supply to the lungs, through capillaries; thence it is returned by the veins to the right auricle, from there it goes to the right ventricle, from which it is pumped through the lungs for purification to the left auricle and thence to the left ventricle again. The length of time required for any portion of blood to make the complete circuit in the human being is not known with absolute accuracy, but it is probably not less than 15 seconds nor more than 30 seconds.

The work done by the heart may be expressed in units. Assuming the pressure in the left ventricle during contraction to be 130 millimetres of mercury, each square centimetre will receive a pressure of 175.5 grams. Assuming further that the left ventricle forces 100 cubic centimetres of blood at each contraction, the work done will equal 17,880 gram centimetres. The right ventricle does a third as much work as the left, giving a total of 23,840 gram centimetres. The total work of the heart per diem equals 24,000 kilogram metres, equivalent to 56.6 kilo-calories.

The relatively high pressure required of the heart in maintaining the circulation is due to the fact that it has to force the blood into arteries having elastic walls that offer a considerable resistance to stretching. The stream from the heart into the arteries is intermittent, the elastic arterial walls are stretched by the incoming blood absorbing the force during systole and tending to again give out this force when the heart ceases during diastole to supply fresh blood. Even during diastole the pressure within the arteries remains considerable. Hence the heart has to force the blood against the elastic tension of the arterial wall and against the blood already in the vessel from previous heart beats. This force stored up in the arterial wall tends to drive the blood along to the capillaries and veins, making in the capillaries and veins a constant flow, just as a single-cylinder pump provided with an air-chamber delivers a constant stream. The circulation, then, in the arteries is intermittent, in the capillaries and veins constant.

An element of much interest as well as of great importance to the proper maintenance of the circulation in the arteries and to the nutrition of the organs supplied by them with blood is what is called "vascular tonicity," by which is meant the peculiar property inherent in the arterial walls of maintaining a relatively constant blood pressure with varying amounts of blood contents. In an ordinary system of hydraulics maintained through elastic tubes the walls of which are stretched by the circulating contents, the pressure falls if some of the contents escape. In animals, on the contrary, a considerable quantity of blood may be withdrawn from the blood-vessels, yet the blood pressure, after a fall of very short duration, returns to the normal. This tonicity is due to the fact that the walls of the arteries have circular muscle fibres, under control of nerves, that contract down upon the blood remaining in the vessel and so maintain the pressure, a matter of great importance, as an equal pressure in organs is necessary for the proper physiological function.

The muscle in the arterial walls is supplied with two sets of nerves called vasomotor nerves, having opposite actions. One set called vasoconstrictors has the power when stimulated of contracting the vessel, the other set called vasodilators enlarges the vessel. Under normal conditions a certain equilibrium is established between the two sets of nerves and the artery is said to possess "tone." Increased action of one over the other will produce increased amount of blood in the part, as in the familiar example of blushing, or on the other hand pallor as seen in fright. Certain drugs have a powerful effect upon these nerves.

Before considering the diseases of the heart a word may be said of the historical development of the subject. That the blood circulated was not known until Harvey demonstrated it in 1628. Auenbrugger, a Viennese physician, in 1761 invented percussion, the method by which the position, size, and in a measure the changes in organs may be determined by the sound produced when the surface of the body over them is struck or "percussed," as it is technically called. His invention remained unheeded until 1806, when Corvisart, body physician to Napoleon, used it in mapping out the heart in healthy and in diseased conditions. Laennec, the founder of auscultation as used to-day, by means of his newly invented stethoscope, gave to the world in 1819 the first accurate description of the characteristics of the heart sounds and the significance of changes in the sounds in the diagnosis of diseases of the heart. Bouil-

laud in France and Hope in England were also pioneers in this work, practically all that has been done since then being an elaboration along lines laid down by them.

By percussion the size and position of the heart can be accurately determined, and by auscultation variations from the normal sounds and the presence of abnormal sounds enable one to determine what special derangement of the heart exists.

To understand the abnormalities of the heart it should be borne in mind that the work of this organ is done by the muscle of which it is composed; that the nerve stimulus for the muscular contraction comes from within the heart wall, and that the regulatory action, that is, whether it beats faster or slower, depends upon two nerves of opposing action, the vagus and the sympathetic; stimulation of the former slowing the heart, stimulation of the latter increasing the rapidity of action. Under ordinary conditions an equilibrium is established between them, somewhat analagous to the equilibrium in a balance when equal weights are placed in the scale-pans; an equilibrium that is at once disturbed if weights are added to or taken from either pan. Furthermore intact valves are necessary for the proper function of the heart.

Hence changes in the action of the heart are due to changes in the nerve stimulation; changes in the muscle; changes in the valves. They may exist alone or in combination. Changes affecting the nerves are more commonly functional or temporary; while those affecting muscles and valves are organic and usually, though not always, permanent.

Diseases of the valves are the most frequent, the most important and of the greatest interest. A valve to perform its duty properly must be so flexible that it is readily thrown back against the walls of the heart so as not to hinder the passage of the blood through the orifice it should go. It should also quickly fall back into place and meet its fellows, so as to block the passage and prevent the flow of blood in the direction it should not go. Unfortunately these delicate valve segments are prone to inflammation, rheumatic fever being the commonest cause. This inflammation is associated with the formation of new tissue much like that formed in the scar of a wound. It leads to thickening, rigidity, retraction and deformity of the valves, and also frequently to adhesion of the cups along the edges of closure.

These changes affect the function of the valve, causing on the one hand narrowing of the orifice so that the passage of the blood is obstructed, hence the technical use of the term "obstruction," or "stenosis"; on the other hand the segments of valves may be so shortened and puckered that they do not meet each other, and so leakage results. To this condition the term "insufficiency" or "regurgitation" is applied. Either obstruction of a valve orifice or leakage through a valve calls upon the muscle of the heart for more work. In the former case the blood is forced under a greater resistance; in the latter more blood must be forced to make up for the leakage. The muscular wall thickens and the cavity of the heart behind the leaky valve enlarges to "compensate," as the expression is for the valvular defect. This compensation may remain effective for years, the patient having but little inconvenience from the disease.

Sooner or later the heart muscle feels the effect of the prolonged overwork, it weakens, becomes stretched, the cavity enclosed by it enlarges, and the condition known as "broken compensation" follows. The heart can no longer supply a sufficient amount of blood for the needs of the body, the circulation is slowed, stagnation results with the associated symptoms of distress in breathing and frequently dropsy. There is marked impairment in the functions of the organs of the body due to imperfect blood supply. Valvular disease is very common and may occur at any age, but it usually involves the valves of the left heart, mitral and aortic.

With care on the part of the patient life may often be prolonged with comfort for many years. Apart from the benefit derived from rest, the drug digitalis by prolonging diastole and stimulating the heart muscle to better contraction gives the best results. When properly used it is a great boon to the patient.

The muscle of the heart undergoes a degenerative change in acute infective diseases associated with fever, like typhoid fever, pneumonia, and diphtheria, by which its contractile power is lessened. It may reach such a degree as to lead to death from paralysis of the heart wall. If the patient recovers from the disease the heart muscle in time recovers its normal tone.

An important disease of the heart muscle is one occurring usually in males after middle life, frequently associated with the symptom known as angina pectoris. It is a degeneration of the heart wall due to partial occlusion, by thickening of the walls, of the two coronary arteries which supply the heart muscle with blood, thus disturbing the nutrition of the muscle and the nerve ganglia. Angina pectoris is characterized by the sensation of great constriction and pressure and often of a violent tearing of the heart, with intense anxiety and a feeling of impending death. The suffering is often very great, and while the attack may be of short duration the prostration following one is marked.

Fatty degeneration of the heart muscle occurs, but it cannot be diagnosticated with exactness during life. Although the term is often heard its use should be reserved as an anatomical and not as a clinical diagnosis. That is, one can be sure of it only when one sees the exposed heart. On the other hand, collection of fat between the muscle-fibres and around the heart such as occurs in fat people may seriously embarrass the heart by not allowing enough space for it to move freely.

Extreme muscular effort as in lifting or carrying a heavy load or a prolonged march or climbing a mountain may overstrain the heart and lead to feeble action. Rest usually repairs the damage, although sometimes it is permanent.

Prolonged overwork and certain forms of disease of the kidney may lead to marked enlargement of the heart, due mainly to thickening of muscle wall of the left ventricle, to which the term "hypertrophy" is applied.

Disturbances of the heart function, due to some action through its nerves, are of great importance. Such may be physiological or functional, or they may be due to diseased conditions. Among the former are examples familiar to all. The increased frequency and force of the heart beat due to the emotions, to alcohol, to tea, to

coffee, to tobacco, belong in this category. If not used to excess the effect of the above may be merely temporary, the heart resuming its usual frequency and quiet action when the effect of the stimulation has ceased. Prolonged abuse of such substances or long continued nerve worry or excitement may lead to a more permanent disturbance of the heart functions, indicated by palpitation, either permanent or after a trivial cause, or by irregularity in the rhythm. The "tobacco heart" of the milder form is an irritable one, with increased frequency of the beat; in the severer grade marked irregularity is characteristic. In the nervously tired person palpitation is common, while the uncomfortable sensations about the heart due to disturbed digestion with fermentation in the stomach often lead the individual to consult a physician feeling that heart disease exists.

A nervous disorder of the heart of considerable interest is one associated with greatly increased frequency of its beat, but with a regular rhythm, combined with a marked prominence of the eyeballs, enlarged neck (goitre) and tremor of the hands. This complex has received the name of exophthalmic goitre, a neuropathic disturbance associated with irritation of the sympathetic nerve leading to the rapid heart action.

Still more uncommon and as yet unexplained is the condition called Tachycardia (rapid heart) characterized by paroxysmal attacks of very rapid beating of the heart, lasting but a short time and followed by normal frequency. During an attack it may be impossible to count the heart or pulse beats, owing to the rapidity.

WM. WHITWORTH GANNETT, M.D.,
Visiting Physician to the Massachusetts General Hospital, Boston, Mass.

Heart of Midlothian, The, a romance by Sir Walter Scott, published anonymously in 1818. It takes its name from the Tolbooth or old jail of Edinburgh (pulled down in 1815), where Scott imagined Effie Deans, his heroine, to have been imprisoned. The book is notable for having fewer characters than any others of Scott's novels. It has also a smaller variety of incidents, and less description of scenery.

Heart-urchin. One of a group of sea-urchins (see ECHINOIDEA) of elongated form and cordate outline from a lateral point of view. The group is best represented by the genus *Spatangus*, common in Europe, but heart-urchins occur elsewhere, and are known as fossils.

Hearts-ease, a violet (q.v.), especially the common yellow violet of Europe, or a pansy.

Heat. Until the early part of the 19th century, it was generally believed that heat was a substance devoid of weight (imponderable), and diffused through the mass of bodies. This hypothetical substance was called *caloric*. Many phenomena seemed to be explained by the assumption of the existence of caloric, but finally, through the experiments of Davy and Rumford, in which heat was actually created from mechanical energy, the old caloric theory was abandoned. In its place we now have the molecular motion theory. According to this theory heat is nothing but a violent agitation of the molecules of matter. These molecules are extremely minute, but have a definite size and weight for each definite substance. It has been estimated that a molecule of water has a diameter of about one fifty-millionth of an inch. Though molecules are small in size, their velocity, even at ordinary temperatures, is very great. In air, where the molecules dart about in straight lines until they encounter other molecules, they attain a speed of 1,470 feet a second at the freezing temperature. The average length of their path between two encounters — the *mean free path* — is about 1-277,000 inch, and the number of molecules in a cubic inch of air is about 10 raised to the 21st power. Each molecule experiences about 5,000,000,000 collisions a second.

Expansion of Solids, Liquids, and Gases.— The molecules of every substance attract one another with a force called cohesion. It is cohesion that prevents a wire from breaking when it supports a heavy weight. The pressure of the atmosphere also helps to hold the molecules of a body together. Opposed to both of these forces is heat. The effect of the agitation of the molecules is to make them jostle one another apart. Thus it is that in general an increase of temperature results in expansion. In solids, where the cohesion is enormous, the expansion for a given increase of temperature is very slight, especially when the test is made at low temperatures. At higher temperatures, when the molecules have somewhat weakened their mutual hold through having moved further apart, an increase of temperature equal to the previous increase generally results in a somewhat greater expansion. To express such ideas technically we employ the expression *coefficient of linear expansion,* which means the fraction of its length that a bar expands when heated one degree centigrade. As the length varies with the temperature, the length at the freezing point, 0° C., is taken as the standard length. Using then this expression we may say that the coefficient of expansion of a solid generally increases with the temperature. The coefficient of linear expansion of a number of substances will be found in the following table:

COEFFICIENTS OF LINEAR EXPANSION OF SOLIDS.

Aluminium	0.0000233	Wood (soft)	0.000003
Gold	0.0000144	Wood (hard)	0.000006
Iron	0.0000121	Vulcanite	0.000067
Lead	0.0000293	Paraffin	0.00034
Platinum	0.0000090	Quartz	0.0000013
Copper	0.0000168	Rock salt	0.00003
Zinc	0.0000292	Ice	0.00005
Silver	0.0000193	Glass	0.0000083
Steel	0.0000123	Granite	0.0000087
Guillaume's nickel steel (36 per cent nickel)	0.00000087	Porcelain	0.0000025

Two notable cases may be remarked. It is seen from the table that the coefficient for glass is very close to that for platinum. This fact is taken advantage of in the construction of incandescent electric lamps, and of those scientific instruments where it is necessary to have a wire pass through glass and leave an air-tight joint. In making the joint, the glass around the hole is softened by heat until it gathers closely around the hot platinum wire. In cooling, if the coefficient for platinum were higher than that for glass, the platinum would contract more rapidly than the glass and leave a leaky joint. The second case to be noted is that of Guillaume's nickel steel. The coefficient of expansion of this metal is so extremely small that

it is eminently suited to the construction of clock pendulum rods, of surveying instruments, and of standard scales of length, and to many other purposes where much expansion now proves an annoyance. Unfortunately the high cost of nickel will preclude the employment of this wonderful alloy in some cases.

The influence of expansion is seen in railroad tracks. On a cold day 60-foot rails may contract so as to draw apart one half of an inch. The cables of the Brooklyn Bridge support the slightly arched roadway. When they sag down in hot weather through expansion, they tend to make the roadway buckle. This tendency is increased by the expansion of the roadway itself. However, both tendencies were overcome through the foresight of the engineers, who provided a telescoping joint in the roadway at the middle of the span. The parts of this joint play in and out about a foot. On hot days clock pendulums grow longer, and so the clocks lose time. Glass when suddenly and hence unevenly heated, expands more at one point than at another, thus introducing internal strains that cause fracture, but vessels made of vitrified quartz are strong enough to resist this tendency to crack; they will endure without injury the sudden application of a blowpipe flame.

In liquids the molecules are so far freed from cohesion that they are able to roll around one another and to wander from one position to another. The small remaining cohesion is assisted by the pressure of the atmosphere or by any other pressure to which the liquid may be subjected and so the molecules in the body of the liquid are prevented from flying directly apart. It is on account of this small resistance to expansion that we find liquids very much more expansible than solids. The term *coefficient of cubical expansion* is employed to express the degree of expansibility of a liquid. It means the fraction of its volume that a liquid expands when its temperature is raised one degree centigrade. The cubical coefficient of a substance is three times as great as its linear coefficient, because we measure the effect of expansion in length, breadth, and thickness, instead of merely noting the expansion in length. Of course a liquid confined in a tube of unchanging dimension could only expand in length, but the effect in this one direction would be three times as much as it would be if the liquid were allowed to expand proportionally in all three dimensions.

COEFFICIENTS OF CUBICAL EXPANSION, LIQUIDS.

Ethyl alcohol	0.00106	Petroleum (heavy)	0.00090
Methyl alcohol	0.00114	Mercury	0.000181 53
Acetone	0.00135	Aniline	0.00118
Ether	0.00148		
Olive oil	0.00080		

The expansibility of water is strikingly irregular. Starting at the freezing point, water contracts as the temperature rises until at about 4° C. it has assumed its maximum density. A further increase of temperature now causes the water to expand, which it does at an increasing rate until it begins to boil at 100° C.

Gases surpass even liquids in their expansibility. Because in gases the molecules are relatively very far apart, cohesion counts for nearly nothing, leaving external pressure as almost the sole force restraining expansion. It appears that the coefficient of expansion of a gas is nearly independent of the external pressure, for though a greater pressure tends to restrain expansion more, the greater crowding of the molecules resulting from this pressure causes more frequent blows among the molecules, and makes the expansive force increase in nearly the same proportion as the external pressure. This law is not perfectly complied with because the molecules in a gas are not quite free from cohesion, especially when much compressed, and because the diameter of the molecule is an appreciable fraction of the distance between two molecules. Another law, fulfilled only approximately for the same reasons, is that all gases have the same coefficient of expansion, as will be seen in the following table, which gives the cubical coefficient referred as a standard to the volume the gas has at 0° C.

COEFFICIENTS OF CUBICAL EXPANSION, GASES AT A PRESSURE OF FROM 300 TO 500 MM.

Air	0.003667	Carbon dioxide	0.003710
Hydrogen	0.003661	Nitrous oxide	0.003719
Nitrogen	0.003661	Cyanogen	0.003877
Carbon monoxide	0.003667	Sulphur dioxide	0.003903

The Convection of Heat.—When the air in contact with a hot stove becomes warmed, it expands and grows lighter than the other air. Owing to unbalanced forces the hot air rises to the ceiling and then spreads out to the walls. It there becomes cooled, and therefore contracts and becomes dense. As a result it descends at the walls and finally returns to the stove only to start again on the journey. During this process, called *convection*, heat is carried by the air from the stove to the most distant parts of the room. Winds consist of convection currents in the atmosphere. Some parts of the earth's surface become more highly heated by the sun than others. The air over the hot areas expands and becomes specifically lighter than the surrounding air. The general result is that the hot air is forced to rise giving place to the surrounding cooler air which blows toward the hot area as a surface wind. The hot air risen aloft spreads away toward the cool regions as an upper wind. Corresponding to the ascent of air over the hot areas is a descent of air over the cool areas. Much heat is brought from the tropical regions to temperate regions by regular winds.

Convection phenomena also occur in liquids. A large vessel of water supplied with heat at one side of the bottom becomes through the action of convection currents uniformly heated throughout. Much heat is conveyed from the equator toward the poles by means of the Gulf Stream and other ocean currents. It is probable, however, that with ocean currents differences of temperature have little to do with the motion of the water, but that the motion is caused chiefly by the action of winds that blow with great steadiness in a westerly direction across the equatorial portions of the great oceans. Difference in salinity of the ocean at different latitudes may possibly be a partial cause of the phenomenon.

Thermometry.—Before proceeding further in the discussion of heat phenomena, it will be necessary to describe some of the methods employed for measuring temperature or the degree of hotness of a body. Most commonly the methods depend upon the property of expansion. In ordinary thermometers the expanding body is either mercury or colored alcohol. The

liquid, say mercury, is held in a glass tube having a fine bore and at one end a spherical or cylindrical bulb, the other end being simply closed. Above the mercury, which fills the bulb and part of the stem, is a space that is free from air and contains only a small amount of mercury vapor. When the thermometer is warmed, the mercury rises in the tube because the cubical expansion of mercury is greater than the cubical expansion of glass. The glass tube is provided with a scale, sometimes engraved directly on the tube, and sometimes engraved on some other material and mounted at the back of the tube. For a Fahrenheit scale division number 32 is placed opposite the mercury level when the thermometer is placed in pure crushed melting ice, and division number 212 is placed opposite the mercury level when the thermometer is placed in saturated steam over boiling water. As the temperature of the boiling point depends upon the atmospheric pressure, which is ever varying, the standard boiling point is taken to correspond to the average atmospheric pressure, which is measured by a barometric column of 760 millimetres. The space between these marks, the freezing and boiling points, is divided into 180 equal divisions, and then divisions equal to these are extended above the boiling point and below the freezing point. For the centigrade scale, which is generally employed in scientific work, the freezing point on the thermometer is marked 0° and the boiling point 100°. For the Réaumur scale, much used for household purposes in Germany, these points are marked 0° and 80° respectively, and finally for the De Lisle scale, which is used in Russia, the direction of the graduation is reversed, the boiling point being marked 0° and the freezing point + 150°. With this last thermometer, the greater the intensity of the *cold* the higher the number representing the temperature. Mercury thermometers permit of the measurement of rather high temperatures, mercury not boiling until the temperature of about 357° C. (674.3 F.) is reached. Still higher temperatures with mercury thermometers may be reached by checking the vaporization of the mercury through the introduction into the upper part of the tube of a compressed gas such as nitrogen. With such a thermometer the only limitation is the softening of the glass at high heats, and even this trouble is largely lessened by the use of vitrified quartz for the material of the bulb. On the other hand, mercury freezes at about — 39° C. (— 38.2° F.) and so becomes useless for indicating temperatures lower than this. For these lower temperatures alcohol may be employed as the thermometric substance because it resists freezing until temperatures far below any met with in nature are encountered. In addition to this advantage alcohol expands much more rapidly than mercury, thus permitting a much larger bore for the same length of degree. However, for very high temperatures alcohol is not available, as it boils at the moderate temperature of 78.3° C. (173° F.).

In practical work thermometry fairly bristles with errors. For several months after a thermometer is made the bulb gradually shrinks, probably owing to some molecular instability in the glass caused by the excessive heating employed in the process of blowing the bulb. This causes the thermometer to read too high. After each time a thermometer is used for a very high temperature the bulb on cooling fails to contract promptly to the volume proper to the new temperature, and so now the thermometer for a while reads too low; however, prolonged heating at the temperature of boiling mercury tends to put the glass into a more stable state. Also such troubles are much reduced by the use of hard glass instead of soft glass for the bulbs. Errors also arise from the following causes: non-uniformity of the bore; variations of atmospheric pressure, which cause a yielding of the bulb; failure to have the stem of the thermometer at the same temperature as the bulb; the hydrostatic pressure on the bulb due to the liquid being tested, especially when the thermometer is sunk to great depths; a variation in the internal pressure of the mercury itself on the bulb when the thermometer is inclined from the vertical position to the horizontal; a peculiar jerking motion of the mercury when it ascends a very fine bore; the fact that equal volumes of the bore marked off on the tube do not represent equal expansions of the mercury, since at high temperatures the volume of the bore indicating a degree has increased (this is quite distinct from the matter of the relative expansion of glass and mercury); irregularities in the expansion of the glass of the thermometer; and lastly irregularities in the expansion of the fluid itself, be it mercury, alcohol, air, or any other substance. This last source of error is worth much consideration because two thermometers otherwise perfect but containing different liquids, as alcohol and mercury, fail to agree in their indications. Further, we have no right arbitrarily to select any particular fluid as a standard and yet feel that our temperature scale has anything more than an empirical value. It will, however, be explained in the last section how a theoretical definition for temperature measurement can be formulated (the thermodynamic scale), agreeing fairly with ordinary thermometers, very closely with the hydrogen or nitrogen thermometer, and perfectly free from ambiguity.

In the hydrogen thermometer advantage is taken of the increase of pressure of a gas attending an increase of temperature, the volume of the gas being kept constant. The hydrogen is confined in a glass bulb about two inches in diameter which is connected by a thick-walled capillary tube with the top of one side of a U-shaped apparatus consisting of two vertical glass tubes connected by a rubber hose at their lower ends and partly filled with mercury. When the hydrogen in the bulb is warmed it tends to expand and push the mercury down its side of the U and to cause it to rise on the other side, which is open to the atmosphere. This effect is counteracted by raising the glass tube on the open side, the rubber tubing allowing this to be done. The extra back pressure of the mercury forces the hydrogen back to its former volume. In measuring the pressure to which the hydrogen at any time is subjected, the difference in level of the mercury columns must have added to it the length of the barometric column measured at the time. For each degree centigrade added to the temperature, the hydrogen is found to increase in pressure about 1/273 of its pressure measured at 0° C. Similarly for each degree subtracted, the pressure decreases 1/273 of the pressure at 0° C.

If this law held to the limit, we would conclude that at $-273°$ C. the hydrogen would lose all its pressure, thus indicating the cessation of all molecular motion — a veritable absolute zero of temperature. However, at extremely low temperatures the perfect working of this law is interfered with through the dominance of cohesion which reduces unduly the pressure of the hydrogen, and may cause it to assume the liquid or even the solid state. Nevertheless, this limiting temperature as predicted by the hydrogen thermometer agrees almost exactly with the true absolute zero of the thermodynamic scale referred to above. On this absolute scale the temperature of freezing water is approximately $+273°$ Abs., and temperature of boiling, $+373°$ Abs.

Other methods of measuring temperature depend upon change in the electrical resistance of platinum, and upon the electromotive force created when the juncture of two dissimilar metals as platinum and rhodium is heated. Very high and very low temperatures may be measured by such methods.

Conduction of Heat.—When a sterling silver spoon is placed in a cup of hot tea, the handle of the spoon soon becomes uncomfortably warm to the hand. Heat has been conducted through the silver. The molecules in the bowl of the spoon are the first to have their motion accelerated by contact with the tea. This extra motion is communicated to their neighbors which in turn pass it on until, step by step, the motion reaches the molecules in the handle. It appears that in some substances the character of connection between the molecules is more favorable to conduction than in others. As we might have expected, from the mutual grip of the molecules found in solids, that class of bodies furnishes the best conductors; but in gases, where the molecules are very loosely distributed, we naturally find the poorest conductors. Liquids as conductors occupy a position intermediate between solids and gases. Metals surpass all other materials in conducting power, silver standing at the very head of the list, while near the foot of the list of solids are found organic materials and mineral substances especially when in the porous or fibrous state, such as horn, leather, magnesia brick, asbestos fibre, sand, cotton wool, cowhair felt, and down. Great value is attached to poor conductors of heat. They are called insulators. Bone is used in joining the handles to silver tea pots. Our clothes are made of organic material woven so as to leave a multitude of fine pores, a condition favorable to insulation and met with in the fur of animals and in the feathers of birds. Saw dust and mineral wool for the same reason are made to serve as insulators of heat in the outer casing of ice boxes.

In the following table of conductivities the better conductors have the higher numbers. These numbers, called the *coefficient of conductivity*, indicate the amount of heat energy measured in calories (a *calorie* is the amount of heat energy required to raise the temperature of a gram of water one degree centigrade) conducted from one face to the opposite face of a centimetre cube of the substance when one of the faces is maintained one degree hotter than the other. The amount of heat energy conducted is proportional to the difference in temperature between the opposite faces.

COEFFICIENTS OF CONDUCTIVITY.

	Degrees Cent.	
Aluminium	at 0	0.343
Aluminium	at 100	0.362
Bismuth	at 0	0.0177
Bismuth	at 100	0.0164
Brass	at 0	0.2041
Brass	at 100	0.2540
Copper	at 0	0.7189
Copper	at 100	0.7226
Iron	at 0	0.166
Iron	at 100	0.163
Lead	at 0	0.0836
Lead	at 100	0.0764
Silver	at 0	0.960
Zinc	at 0	0.303
Mercury		0.0152

Slate	0.00272
Granite	0.0053
Marble	0.0050
Sand, white	0.00093
Snow, compact	0.00051
Vulcanite	0.0004
Wood, fir —	
Along grain	0.0003
Across grain	0.00009
Bees'-wax	0.00009
Ether	0.0003
Water	0.002
Air	0.000056
Hydrogen	0.00039

Specific Heat.— In the last section the expression "heat energy" was employed, and the "calorie," its unit, was defined. If thin glass vessels containing equal weights at equal temperatures of different materials, mercury and water for example, be placed over equal gas flames so as to receive in a given time equal amounts of heat energy (equal numbers of calories), it will be found that the water will require nearly 30 minutes to get as hot as the mercury does in one minute. The water is said to have a greater capacity for heat than the mercury has. Making allowance for the heat capacity of the glass vessels and for radiation and conduction it is found that the heat capacity of mercury is 0.034 that of water. We say that the *specific heat* of the mercury is 0.034, for water is taken as the standard and its heat capacity is assigned the value 1.0. The value of the specific heat of a number of solids and liquids is given in the following tables:

SPECIFIC HEAT OF SOLIDS.

Substance	A Atomic Weight	B Specific Heat	C = A × B Atomic Heat
Aluminum	27.04	0.2022	5.45
Bismuth	207.5	0.0298	6.17
Copper	63.18	0.09232	5.82
Gold	195.74	0.03035	5.94
Iron	55.88	0.10983	6.13
Lead	206.39	0.0315	6.50
Nickel	58.24	0.10842	6.31
Platinum	194.3	0.03147	6.09
Silver	107.66	0.0559	6.10
Sulphur	31.98	0.1844	6.02
Tin	117.35	0.0559	6.65
Zinc	64.88	0.0935	6.05
Ice	.....	0.502	.....
Paraffin	.....	0.694	.....
Glass	.....	0.19	.....
Wood	.....	0.6	.....
Quartz	.....	0.186	.....
Rock Salt	.....	0.219	.....
Gypsum	.....	0.26	.....
Ruby	.....	0.22	.....
Brass	.....	0.093	.....

SPECIFIC HEAT OF LIQUIDS.

Acetone	.53	Glycerine	.55
Alcohol, Ethyl	.65	Mercury	.034
Benzol	.44	Carbon disulphide	.24
Bromine	.46	Turpentine	.46
Ether	.54		

In the first table the atomic weights (the weight of the atom as compared with the weight of an atom of hydrogen) of some of the elements in the solid state are also given. The product obtained by multiplying the specific heat by the atomic weight is given in the last column. It will be observed that these products are approxi-

mately equal. This equality indicates that if we took as our standard of comparison equal numbers of atoms of a solid instead of equal weights, all elements in the solid state would have the same heat capacity. It takes about as much heat energy to raise the temperature of an atom of gold one degree as it does for one atom of aluminium. This law of Dulong and Petit also applies with some degree of approximation to compounds in the solid state — not equal heat capacity for the molecules, but for the atoms.

In the cases of gases we have two specific heats according as on the one hand the gas is confined to constant volume while being heated, or as on the other hand the gas is allowed to expand so as to keep the pressure constant. This is shown in the accompanying table where it will be seen that the specific heat at constant pressure is greater than the specific heat at constant volume.

SPECIFIC HEATS OF GASES.

Substance	Symbol	Constant volume equal weights	Constant pressure		Ratio of specific heats, equals cal. 4 ÷ cal. 3
			Equal weights	Equal volumes	
Air	.....	.1692	.2374	.2374	1.403
Mercury vapor	Hg	.....	.....	.....	1.666
Argon	Ar	.....	.....	.....	1.63
Carb. monoxide	Co	.1746	.2450	.2370	1.403
Oxygen	O_2	.1542	.2174	.2405	1.41
Hydrogen	H_2	2.417	3.4090	.2359	1.41
Nitrogen	N_2	.1729	.2438	.2370	1.41
Chlorine	Cl_2	.0913	.1210	.2962	1.336
Carbon dioxide	CO_2	.1654	.2169	.3307	1.311
Ether	C_4H_4O	.467	.4810	1.2296	1.03

This difference in specific heat in the same gas is due to two causes. When the gas expands not only do the molecules acquire greater kinetic energy, but in pushing each other farther apart against the attractive force of cohesion, they require a further amount of energy of the potential sort, and in pushing back the restraining pressure of the atmosphere still another large supply of energy is needed. It appears from several independent considerations that in gases far removed from their liquefying points the cohesion effect is exceedingly small, and so we conclude that the excess of specific heat of an expanding gas is almost entirely due to work done on the external pressure applied to the gas.

In the last column of the table the ratio of the two specific heats of the gases is given. This ratio is found to vary, decreasing from simple gases like mercury vapor, the molecules of which have single atoms, to complex gases like ether vapor, the molecules of which have 15 atoms. With complex molecules a large part of the energy is internal, much being stored up in the rotating motion of the individual molecules, and in the relative motion of their atoms, leaving the energy of translation of the molecules and the energy due to the pushing back of the external pressure about the same as before. It follows then that the energy associated with the external pressure is a smaller fraction of the whole energy, and that therefore, as observed, the ratio between the heat energy imparted to an expanding gas and the energy imparted to a non-expanding gas must be smaller for such complex molecules. The value of this ratio is the principal means of judging of the number of atoms in a molecule of an element in the gaseous state.

Before leaving this subject it should be remarked that the specific heat of water varies slightly with the temperature, and so it is convenient to take as the value of the calorie one hundredth the heat required to raise the temperature of a gram of water from 0° C. to 100° C.

Latent Heat.—If heat energy be imparted to a mass of ice at the point of melting, the ice will proceed to melt, but will not grow any warmer as it does so. The heat energy thus added without increasing temperature is called *latent heat.* Latent heat is devoted only to shaking the molecules of ice asunder, not to increasing their speed. Temperature depends upon the energy of motion (kinetic energy) of the molecules; latent heat only stores up energy of position (potential energy) of the molecules, and so does not produce an increase of temperature. Again, when water is being boiled, a large amount of heat energy becomes latent. The latent heat of vaporization and of melting for a variety of substances is given below.

LATENT HEAT OF VAPORIZATION.

	Calories		Calories
Water	536	Mercury	62
Acetone	126	Carbon disulpbide	90
Ethyl alcohol	206	Sulphur	362
Methyl alcobol	264	Ether	91
Liquid air	47		

LATENT HEAT OF MELTING.

	Calories		Calories
Ice	80.	Silver	21.07
Sulphur	9.37	Mercury	2.82
Paraffin	35.10	Iron	35.
Phosphorus	5.	Platinum	27.
Bees'-wax	42.	Tin	14.
Zinc	28.13	Bismuth	13.
Lead	5.86	Copper	30.

It should be remarked that the latent heat devoted to converting a liquid into vapor besides increasing the internal potential energy of the molecules also does work in pushing back the atmosphere, but with water this external work bears a very small ratio to the internal work against cohesion, namely, a little more than one twelfth.

Heretofore we have supposed the energy for melting or for vaporization to be derived from some external source of heat. It is, however, possible to secure a change of state through the consumption of the heat energy of the body itself. If water be left in an open vessel it will presently have evaporated entirely away. During the progress of this vaporization a thermometer placed either in the water or in the moist air above the water will show a temperature lower than that of the surrounding air. The reason of this is as follows: At the surface of the liquid, with all the irregularities of position and velocity possessed by the molecules, some of them find opportunity to fly off from the liquid surface. On the average it will be the faster going molecules that spring away first, thus leaving the more slowly going ones behind, which is the same as saying that the remaining liquid is cooler. Also in going away, the

molecules fly against the back pull of cohesion, and so their velocity is checked. Indeed many are entirely stopped and drawn back into the liquid, though others escape quite beyond the range of cohesion of the liquid and diffuse among the molecules of the air. The reduced motion of these escaping molecules causes the low temperature referred to above of the vapor. Common illustrations of cold by evaporation are frequently met with. The function of perspiration is a means of regulating the temperature of the human body. In the healthy state when we are overheated the skin becomes very moist and the evaporation of this moisture, assisted by a breeze or by fanning, cools the surface. In disease the proper action of the skin may be interfered with, and becoming dry, may fail through lack of evaporation to provide the normal cooling effect. An exalted temperature of the body ensues; in other words, a fever. Certain drugs tend to promote perspiration and thus reduce the temperature of the patient. Another large factor in the temperature regulation of the body is in the water evaporated from the lungs in the process of breathing. The evaporation of ammonia that has been liquefied by pressure furnishes the cold employed in some ice machines. In the case of liquefaction the necessary latent heat may be derived from the body itself. This occurs when a salt is dissolved in water, a process that is generally accompanied by a fall of temperature, though occasionally a rise in temperature is noted. The factors governing the result in such cases are rather complicated. We have to take account of the work done by the solvent in tearing molecules away from the solid lump and in some cases the tearing of these molecules apart into electrically charged parts called ions. On the other hand a certain amount of kinetic energy is furnished by the attraction of the molecules of the dissolving substance by the molecules of the solvent. According as the back pulls or the forward pulls predominate, will the temperature of the solution be lowered or raised. If much chemical action takes place between the substance and the solvent, the solution is almost always warmed.

The temperature at which melting takes place depends upon external pressure. When a solid like paraffin expands on liquefying high pressure, which resists expansion, stops melting until a temperature slightly higher than the ordinary melting point is reached. Paraffin that under ordinary conditions melts at 46.3° C. melts at 49.9° C. when subjected to the additional pressure of 100 atmospheres. In the case of ice, which contracts on melting, melting is favored by pressure. The addition of one atmosphere of pressure lowers the melting point of ice by 0.0072° C. This fact accounts for the slipperiness of ice especially when being skated upon. The sharp edge of the skate exerts great pressure on the ice below it, which melts and furnishes a lubricating film of water. This film of water is cooler than the ice furnishing it, some of the heat of the ice having become latent, and as soon as the skate has passed over, the water immediately resumes the solid state. This process of freezing again is called regelation. Regelation is an important factor in glacier motion. The ice as it follows down a tortuous valley is continually being cracked. After the settling following this cracking, the great pressure from the upper ice fields melts the ice at the points of contact of opposite sides of a fracture, and the escaping undercooled water freezes again, thus healing the fracture. In this way the glacier appears to follow down the irregularities of a valley as would a very viscous mass.

MELTING POINTS.

	Degrees Centigrade		Degrees Centigrade
Paraffin	55	Bismuth	270
Ice	0	Cadmium	318
Silver chloride	450	Copper, pure in air	1065
Fluor spar	900	Copper, pure, air excluded	1084
Potassium nitrate	340	Iron	1600
Salt, common	800	Lead	330
Spermaceti	44	Mercury	—39
Sugar, crystals	170	Nickel	1500
Bees'-wax	63	Palladium	1700
Brass	900	Platinum	1900
Glass, crown	400	Rhodium	2000
Gold	1064	Selenium	216
Cast iron, gray	1200	Silver	1000
Cast iron, white	1100	Sulphur	114
Silver, sterling	900	Tin	230
Steel, cast	1400	Zinc, pure	419
Hydrogen	—255	Manganese (99%)	1245
Oxygen	—191	Chromium (99% free from carbon)	1515
Aluminium, pure	657		
Antimony	440		

Saturated and Unsaturated Vapors.—When a liquid, water for example, is placed in a vacuous enclosure kept at constant temperature by artificial means, it immediately begins to evaporate, the vapor presently attaining a maximum density and pressure. The vapor as well as the space occupied by it is then said to be *saturated.* Before this maximum pressure was reached the vapor was unsaturated. If the temperature of the whole apparatus be now raised, more water will commence to evaporate, and the vapor will increase in density and pressure before it is again saturated. Had the saturated vapor formed in the first place been shut off from the water surface before raising the temperature, it would not become as dense as when it had the water evaporating into it, and so we would then pronounce the heated saturated vapor as unsaturated. On the other hand if a mass of unsaturated water vapor be cooled, the density of the vapor will at a certain temperature be sufficient to cause saturation. Below this particular temperature, called the *dew-point,* some of the moisture will condense. In some cases, however, when there are no nuclei in the form of dust particles, free ions, etc., the vapor may cool appreciably below the dew-point without immediate condensation. The vapor is then said to be supersaturated. The presence of air has only a very small influence on the density and pressure of saturated water vapor in contact with water, especially when the temperature is not high.

When the temperature of water or other volatile liquid is raised so high that the pressure of the saturated vapor becomes as great as that of the atmosphere, bubbles of the vapor begin to form in the body of the liquid. This constitutes the process of boiling. The temperature at which a liquid boils is much influenced by the external pressure. The boiling point is the same as the temperature at which the pressure of the saturated vapor equals the external pressure on the bubble. In the following table these temperatures with their corresponding pressures are given for water.

PRESSURE OF WATER VAPOR.

Temperature degrees centigrade	Pressure in millimetres of mercury	Temperature degrees centigrade	Pressure in millimetres of mercury
—10	2.08	50	91.98
— 5	3.14	55	117.48
0	4.60	60	148.79
+ 5	6.53	65	186.94
10	9.16	70	233.09
15	12.70	75	288.52
20	17.39	80	354.64
25	23.55	85	433.41
30	31.55	90	525.45
35	41.83	95	633.78
40	54.91	100	760.00
45	71.39	101	787.63

Degrees centigrade	Pressure in atmospheres	Degrees centigrade	Pressure in atmospheres
100.	1	198.8	15
112.2	1½	201.9	16
120.6	2	204.9	17
133.9	3	207.7	18
144.0	4	210.4	19
152.2	5	213.0	20
156.2	6	215.5	21
165.3	7	217.9	22
170.8	8	220.3	23
175.8	9	222.5	24
180.3	10	224.7	25
184.5	11	226.8	26
188.4	12	228.9	27
192.1	13	230.9	28
195.5	14		

BOILING POINTS OF LIQUIDS.

	Degrees Centigrade		Degrees Centigrade
Hydrogen	— 246.	Sulphur dioxide	— 10.1
Helium	— 240.?	Ether	+ 34.6
Nitrogen	— 196.5	Carbon disulphide	+ 46.2
Air		Acetone	+ 57.
Argon	— 186.1	Chloroform	+ 60.2
Oxygen	— 182.7	Methyl alcohol	+ 64.9
Fluorine	— 187.	Ethyl alcohol	+ 78.3
Krypton	— 152.7	Benzol	+ 80.2
Xenon	— 109.9	Water	+ 100.0
Ethylene	— 102.	Amyl acetate	+ 150.0
Nitrous oxide	— 89.	Aniline	+ 184.4
Carbon dioxide (sub-limes)	— 80.	Sulphuric acid	+ 330.?
Chlorine	— 33.6	Sulphur	+ 448.4
Ammonia	— 32.9	Mercury	+ 356.8
		Zinc	+ 958.

A saturated vapor in contact with its liquid offers a beautiful instance of dynamic equilibrium. We conceive that molecules are ever leaving the surface of the water, adding themselves to the vapor. At the same time molecules of the vapor coming near to the liquid surface or plunging into it are caught by the cohesion of the liquid, thus subtracting themselves from the vapor. A less dense vapor would lessen the latter process and would allow the vapor to grow denser; a denser vapor would increase it and allow the vapor to fall to a state — the saturated state — when the rate of evaporation is just equal to the rate of condensation.

The degree of moistness of air is expressed by the phrase *hygrometric state*. The hygrometric state does not express the density of the water vapor present, but instead expresses the quotient obtained by dividing the density of the vapor present by the density of the vapor required to saturate the air. If pressures were employed instead of densities in getting the quotient, substantially the same result would be obtained. Still another common way of defining hygrometric state is to take the quotient obtained by dividing the pressure of the vapor corresponding to the dew-point by the pressure of vapor saturated at the temperature of the air, a method closely agreeing with the former ones.

The Critical State.—When the temperature rises, the density of a saturated vapor in contact with its liquid becomes denser, while the liquid itself expands and becomes less dense. If the heating of the liquid and vapor takes place in a strong closed vessel containing not too much or too little of the liquid, after a while a temperature is reached at which the saturated vapor becomes as dense as the liquid. At this point they become identical in their physical properties; the line of demarkation of liquid and vapor fades away, and the two fluids begin to mix. The temperature at which this phenomenon occurs is called the *critical temperature*, the corresponding pressure is called the *critical pressure*, and the liquid is said to be at the *critical state*. Above the critical temperature it is impossible to distinguish between a liquid and its vapor. No matter how great the pressure, a gas or vapor cannot be forced into the state of a liquid that is obviously distinct from the vapor unless the vapor be cooled below the critical temperature.

CRITICAL TEMPERATURES AND PRESSURES.

Substance	Critical Temperature Degrees Centigrade	Critical Pressure Atmospheres
Hydrogen	— 225.	15.
Oxygen	— 118.8	50.8
Nitrogen	— 146.	35.
Carbon monoxide	— 141.	36.
Argon	— 120.	40.
Fluorine	— 121.	50.6
Methane	— 95.5	50.
Carbon dioxide	+ 31.	75.
Ammonia	+ 130.0	115.
Sulphur dioxide	+ 155.4	80.
Chlorine	+ 144.0	83.9
Nitrous oxide	+ 35.	75.
Water	+ 365.	200.
Ethane	+ 34.	50.2
Ethylene	+ 10.	51.7

Radiation.—We have described two methods by which heat energy may be transferred from one place to another — by conduction and by convection. A third method remains to be studied. How does the heat of the sun reach us? By means of waves in the luminiferous ether. Go to a quiet pond in which a piece of wood may be floating. Standing on the shore, vibrate your hand up and down in the water. Waves run from your hand over the surface of the water to the wood and cause it to vibrate up and down. Energy from the hand has been transferred to the wood by means of waves. These waves consist of the successive vibration of successive particles of water, each particle receiving energy from behind and passing it on to the front. It is much the same with heat waves. The ether, which fills all space, is capable of being set into vibration by vibrating molecules and of handing this vibration on step by step in the form of waves. Molecules acted upon by these waves are themselves set into vibration. The vibrating molecoles of the sun generate ether waves, and the ether waves generate vibration of the molecules of bodies on the earth. These ether waves are called *radiant heat*. We now have a very wide range of ether waves under experimental control. From the large waves generated by electrical oscillations used in wireless telegraphy

and sometimes a quarter of a mile long we may pass by insensible gradations with only two breaks to the extremely minute waves supposed to constitute Roentgen's X rays. Dark heat waves or infra-red rays, ordinary light, and ultra-violet light belong to the middle of the series. Quite recently Blondot has discovered a peculiar radiation which he designates as *n rays.* There are indications that n rays are ether waves about one fifth of a millimetre in length. All of these waves behave very much like light. They all have the same velocity as light, namely, 186,300 miles a second (n rays not tested yet). All except Roentgen rays may be reflected, refracted, polarized, and absorbed by transmission to a degree depending upon the substance used for transmission and the particular wave-length of the rays.

Thermodynamics.—The most cogent reason for discarding the caloric theory of heat is that heat may be generated from that which is not in any sense substance — heat may be derived from mechanical energy. Heat is generated when a brass button is rubbed on the carpet, when a bullet is struck with a hammer, and when two pieces of ice are rubbed together, a process resulting in their melting. The relation between mechanical energy and the heat energy generated by its consumption was first carefully investigated by J. P. Joule before 1850. One pound-calorie of heat energy is obtained from 1,400 foot-pounds of mechanical energy. That is to say, the energy due to the fall of 1,400 pounds through the distance of a foot is sufficient if transformed into heat to raise the temperature of a pound of water through one degree centigrade. This number of foot-pounds is called the *mechanical equivalent of heat,* for it has been found that the process is reversible. When by means of an air-engine or a steam-engine one pound-calorie of heat is consumed in generating mechanical energy, 1,400 foot-pounds of the latter are obtained. *The first law of thermodynamics* states that when mechanical energy is converted into heat, or when heat is converted into mechanical energy, the quantity of mechanical energy is equivalent to the quantity of heat energy. *The second law of thermodynamics* states that it is impossible for a machine without the consumption of external energy to make heat pass from a body at a low temperature to one at a high temperature. When external energy is supplied, the transfer of heat becomes possible through the use of a reversible engine. A reversible engine is one that while it may on the one hand take heat from a high temperature source and transfer it to a low temperature escape with a conversion of a definite portion of the heat into mechanical energy, may, on the other hand, when its operation is reversed by the application of external mechanical energy equal in amount to that generated in the first operation, take back the same heat from the low temperature escape and transfer it together with an amount of heat equal to that lost in the first operation to the high temperature source. The fraction of the heat leaving the high temperature source converted into mechanical energy, or when the engine is reversed, the fraction of the heat entering the high temperature source obtained from the mechanical energy applied has been shown by Carnot to be the same for all reversible engines of whatever nature and working with any substance whatsoever, provided they work between the same temperatures. This fraction may be called the *thermodynamic efficiency* of the engine. The thermodynamic efficiency of good steam-engines occasionally exceeds 20 per cent. This means that 20 per cent of the heat energy supplied to engine is transformed into mechanical energy, the remaining 80 per cent escaping unused at the condenser or exhaust.

Using the provisional absolute scale as indicated by a hydrogen thermometer experiment shows that the efficiency, W/H, is roughly represented by the following equation in which W stands for the mechanical energy realized, H for the heat (measured in the equivalent foot-pounds) leaving the high temperature source, T for the temperature of the source, and T^1 for the temperature of the cooler escape.

$$\frac{W}{H} = \frac{T - T^1}{T}$$

This suggests a new definition for a temperature scale, namely that numerical values of temperatures be so adjusted as to fulfil exactly the above formula. Since the formula only fixes a ratio between the temperatures T and T^1 corresponding to a given efficiency, an infinite number of sets of numerical values for these temperatures could be found to satisfy the formula. But if it be decided that a definite numerical range, say one hundred degrees, be comprised between the freezing and boiling points of water, only one set of values becomes possible. This decision makes the value of the freezing point very nearly $+273°$ Abs., and the value of the boiling point $+370°$ Abs. Lord Kelvin was the first to propose this *thermodynamic scale.* Theory shows that its indications would correspond exactly to a thermometer containing a perfect gas. Hydrogen is not quite a perfect gas, for its molecules attract each other slightly and they occupy an appreciable fraction of the space holding the gas. Hence there are small deviations of the hydrogen thermometer from the thermodynamic scale, especially at low temperatures. It should be added that the practical realization of the thermodynamic scale, though much aided by very ingenious mathematical considerations relating to careful experiments made by Regnault on the expansion and the increase of pressure observed when hydrogen and other gases are heated, and by Joule and Kelvin on the temperature changes suffered by gases in expanding through a porous plug, still that realization is far from complete. Nevertheless, the thermodynamic scale offers us a theoretical ideal which is absolutely independent of the thermal properties of any particular substance, but is only related in a definite way to a fixed universal law.

When a *small* amount of heat is transferred from or to a gram of a substance, the heat transferred (measured in calories), divided by the average absolute temperature of the substance at the time of the transference is called the *change* of *entropy* of the substance. For convenience, the zero of entropy is generally taken to correspond to water at the freezing point and under the normal atmospheric pressure. It may be shown that when two bodies at different temperatures are

placed in contact and their temperatures become equalized, the average entropy rises, for from the above definition of entropy, the heat leaving the hotter body must reduce its entropy less than it increases the entropy of the cooler body into which the heat enters. Consequently the average entropy of the universe is constantly rising and tending toward a maximum. At the same time the availability of the energy of the universe is tending toward zero.

Ernest R. von Nardroff, E. M., D. Sc.,
Head Science Department Erasmus Hall High School, Brooklyn, N. Y.

Heath, Daniel Collamore, American publisher: b. Salem, Maine, 19 Jan. 1857. He was graduated from Amherst in 1868, became junior member of the firm of Ginn and Heath, publishers of Boston, and in 1886 established in Boston the house of D. C. Heath & Company, publishers of text-books for schools and colleges, with branch offices in New York, Chicago and London.

Heath, Francis George, English writer: b. Totnes, Devon, 15 Jan. 1843. He entered the civil service as a clerk of the higher division in the customs department in 1862, and was transferred as surveyor to the outdoor division of that department in 1882. In 1896 he founded and in 1897 became editor of the Imperial Press, in connection with which he directed from 1896 the publication of the Imperial library. He was for several years prominent in his activity for the preservation and extension of open spaces in and about London; and published: 'The "Romance" of Peasant Life' (1872); 'The Fern World' (1877; 10th ed. 1902); 'Our Woodland Trees' (1878); 'Where to Find Ferns' (1881), and other volumes.

Heath, Perry Sanford, American journalist and politician: b. Muncie, Ind., 31 Aug. 1857. He learned the printer's trade, in 1877 became a newspaper reporter, in 1878–80 was editor of the Muncie *Times*, and in 1881 established the *Pioneer* at Aberdeen, S. D. In 1881–93 he was a correspondent at Washington, D. C., in 1894–6 president and general-manager of the Cincinnati *Commercial-Gazette* (now the *Commercial-Tribune*), and in 1897–1900 was first assistant postmaster-general of the United States. In 1900 he was elected secretary of the Republican National committee.

Heath, William, American soldier: b. Roxbury, Mass., 7 March 1737; d. there 24 Jan. 1814. When the Massachusetts congress in 1774 voted to enroll 12,000 minute men, volunteers from among the militia, Heath, then a farmer in Roxbury, was commissioned as one of the generals. In June 1775 he received the appointment of brigadier in the Continental army, and in August 1776 was created major-general. When the troops moved to New York Heath was stationed in the highlands near King's Bridge, with orders to throw up fortifications for the defense of that important pass. In 1777 he was transferred to Boston, and the prisoners of Saratoga were entrusted to him. In June 1779 he was again in New York, at the Highlands, with four regiments, and was stationed near the Hudson till the close of the war. He was the last surviving major-general of the war. Consult: 'Memoirs of Maj.-Gen. Heath, containing Anecdotes, Details of Skirmishes, Battles, etc., during the American War' (1798).

Heathcock, Heath-hen. See Blackcock.

Heath'cote, Caleb, American merchant: b. Chesterfield, Derbyshire, England, 6 March 1665; d. New York 28 Feb. 1721. He was successful in a mercantile career in New York from 1692, save for the years 1698–1701, was a councillor of the province, was a petitioner for a license to build Old Trinity, was mayor of New York in 1711-14, and held other posts, among them those of judge of Westchester County; commander-in-chief of the military of the colony; surveyor-general; and receiver-general of customs for North America. His letters and despatches afford interesting glimpses of the history of his time.

Heaths, or Heather, a group (*Ericoideæ*) of the order *Ericaceæ*. The leaves of the heaths are simple and entire; their flowers oval, cylindrical, or even swelled at the base; the anthers of many with horn-like appendages. From 400 to 500 species are known, 12 or 15 of which inhabit Europe, and have small flowers, while all the remainder are natives of South Africa, many of them bearing brilliantly colored flowers, and forming one of the most characteristic genera of that region of dry plains. The common heath of Europe (*Calluna vulgaris*), a low shrub, often covers exclusively extensive tracts of dry land, and is used in domestic economy; mixed with oak-bark it is employed in tanning; and also, when tender, for fodder. This species forms the "heather" of British moorlands; but in Scotland are two other species, whose flowers are the "heather-bells" of Scottish song and story. Many South African species, remarkable for the size and beauty of their flowers, are much cultivated in greenhouses, and have been so improved and hybridized that they exhibit a wonderful richness of color.

Heating and Ventilation. Generally speaking, the methods of heating buildings may be divided into two general classes — the direct and the indirect system, or a combination of the two. Heating by means of an open fire, by a stove, and by radiators placed in the rooms to be warmed are examples of the former method, while furnace-heating and heating by means of a current of air warmed by indirect steam or hot-water coils are examples of the latter method. When a direct radiator is fitted with a connection to the outer air, it is said to be arranged on the direct-indirect principle. Hot water, steam, or electricity may be the vehicle used for conveying heat to radiators. Ventilation is only obtained by supplying air, and in some systems of heating and ventilation the air is made so hot that part of it is available for heating purposes. This is the case in furnace-heating.

It is well known that when two bodies of different temperature exist, heat passes from the warmer to the cooler body until their temperatures are equal. If a building be of a temperature of 70° F. and the outer air of a lower temperature, heat will be transmitted by the walls, windows, and other exposed surfaces, and the temperature of the air in the building will be lowered. It is only by supplying to the building an amount of heat equivalent to that transmitted by the walls and windows that it is possible to maintain the building at constant temperature. If we supply more heat than is

transmitted by the walls, the temperature of the room rises.

Heat is measured in units which have as exact a value as a ton of coal or a pound of sugar. British physicists have selected as the unit of heat that quantity which will raise the temperature of one pound of water one degree on the Fahrenheit scale when the water's temperature is near 39° F. This unit is designated as the British thermal unit. It is known with reasonable accuracy just how many heat-units are transmitted by each square foot of wall, window, and other exposed surfaces of the various materials used in building construction, under such extreme conditions as to building and outside temperature as may exist. With these data and the plans of a building, calculation will show the heat-loss from a building or a room, and the heating-apparatus should be proportioned to supply this amount of heat. Allowances are made for various conditions that may exist, depending upon the judgment and experience of the designer. The heat required can be supplied by radiation from an open fire or from a stove, but this is an unsatisfactory method. Direct radiators supplied with steam or hot water can be placed in a room to furnish the heat necessary, or the heat may be supplied by hot air from a furnace, or by air heated by indirect radiators supplied with steam or hot water.

Heating by hot air is a slightly more expensive method than heating by direct radiation, for to be effective the air must be taken in from outdoors, sometimes at very low temperature, and heated above the temperature of the room to be warmed. If cold air at 40° F. is heated to 100° F., and is supplied to a room at this temperature, it is evident that as soon as this air is cooled from 100° to 70° no more heat can pass from the air to the room if the temperature of the latter remains at 70°. Under these conditions only one-half of the heat that has been supplied to the air is available for heating the room. This will tend to show why heating by hot air is more expensive, estimated from the cost of fuel, than the direct system. When the advantages of the air supply that accompanies indirect heating are taken into account the increased fuel cost becomes insignificant.

Direct heating is usually obtained by steam and hot-water radiators. Although manufacturers have greatly improved the appearance of direct radiators, at best they are unsightly and objectionable from an artistic point of view. This objection may be overcome by concealing the radiators in boxing beneath windows, when the walls of the building are thick enough to permit the boxing to be built in without projecting into the room. A screened opening is provided in the front of the boxing near the floor, and one at the top over the radiator, to permit a circulation of air, so that the radiators can be effective.

In residence-heating it is frequently the custom to heat the first floor by the indirect method and the upper stories by the direct. When an owner will pay for it, the indirect method is used throughout the building. Such a system is much to be preferred to the direct.

The simplest method of connecting steam-radiators is by the gravity system, and it is usually employed unless steam exhausted by engines is available for heating. This system comprises distributing-mains connecting with the top of the boiler, and with vertical riser-pipes from which horizontal branches lead to the radiators. Usually a return pipe is connected to the opposite end of the radiators from that at which steam is admitted, this return connecting, through return risers and mains, with the boiler at a point below the water-line. As the steam in the radiators condenses, the resulting condensation flows back by gravity through the return pipes to the boiler. The flow and return pipes are made sufficiently large to insure a practically uniform pressure throughout the system. The system is simplicity itself, as the fire only needs attention. When the boiler is once filled, no more water is required.

It is only recently that the steam exhausted by engines and pumps has been used for heating. Before this time steam direct from the boilers was used in direct radiators for heating mills and factories. The radiators consisted of coils of pipe suspended from the walls or ceilings. Sometimes the condensation was returned to the boilers by a pump or other device; sometimes it was allowed to go to waste. As the steam exhausted by engines, pumps, etc., contains a very large percentage of the heat that it contained upon entering the engine, someone conceived the idea of utilizing this steam for heating buildings, thereby saving the steam direct from the boilers that would otherwise have to be used. This practice is now almost universal where exhaust-steam is available, and the saving that it has occasioned is very great. By placing what is known as a back-pressure valve in the exhaust-pipe, sufficient pressure is maintained to cause the exhaust-steam to circulate through the pipes and radiators of the heating-system, the latter being connected to the exhaust-pipe between the engine and the back-pressure valve. The condensation that occurs in the heating system can be collected and returned to the boilers by various methods. Usually a pump or similarly acting device is employed.

A hot-water system arranged on the gravity-principle has flow and return pipes similar to the gravity-system of steam-heating described. The entire system is filled with water. As the water is warmed in the boilers it becomes lighter in weight per cubic foot, making a difference in pressure between the flow and return pipes and causing a circulation to begin. The water rises in the flow pipes to the radiators and is there cooled. On its return to the boiler the water is again heated, and so the circulation is maintained. As the difference in weight between the water in the flow and return pipes is very slight, the motive power producing the circulation is very slight also. Hence the pipes have to be relatively larger than for steam-heating and very carefully connected to avoid excessive friction, which would stop or retard the circulation. As large pipes are costly, in some large plants heated by hot water, a circulation is brought about by pumps.

Direct steam-radiators emit about 250 British thermal units per square foot of radiating surface per hour, and hot-water radiators about 180 heat-units per square foot. Consequently about one third more radiating surface is neces-

sary with hot water than with steam. The pipes also must be larger, hence the hot-water system is the most expensive in first cost. Hot water, however, is cheaper to operate, for water will circulate with a very low fire and supply the small amount of heat required to warm a building in mild weather.

With direct steam-heat, operating on the gravity-system, it is impossible to vary to any appreciable extent the temperature of steam in a radiator; hence with this system the alternative is, all the heat the radiator will supply or none at all. This is the principal objection to heating by means of direct steam. Air warmed by the relatively cooler hot-water radiators is thought by some to be more agreeable than air heated by steam-radiators.

With indirect heating the lack of means of regulating the steam-temperature is not of so much moment, for the air-supply can be partly shut off by partly closing a register in mild weather; or else, if the full air-supply is required at all times, arrangements can be made for passing part of the air-supply around the indirect radiators, which is called "by-passing" them. Another method is to divide the indirect radiator into independent sections and place some of the sections under the control of a regulator that automatically shuts off the supply of steam when the room becomes too warm. The method of "by-passing" the radiator, or subdividing it, is used mainly with the fan-system of supplying air.

The cost of indirect hot-water heating is greater than that of indirect heating by steam, as the radiators and pipes must be larger, the same as in direct heating. Hot water is, however, cheaper to operate. The principal objection to its use in indirect heating is the possibility of damage to the indirect radiators through the freezing of the water in them in severe weather, if the circulation should from any cause be arrested.

The direct-indirect system consists of direct radiators connected with the outer air by means of an opening in the building-walls beneath the window-sill, the radiator being set under the window opposite the opening. With this system there is always the possibility of getting too much air when the wind blows strongly. Furthermore, in situations where the air is smoke-laden or dusty, it is not easy to keep the smoke and dust from entering a building supplied with air by this means.

As has been said, a supply of air may be brought about by the gravity-method or by means of fans. In the gravity-method the heated column of air in the flue is lighter than the outdoor air; hence it rises. As in the case of hot-water heating, the motive power is very slight, and it becomes less as the outdoor temperature increases. For this reason the gravity system is not a positive one, and it cannot be depended upon to supply much air in mild weather. Its use for schoolhouse ventilation is therefore to be deprecated. An important advantage of this system is its simplicity, as no machinery is required with it.

With the fan-system some type of fan is employed, to give a positive supply of air. The air is blown over coils, usually steam, and delivered to the room at a temperature slightly above that of the room, if the air-supply is intended to ventilate only, or at a higher temperature if the air-supply is to carry with it the heat necessary to balance that transmitted by the walls and windows. In the former event the indirect coils act as tempering-coils, being sufficient only to raise the air to about 70° F. If the air-supply is to furnish heat for warming the rooms, additional coils, known as supplementary coils, are provided. These raise the air-temperature from 70° to from 100° to 120° F. Sometimes the supplementary coils are combined with the tempering coils, the whole being divided into several independently controlled sections. In some instances the supplementary coils are divided into a number of small coils, one being placed at the base of each air-supply flue, and so arranged that, by adjusting dampers controlled by hand or automatically, the temperature of the air supplied to any room can be regulated independently of that supplied to other rooms. If all of the air is passed through one group of coils, independent regulation of the temperature of the air in the branch ducts and flues is impossible. This independent regulation can be obtained, however, by the double-duct system. The coils are divided into two groups, one for tempering and one for supplying additional heat. All of the air is passed through the tempering coils, but only part of it through the supplementary coils, the balance "by-passing" the latter coils and flowing through a system of ducts, usually located below the system conveying the air of higher temperature, to the base of the flues. At the junction of the two ducts a mixing-damper is provided, so arranged as to open in one duct as it closes in the other. By adjusting this damper the air can be mixed to give the resultant temperature required.

In situations where direct radiators can be used, either exposed or concealed, it is becoming the practice to provide sufficient heat by means of direct radiation to balance the heat transmitted by walls, windows, etc., also a supply of tempered air for ventilation only. As previously explained, when heat is supplied by means of air, the fuel-cost is greater than with direct heating; so that a building can be warmed with less coal with the direct than with the indirect system. Furthermore, with the combined system, heating can be done at night, and at other times when air-supply is not required, at minimum cost. This system is particularly adapted for schoolhouse heating and ventilation.

The withdrawal of impure air from rooms is effected by fans connected to a system of vent-flues extending upward to an attic space, or downward to a cellar or basement, if the latter is more convenient. Another method of accelerating the outflow of air through flues rising to the roof of a building is by the use of aspirating coils. These are simply coils of pipe, or radiators, placed in the vent-flues as low down as possible, the coil heating the air and thus causing it to rise. Theoretically the aspirating-coil is a more expensive method of moving air than the mechanical method, as far as fuel-cost is concerned. It is simpler, however, than the fan-system.

Fans are of two general types — the disk or propeller fan, and the centrifugal blower. The former is constructed somewhat like a ship's propeller, and the current of air that it produces is mainly in a direction parallel with the shaft of the fan. The centrifugal blower, as usually de-

signed, consists of a wheel with blades, something like a ship's paddle-wheel, enclosed in a casing. The air enters at the axis of the fan, and when the fan-wheel is revolved the air is discharged radially to the casing by the action of centrifugal force. Relatively speaking, the propeller-fan will move a large volume of air with small expenditure of power, but the pressure at which it will deliver air is limited. The centrifugal fan will deliver air under a greater pressure and the power required is therefore greater. In some buildings, where the system is of ducts and flues, is long, and the cross-sections are comparatively small, to save space, quite a pressure is required to force the necessary amount of air through them. For such situations the centrifugal blower is best adapted. When the ducts are short and of ample area, it is best to use the propeller type of fan.

Fans are driven usually by small steam-engines or by electric motors. Sometimes gas-engines have been used with success. Where an engine is used, it is necessary for the boilers to operate under a sufficient pressure to drive the engine, or at least under a higher pressure than is commonly used with the gravity-system of connecting radiators. If the steam exhausted by the engine is condensed in the heating-system, as it usually is, a pump is necessary to return the condensation to the boilers. In large office buildings, public buildings, theatres, etc., where a skilled engineman is employed to care for the plant, the use of a pump, an engine, etc., does not present an objection. On the other hand, in the case of schoolhouses, large residences, churches, etc., which are apt to be looked after by less skilled attendants, an engine, pump, and other apparatus that must go with them are open to objection. In such cases electric motors can be used if current can be obtained from an electric-supply company. The entire heating system can then be operated on the simpler gravity-system. Of course the current must be paid for, but in many locations its cost will be more than offset by the greater simplicity of the motor-driven system.

Heating by electricity is not done to any great extent, on account of the excessive cost. When coal is burned under a steam-boiler, it is not uncommon for 60 per cent of the heat in the fuel to be realized in the steam which can be used for heating. If the heat in coal be transformed into electrical energy, and this again transformed into heat, less than 10 per cent of the heat in the fuel will be realized for heating.

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HENRY C. MEYER, JR.,
Consulting Engineer.

Hea'ton, Augustus George, American artist: b. Philadelphia, Pa., 28 April 1844. He was the first pupil from the United States to study at the Paris Beaux-Arts, where he was trained by Cabanel. Later (1878–80) he was in the studio of Léon Bonnat, and exhibited considerably at the Salon. Among his paintings are: 'Washington at Fort Duquesne'; 'The Recall of Columbus,' engraved on the 50-cent Columbian Exposition stamp of 1893; a portrait of Bishop Bowman; and 'Hardships of Emigration,' engraved on the 10-cent Omaha Fair stamp. He wrote 'The Heart of David — the Psalmist King' (1900).

Heaton, John Henniker, English publicist: b. Rochester, Kent, England, 1848. He was for some time prominent in Australian journalism and has sat in the House of Commons for Canterbury from 1885. He carried the Imperial Penny Postage Scheme in July 1898, introduced telegraph money orders into England, the parcel-post to France, and has been connected with other progressive schemes. He has published: 'Manners and Customs of the Aborigines of Australia'; 'Australian Men of the Time'; etc.

Heaton, John Langdon, American journalist: b. Canton, N. Y., 29 Jan. 1860. He was graduated from St. Lawrence University in 1880, entered journalism as a member of the Brooklyn *Times* staff in 1881, and in 1897 became assistant editor of the New York *World*. His publications are: 'The Story of Vermont' (1889); 'Stories of Napoleon' (1895); 'The Book of Lies' (1896); 'The Quilting Bee' (1896).

Heaven, in a physical sense, is the azure vault which spreads above us like a hollow hemisphere, and appears to rest on the limits of the horizon. Modern astronomy has taught that this blue vault is, in fact, the immeasurable space in which earth, sun, and planets, with the countless host of fixed stars, revolve. The blue color of the heavens is due to the action of minute particles in the air upon the blue rays in sunlight.

In ancient astronomy, heaven denoted a sphere or circular region of the ethereal heaven. The ancient astronomers assumed as many different heavens as they observed different celestial motions. These they supposed to be all solid, thinking they could not otherwise sustain the bodies fixed in them; and spherical, that being the most proper form for motion. Thus they had seven heavens for the seven planets: the moon, Mercury, Venus, the sun, Mars, Jupiter, and Saturn. The eighth was that of the fixed stars, which was particularly denominated the firmament. Ptolemy adds a ninth heaven, which he calls the *primum mobile*. But others admitted many more heavens, according as their different views and hypotheses required: Eudoxus supposed 23; Regiomontanus 33; and Fracastoro no less than 70.

In theology, this word denotes the upper and nobler region of God's universe, in contrast with the earth, the lower part assigned to men for their habitation. Of the belief in the existence of some special scene of the presence of Deity, the majority of the known religions of the world bear ample evidence. According to Aristotle all men, whether Greeks or barbarians, had a conception of God; and all united in placing the residence of the gods in the most elevated regions of the universe. This idea runs through the Persian, Egyptian, German, Scandinavian, and indeed of all the ancient religions

in which the belief in a supreme being assumes any other form than the pantheistic; and even though the pantheistic philosophers may have denied that any peculiar locality could be regarded as the peculiar habitation of the Deity, we find that the popular belief and worship of the sect is evidently grounded upon a contrary opinion. In addition, however, to its being the special seat of the Deity, heaven also denotes the place, or the state or condition of blessed spirits, and of the souls of just men either immediately after physical death or at some certain period subsequent to it. All the religious systems which include the immortality of the soul involve, at least in substance, the idea of a future state of happiness as a reward for a virtuous life. The delights of the heavens of the various creeds differ greatly in kind. The pleasures of the classical Elysian fields were to a great extent pleasures of sense; the German warrior believed he would be transferred to a region where he would be able to pursue his old fierce enjoyments, and the American Indian cherishes the notion that he quits this world for a happier hunting-ground. Among Christians the general opinion is that heaven is the residence of the Most High, the holy angels, and the spirits of just men made perfect, that this abode is eternal, its joys entirely spiritual; it is believed also by many that the just who are free from sin are admitted into heaven immediately after death; also that the souls of the patriarchs, prophets, and in general the good, were detained, before the new dispensation, in a temporary abode till the coming of the Redeemer. See IMMORTALITY.

Heaves, or Broken Wind, a disease of the horse generally described as unsoundness of the respiratory organs. The disease is not well understood by veterinarians and the treatment is unsatisfactory. It is generally conceded that the disease is incurable. The characteristic symptoms are labored breathing, dilated nostrils, bloodshot eyes and dependent belly. Horses with this disease often drop down while at work and succumb to congestion of the lungs, hemorrhage or suffocation, the direct result of the heaves. Upon post-mortem examination the stomach is found distended and to have thinner walls than in the normal horse.

Hebe, hē'bē, according to Greek mythology, the goddess of youth, and the cup-bearer on Olympus until replaced by Ganymede. She was a daughter of Zeus and Hera, who gave her as a wife to Heracles, in reward of his achievements. At Rome she was worshipped as Juventas. She is described by some authorities as a divinity who had it in her power to make old persons young again. In the arts she is represented with the cup in which she presents the nectar, under the figure of a charming young girl, her dress adorned with roses, and wearing a wreath of flowers. An eagle often stands beside her, which she is caressing.

Heber, hē'bėr, **Reginald,** English Anglican bishop and poet: b. Malpas, Cheshire, 21 April 1783; d. Trichinopoli, India, 1 April 1826. He was educated at Brasenose College, Oxford, distinguished himself by the English prize poem —'Palestine,' was elected to a fellowship in All Souls' College, traveled in Germany, Russia, and the Crimea, entered holy orders in 1807, and became the incumbent of Hodnet, Shropshire. In 1812 he was appointed prebendary of St. Asaph, in 1815 Bampton lecturer at Oxford, in 1822 preacher at Lincoln's Inn. From 1822 until his death he was bishop of Calcutta, at that time constituting one very extensive diocese, in all parts of which he traveled to the furtherance of the mission work in progress. He completed the establishment of Bishop's College, Calcutta, begun by Bishop Middleton. Heber is best known for his hymns, 58 of which, including the familiar 'From Greenland's Icy Mountains,' 'Brightest and Best,' and 'Holy, Holy, Holy!' appear in 'Hymns Written and Adapted to the Weekly Church Service of the Year.' In prose he wrote 'A Life of Bishop Jeremy Taylor' (1822), and 'A Journey Through India' (1828). Consult the 'Life' by Smith (1895).

Hébert, Jacques René, zhäk rė-nā ā-bār, French journalist and politician: b. Alençon, Orne, 15 Nov. 1755; d. Paris 24 March 1794. At the beginning of the French Revolution Lemaire published a journal supporting constitutional principles under the title 'Père Duchesne.' The Jacobins soon established a rival 'Père Duchesne,' of which Hébert became editor. The journal owed its success to the cynical virulence with which it advocated the popular cause, and abused the court and the monarchy, and soon had the field to itself. He was a member of the Revolutionary Commune that approved the massacres in the prisons in September 1792, was soon after substitute attorney of the commune, and employed all his influence in forwarding a project to establish the authority of the commune on the ruins of the national representation. The Girondists, who were at that period contending against the Mountain, had credit enough to procure the arrest of Hébert 24 May 1793. Again restored to liberty, he assisted with all his power and influence in the proscription of the Brissotins. Their downfall hastened his own. With Chaumette he established the 'Feast of Reason,' and afterward accused Danton of having violated the nature of liberty and the rights of mankind. This terrified both Danton and Robespierre, who suspended their mutual jealousies to accomplish his destruction; and Hébert, with the greater part of his associates, was arrested and guillotined.

Hébert, Louis Philippe, Canadian sculptor: b. Sainte Sophie d'Halifax, Quebec, 27 Jan. 1850. He studied for several years in Canada, and later in Paris, where he established his studio. In 1894 he won the Confederation medal awarded by the Canadian government Among his works are historical subjects executed for public buildings in Quebec, Ottawa, and Montreal.

Hebrew Language and Literature, the tongue in which the ancient Jews spoke and wrote, and the books produced by that people during their settlement in Palestine as an independent nation; these latter constitute the Hebrew Scriptures and are looked upon by the Hebrews as containing the inspired word of God. It is impossible not to include in Hebrew literature the immense volume of rabbinical writings produced after the conquest of the Romans and the subsequent dispersion of the

Jews. The destruction of Jerusalem deprived the Israelites of the temple worship, and practically abolished the institution of sacrifice. Hence the importance to them of that literature of the dispersion which did so much in preserving to them their national unity and exclusiveness, and keeping alive the flame of race enthusiasm, amid the new circumstances of their national life as the chosen people.

The Hebrew Language.—The Hebrew tongue belongs to the Semitic family of languages in which are included the Arabic, the Ethiopic, Babylonic and Chaldaic. It is one of the finest, most copious and elastic of this group, and indeed is only inferior in richness and development to the Arabic. It is, however, surpassed by Indo-Germanic dialects such as Greek and Latin, in point of precision, as its want of accidence, in its uninflected nouns and verbs, sometimes leads to confusion and obscurity. In the suggestion of poetic imagery, in gorgeousness of expression and breadth of meaning, it stands alone and pre-eminent.

The alphabet is composed of 22 letters, all consonants, the vowel values being expressed by points of which there are about 40. These are placed above or below the letters they syllabicate. The system of vowel points was introduced so late as the 6th or 7th century by the school of Tiberias when the Masora, a collection of critical, exegetical, and grammatical remarks on the sacred texts, was first committed to writing. There are no capital letters. The writing is from right to left. There are three kinds of Hebrew alphabet now in use—the square or Assyrian (properly called the Babylonian), which is generally supposed to have been introduced by Ezra, the most common in print; the rabbinical, or mediæval, used chiefly in commentaries and notes; and the cursive, in writing.

The Hebrew etymological roots are triliteral, to reckon by consonants. From these roots words are formed by suffixes or prefixes. One of the most remarkable characteristics of the Hebrew language is its apparent fixity of form. After it had been in use for upward of a thousand years there is little variation to be seen in the idiom, vocabulary or literature of its monuments. This has led some critics to dispute the traditional antiquity of the Pentateuch. There is very much less variation from the style of the books of Moses to be found in the latest of the Scriptures than is met with in an English writer of to-day when compared with a writer of the Restoration period. But this may perhaps be explained by the fact that the early Scriptures fixed once for all the Hebrew tongue, which was not allowed to develop or deviate from the standard of a grammar, vocabulary and idiom which were alike inspired of God. The Chinese language furnishes a parallel instance of immutability. The Arabic of the present day is very much the same as in the days of Mohammed, who gave it the form it bears in the Koran, and the Hadiths which supplemented it in subsequent centuries.

Hebrew Literature.—The Hebrew books have had more influence on the religion of the world than any other books of the kind. They afford an example of writings which promulgate a pure monotheism, and depend on none of the variegated and romantic resources of polytheism for their force of persuasiveness. They have been a thesaurus of religious ideas for other sacred books. They may be said to be the golden ore out of which the New Testament was cast as Gideon cast his sacred ephod out of the melted earrings of the Midianites. It is a question whether the Koran would ever have been written but for the boundless material which Mohammed found in the Old Testament Scriptures, and the floating traditions, fables, legends and allegories which resulted from the impression they produced on the minds of a superstitious Western-Asiatic population. The Hebrew writings cover a wide area, whether we consider their literary form as comprising a cosmogony or treatise of primitive science, verses of moral treatises, including a code of civil law, history, poetry, in the form of lyric, drama, and ode; or the time they cover from Moses to Ezra; or the peoples they deal with which include all the ancient monarchies of Western Asia, as well as the most illustrious of Pharaonic dynasties. The ancient books give us a wonderful picture of the pastoral life of the early patriarchs. Tales and poems, items of daily contemporaneous incident abound in them. Poetry among the Hebrews as among all other ancient nations is earlier than prose, and a vein of lyric feelings runs through the Jewish records from the first chapter of Genesis to the Song of the Well in Numbers, and the ode of Deborah and Barak, in Judges. There is the fable of Jotham, and the riddle of Samson. The variety which characterizes even the books of Moses is inexhaustible. But those, such as Joshua, which have been called the Book of the Wars of Jehovah, and the Book of Proverbs, show a still deeper and more prolific vitality in literary and religious ideas. In the age of Samuel there was a new department of literature inaugurated under the influence of religious conviction and emotion. The schools of the prophets favored the cultivation and development of a species of poetry of which the world had never seen the like, and has never yet since equaled. The prophets were poets who stood between Jehovah and his people, interpreting his will, in strains of alternate consolation and rebuke; in words of warning, rebuke, prediction and condemnation. It was in these schools that David learned to be what he styled himself, the sweet singer of Israel. He indeed was the greatest of a line of psalmists, which includes Asaph and the Sons of Korah. His son Solomon became the philosophic moralist of his people, and was as famous for gnomic utterances as his father had been for his psalms. The love idyll followed, and the century of the Hebrew monarchy saw also the rise of Hebrew historic literature.

It is easy to classify the Hebrew literature, which naturally divides itself into origins, legislation, prophecy, history, lyric, proverbs, and moral poetry. The origins and legislation are included in the Pentateuch or five books of Moses, and give us the history of Israel's beginning, and settlement in the holy land. As a sequel to this we have the history of the kings, completed by Ezra. Prophecy as represented by Samuel, Nathan and Gad, Elijah and Elisha, had always existed through the monarchical period, but it reached its highest literary development, in proportion as the national spirit of religion declined, and the days of exile and

dispersion grew nearer. The form the written prophecy takes is that of a rhetorical lyric, frequently a passionate improvisation which often rises in eloquence and power to the pitch of sublimity. Even history sometimes takes the shape of a poetic tale, sometimes of a mere traditional record of events. The early historical books take their tone and color from that of Genesis; the type of the later historian is the book of Samuel and Kings. An appendix to these is furnished by Ezra and Nehemiah. Hebrew poetry is quite different from that of Europe. It has neither the artful arrangement of repeated syllabic metre, like that of Greece and Rome, nor the music of terminal rhymes, like the romantic poetry of the Latin and Teutonic races. It is a wonderful system of strophic parallelisms. This system is shown in its simplest form in the proverbs of Solomon, and revived in the Greek writings of Jesus the son of Sirach. The book of Job excels both of these works in poetic intensity, and wide spiritual sweep. It is largely dramatic in form; occasional lyrical passages occur, while it has an epic prologue and epilogue, that is, the introduction and dénouement have all the direct stateliness of the epic poem. Indeed the foundation of Hebrew poetry is laid in the lyric, and the genius of the national literature are to be looked for in those psalms which were current from the time of David to the Maccabees. The Song of Solomon is a collection of love lyrics, tender and passionate, but more gorgeous and tinged with deeper melancholy than those of the Greek or Persian muse; the village tale of Ruth belongs to the days of pastoral Israel; the novelette of Esther can scarcely claim a place in religious literature; the lamentations of Jeremiah are elegies uttered over the coming downfall of Israel, and the words of the preacher, in Ecclesiastes, which belongs to the Alexandrian periods, are laments over the decline of the people in religious idealism and social virtue. After their return from captivity, the Jewish, or as it is often called, rabbinical literature, grew and flourished with new life. Under the guidance of Ezra the sacred books were collected, authenticated, and arranged into a canon. The Pentateuch was publicly read, taught in schools, explained, and translated into the Aramaic or Chaldee dialect. The traditions explanatory or complementary to the law of Moses were traced through the prophets and elders to that lawgiver, and established as authoritative and binding. They were compiled so as to form what was styled Midrash, divided into the Halacha and the Haggada: the former considered the improvement of the law with a view to practical results; the latter the essence of the religious and historical. To the Maccabean era belong the Apocrypha, various Greek versions of the Bible, and collections of prayers, poems, and proverbs. Following the destruction of Jerusalem (70 A.D.) came the completion of the New Testament, the historical works of Josephus, and various spurious Gospels, all written in the Greek language. On being driven from their capital the Jews founded numerous schools in which their language and literature were taught. The Mishna, which contains traditions and interpretations of the Scriptures, is supposed to have been compiled in the second or third century of our era. The Mishna was considered one of the principal works of Hebrew literature, and the rabbis of Tiberias and Babylon wrote numerous commentaries on it. These were collected into two works, and entitled the Jerusalem and the Babylonian Talmuds. The Jerusalem Talmud was completed about the end of the 4th century; the Babylonian Talmud about a century later. The most brilliant era of modern Jewish literature is that of Moorish Spain. Treated by the conquerors of the Peninsula with mildness, the Jews turned to the culture of science and literature, and soon found themselves at the head of the intellectual world, not excepting the Arabs, whose culture is a subject of admiration among all historians. No science was neglected by the Israelites; astronomy, geography, philosophy, medicine, history, poetry, music, the Spanish rabbis knew and taught. The Jewish school of Toledo was the most renowned of all the schools in the Peninsula. This is the era of the great Moses ben Maimon (Maimonides), the illustrious disciple of Averroes; of the poet and philologist Aben-Ezra; of Kimchi, of Isaac Ben-Sid, etc. The celebrated Academy of Lisbon flourished under Jewish auspices to the end of the 15th century. After their expulsion from Spain, the Jews founded those printing establishments from which issued a great number of works in Hebrew. The 17th century was more fatal to Judaism than even the centuries of persecution. It was the age of Spinoza, the pantheist. But even before his day the Hebrew language had been falling into disuse. In Germany many of the writers of the 18th and 19th centuries were Jews or of Jewish extraction, and are among the brightest names in literature. Moses Mendelssohn, the philosopher; Neander, Heinrich Heine, Berthold Auerbach, Herz, Börne have added much to the literary glory of their age; Disraeli, father and son, Zangwill, Emma Lazarus, are names which will occur to book-lovers of a younger generation.

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Hebrews. See JEWS.

Hebrews, Epistle to the, one of the longest apostolic letters in the New Testament. The absence of the opening salutation usual in the apostolic epistles has led to some doubt as to its authorship. The immediate successors of the apostles (Clement of Rome, Justin Martyr, etc.) considered it as of canonical authority, while the Gnostics Basilides and Marcion rejected it. No doubt as to its authenticity was expressed by the Church, however, until about the middle of the 2d century, and for two centuries afterward it was generally rejected by the fathers of the Roman and North African churches. Toward the end of the 4th century Jerome reviewed the conflicting opinions as to the canonicity of this epistle. He pronounced in its favor. In 416 a decretal of Pope Innocent I. placed its authority beyond dispute. As to the authorship there is no reason to doubt that

at first everywhere but in North Africa, Paul was recognized as the writer. Clement of Alexandria states that it was written by Paul in Hebrew for the benefit of the Hebrews, and translated by Luke for the benefit of the Greeks. The opinion that it was originally written in Hebrew is strongly advocated by Michaelis; while the opposite one, that Greek is the original language, is supported by Rosenmüller and others. Tertullian mentions Barnabas as the reputed author, according to the North African tradition. Luther conjectured that Apollos was the author.

Hebrides, hĕb'rĭ-dēz, **The, or Western Islands,** Scotland, an archipelago off the west coast, extending from lat. 55° 35′ to 58° 32′ N.; the most southern island being Islay, and the most northern, Lewis. The group is politically divided between the shires of Ross and Cromarty, Inverness, and Argyll, very nearly in the line of their coincidence with the coasts of the respective counties. They number about 400 in all, but many are inconsiderable islets and rocks, and only about 90 are inhabited; area, about 2,800 square miles; pop. (1901) 79,159. They are usually divided into the Outer Hebrides, of which the principal are Lewis and Harris (forming a single island), North Uist, Benbecula, South Uist, and Barra; and the Inner Hebrides — Skye, Mull, Islay, Jura, Coll, Rum, Tiree, Colonsay, etc. The Outer are separated from the Inner, and from the mainland, by a strait or channel called the Minch, which at its narrowest part, between Harris and Skye, is about 12 miles broad.

The climate is mild and salubrious, but variable, tempestuous, and humid. Snow and frost are almost unknown in the smaller islands, and are but little felt in the larger. There is comparatively little wood in the Hebrides, and on many of the islands none at all. In Lewis, Skye, Islay, Mull, and several of the other islands, however, both forest and fruit trees have been planted to a considerable extent, with great success. Oats and barley are almost the only cereal crops raised. Potatoes are extensively cultivated. Cattle constitute the staple product. The native breed are small but handsome. Cheese and butter of good quality are produced. The breed of horses is also small, but hardy and docile. The native breed of sheep is very small, but Cheviots have been introduced with success. The productive land is partly occupied as sheep-farms; much of it is held by "crofters," who occupy holdings usually of a very few acres, sometimes with a right of pasturage in common attached. There are also "cotters" who occupy houses, with or without a patch of ground, on the land of the crofter, the farmer, or the landlord, and who are often mere squatters paying no rent. Grouse-moors and deer ranges cover a considerable area. Owing to the minute division of the arable land there is in many places an excess of population. The condition of the crofters and cotters, especially in the Outer Hebrides and Skye, is very depressed, their dwellings miserable, and their living poor, consisting chiefly of potatoes, milk, and oat or barley bread, and in bad harvests it is often insufficient in quantity. The fisheries are not developed to the extent they might be. Whiskey is manufactured in Skye, Islay, and Mull. Gaelic is the universal language of the Hebrides, which in remote times were subject to the kings of Norway, but in 1264 were annexed to the crown of Scotland. They were held by various native chieftains, in vassalage to the Scottish monarch; but subsequently fell into the hands of one powerful chief, who thereupon (1346) assumed the title of "Lord of the Isles," and began to affect an entire independence of his sovereign. The abolition of hereditary jurisdictions in 1748 secured to these islands for the first time the peace and safety afforded by a just and powerful government. Little was known about the Hebrides until the publication of Johnson's 'Journey to the Western Islands of Scotland' (1775), and of Scott's 'Lord of the Isles,' which invested them with a popular interest which has been increased by the facilities afforded to tourists by the steamers of the Clyde.

Hebron, hē'brŏn (originally KIRJATHARBA, now EL-KHALÎL), Asiatic Turkey, a town of great antiquity in Palestine, 18 miles southwest of Jerusalem, 2,830 feet above sea-level. It lies in the narrow valley of Mamre, has narrow streets, high well-built stone houses with flat roofs, extensive covered bazars, with well-furnished shops, exhibiting glass manufactures, consisting of lamps, colored rings, etc., for which the place has long been celebrated. The chief mosque, El-Haram, built around the Cave of Machpelah, from which Christians are rigorously excluded, is esteemed by Mohammedans one of their holiest places. Hebron is one of the oldest existing towns, having been built seven years before Zoan (Num. xiii. 22), and it is mentioned prior to Damascus (Gen. xiii. 18). Abraham resided here, and acquired the Cave of Machpelah as a sepulchre for Sarah and his family. It was David's royal city for seven years. There is a German Protestant mission here. Pop. about 19,000.

Hebron, Neb., city, county-seat of Thayer County; on the Little Blue River, and on the Chicago, R. I. & P., and the Burlington & M. R.R.'s; about 63 miles southwest of Lincoln. It is situated in an excellent agricultural and stock region. It has a large flour-mill, a creamery, and a planing-mill. There are five churches, a high school, three banks, and three weekly newspapers. The shipments of wheat and live stock are extensive. Pop. (1900) 1,511.

Hecatæus, hek-ą-tē'ŭs, distinguished Greek historian and geographer: fl. about 500 B.C. He was a native of Miletus, and the son of Hegesander, a member of an ancient and illustrious family. Of his public life the only event of which we have any definite knowledge was the part he took in the insurrection of the Ionians against the Persians. Being well acquainted with the resources of Persia, he vainly attempted to dissuade Aristagoras, the planner of the revolt, from his undertaking. Later he went as ambassador to Artaphernes, and prevailed on the satrap to win the confidence of the Ionians by lenient treatment. His two great works were his 'Tour of the World,' and his 'Genealogies.' The latter is little more than a prose version of the legends already given in versified form. He improved the map of the world made by Anaximander; and his writings were highly esteemed by Herodotus. The fragments of his works were published by Müller (1841–70).

Hecate, hĕk'ā-tē, in Greek mythology, a goddess, whose parentage is variously given.

Homer does not mention her. She appears to have been originally a Titan who ruled in heaven, on the earth, and in the sea. She could bestow or withhold at pleasure the blessings of wealth, victory, and wisdom to mortals, and was the only Titan who retained power under the rule of Zeus. She was subsequently confounded with several other divinities, and at length became a mystic goddess having all the magic powers of nature at her command. She was identified with Demeter and Artemis, and was regarded as the mystic Persephone. Magicians and witches prayed particularly for her aid. Sacrifices used to be offered to her at places where three ways met (whence her epithet Τριοδῖτις, or in Latin, *Trivia*), and these consisted of dogs, honey, and black female lambs. Her mysterious festivals were celebrated annually at Ægina. Her appearance was frightful. She had three bodies or three heads, and serpents hung hissing around her neck and shoulders.

Heck, Barbara, one of the founders of American Methodism: b. Ballygarry, County Limerick, Ireland, 1734; d. near Augusta, Ont., 1804. She was one of a colony of German immigrants in Ireland who were among the first to be influenced by Wesley's preaching. In 1760 she came to America with her husband, Paul Heck, and Philip Embury (q.v.). In 1766 she was very active in the organizing of a Methodist society which met at Embury's house, and she also did much toward the building of the Old John Street Methodist Church. Later she and her family removed to the northern part of New York State, and when the Revolution broke out went to Ontario, where they founded another Methodist society.

Heck'er, Friedrich Karl Franz, German-American soldier: b. Eichtersheim, Baden, 28 Sept. 1811; d. St. Louis, Mo., 24 March 1881. After studying law in Heidelberg, he abandoned his profession for political life. In 1842 he was elected to the Chamber of Deputies of Baden. On the outbreak of the revolution in Germany in 1848 he endeavored to convert the preliminary convention into a permanent republican assembly. Frustrated in this attempt, he put himself at the head of a band of revolutionists, and invaded Baden from the south. He was defeated at Käudern 20 May 1848, and fled to Switzerland. In the following year he removed to the United States, and became a farmer near Belleville, Ill. On the outbreak of the Civil War he raised a regiment of Germans, serving in General Fremont's division as colonel; and afterward for a time commanded a brigade.

Hecker, Isaac Thomas, American Roman Catholic clergyman: b. New York 18 Dec. 1819; d. there 22 Dec. 1888. In early life he was a member of the Brook Farm community, near Boston, where for nearly a year he officiated as baker for the establishment. In 1845 he became a Roman Catholic; went to Germany to study for the priesthood, and joined the Redemptorist Fathers in Belgium in 1847. He was ordained priest in London by Cardinal Wiseman in 1849. Returning to New York he founded the order of the Paulists (1858), became their superior; and established the 'Catholic World' (1865), of which he was editor till his death. An anonymous French version of Elliott's 'Life of Father Hecker' led to the noted "American" controversy. He wrote: 'Questions of the Soul' (1855); 'The Church and the Age' (1888); etc. Consult: Sedgwick, 'Father Hecker' (1900).

Heckewelder, hĕk'ĕ-wĕl-dĕr, John Gottlieb Ernest, American Moravian missionary: b. Bedford, England, 12 March 1743; d. Bethlehem, Pa., 21 Jan. 1823. At the age of 12 he came with his father to Pennsylvania. He accompanied Post in 1762 in his expedition to the Indian tribes on the Ohio, and in 1771 took up his residence among them as a missionary. After some 40 years' missionary service, he went to Bethlehem, the principal establishment of the Moravians in America, and there remained till his death. He wrote several memoirs upon the Delaware and Mohegan Indians: 'Account of the History, etc., of the Indian Nations' (1818); 'Narrative of the Mission of the United Brethren' (1820).

Hec'la, or Hekla, Iceland, an isolated volcano in the southwest, about 20 miles from the coast. It is of comical shape, terminating in three perpetually snow-clad peaks, the central and loftiest of which, Heklufjall, is 5,110 feet high. The circumference at the base is about 12 miles. It is composed chiefly of columnar basalt, and of lava, mostly covered by stones, scoria, ashes, and other loose volcanic matter. Since the 10th century there are 43 eruptions on record. One of the most tremendous occurred in 1783, after which it remained quiescent till 2 Sept. 1845, when it again became active, and continued with little intermission for 15 months to discharge itself from three craters, its effects being felt as far as the Orkney Islands, 400 miles distant. The last outbreak was in 1878.

Hectic Fever, a type of fever which is intermittent, and is distinguished by an afternoon or evening quickening of the pulse, and rise of temperature. The eyes of the patient brighten, his cheeks flush, and there is some nervous and cerebral excitement. The fever is succeeded by a profuse perspiration. This affection is frequently associated with phthisis, abscess, or septicæmia, and is of dangerous significance.

Hector, in Homeric narrative, the son of Priam and Hecuba, and the bravest of the Trojans, whose forces he commanded. His wife was Andromache, the daughter of Aëtion. He encountered the Grecian heroes in battle, and often gained advantages over them. By his presence Troy was invincible; but when he had slain Patroclus, the friend of Achilles, the latter, forgetting his dispute with Agamemnon, resumed his arms to avenge the death of his beloved companion. Pierced by the spear of Achilles, the body of Hector was dragged at the chariot wheels of the conqueror; but afterward, at the command of Zeus, was delivered to Priam for a ransom, who gave it a solemn burial.

Hector, Annie French ("Mrs. Alexander"), Irish novelist: b. Dublin, Ireland, 1825; d. London 10 July 1902. She began to write at an early age and was a prolific and popular writer. Among her books, all of which enjoyed a wide popularity in the United States, are: 'The Wooing O't' (1873); 'Ralph Wilton's Weird' (1875); 'Her Dearest Foe' (1876); 'The Frères' (1882); 'A Golden Autumn' (1897); and 'A Winning Hazard' (1897).

Hec'uba, in Greek legend, the second wife of Priam, king of Troy, to whom she bore Hector, Paris, Cassandra, Troilus, and other children. After the fall of Troy she was given as a slave to Odysseus, and, according to one form of the legend, in despair leaped into the Hellespont.

Hed'ding, Elijah, American Methodist bishop: b. Dutchess County, N. Y., 7 Jan. 1780; d. Poughkeepsie, N. Y., 9 April 1852. At 19 he entered the Methodist ministry, and was appointed successor of Lorenzo Dow. He extended his travels to Canada, and preached the Gospel in various parts. He became a member of the New York annual conference in 1801, and was made a bishop in 1824. He was instrumental in the establishment of the 'Zion's Herald' at Boston, the first journal published by the Methodist Church in the United States.

Hedge, Frederick Henry, American scholar: b. Cambridge, Mass., 12 Dec. 1805; d. there 21 Aug. 1890. He studied in Germany 1815–23, was later graduated from Harvard and Harvard divinity school, and after holding Unitarian pastorates in Bangor, Maine; Providence, R. I., and Brookline, Mass.; was professor of German at Harvard University (1872–81). Deeply read in philosophy, ecclesiastical history, and German literature, he was a finished writer and a much admired orator, and ranked as perhaps the foremost German literary scholar in the United States. Among his writings are: 'Reason in Religion' (1865); 'The Primeval World of Hebrew Tradition' (1870); 'Martin Luther and Other Essays' (1888); etc. His 'Prose Writers of Germany' (1848) is a standard work. He translated poems from the German and wrote numerous hymns for the Unitarian Church.

Hedge, a fence formed of living trees or shrubs. Hedges are generally composed of one or more of the following species: Hawthorn, crab, blackthorn, holly, privet, beech, hornbeam, maple, barberry, furze, broom, alder, poplar, willow, yew, box, arbor-vitæ, sweet-briar, etc. When there are so many different species to select from, plants may be found suitable for almost all kinds of soil — such as wet or boggy, and dry or sandy; for all situations, whether sheltered or exposed; and for all purposes, such as fences against cattle, or simply as ornaments for garden and pleasure grounds.

Hedge'hog, a small insectivorous mammal of the Old World family *Erinaceidæ,* and especially of the genus *Erinaceus,* characterized by its coat of stiff spines. The family inhabit temperate Europe and Asia, but are not known on sea-girt islands. The best known of the score of species is the common hedgehog (*E. europæus*). It has a long nose, the face, sides, and rump covered with strong, coarse, yellowish hair, the back with sharp, strong spines; and is about nine inches long plus a very short tail. Hedgehogs, as their name indicates, reside under hedges and in thickets, where they turn over the leaves and root in the mould for insects (especially beetles), snails, lizards, roots, fallen fruit, etc.; they are, indeed, omnivorous. The hedgehog defends itself against attack by rolling itself up, and thus exposing no part of its body that is not furnished with a defense of spines. It may be rendered domestic to a certain degree, and has been employed in Europe to destroy cockroaches, which it pursues with avidity. In the winter, in cold climates, the hedgehog wraps itself in a warm nest, composed of moss, dried hay and leaves, and remains torpid till the return of spring. The female produces four or five young at a birth, which soon become covered with prickles. These animals are sometimes used as food, and are said to be very delicate. The long-eared hedgehog (*E. auritus*) of the East is smaller than the common, and is distinguished by the great size of its ears and shortness of tail. Fossil forms as far back as the Miocene differ little from existing species. No true hedgehogs exist in America; the animals often so called being the very different porcupines (q.v.).

Hedge-hyssop. See GRATIOLA.

Hedge-sparrow, a small brown warbler (*Accentor modularis*), with a sweet plaintive song, very common in Europe about gardens and roadsides in summer. It is not a sparrow at all, but nearly related to the American water-thrushes (*Seiurus*). In Great Britain it goes by many names, as dunnock, etc., and is one of the birds most frequently mentioned in books.

Hedin, Sven Anders, svĭn än'dĕrz hĭ-dēn', Swedish geographer and explorer: b. Stockholm 19 Feb. 1865; was educated at Stockholm, Upsala, Berlin, and Halle, at the latter university receiving the degree of doctor of philosophy. In 1885 he began his first journey of exploration through Persia and Mesopotamia. In 1890 he went to Persia as a member of King Oscar's embassy to the Shah, and the next year journeyed through Khorassan and Turkestan. In 1893 he set out on a remarkable journey from the Russian frontier to Peking, through Tibet and the Lob-nor region. He arrived at his destination in 1897, having experienced four years of exciting and harrowing adventures. His second expedition to Central Asia began in 1899. In 1901, writing from Narkhlik, Dr. Hedin tells of finding the ruins of a beautiful Buddhist temple, some rare specimens of wood carving and 12 complete letters written in Chinese on paper and marvellously well preserved. Dr. Hedin has written five books, four in English: 'A Journey Through Persia and Mesopotamia' (1887); 'King Oscar's Embassy to the Shah of Persia' (1891); 'A Journey Through Khorassan and Turkestan' (1892); and 'Through Asia' (1898). He wrote also a scientific treatise in German, 'The Results to Geographic Science of My Travels in Central Asia.'

Hedonism, hē'dō-nĭzm, the philosophical belief of Aristippus, a disciple of Socrates, who taught that pleasure was the end of life, and that it was the duty of a wise man to enjoy pleasure without being controlled by it. Horace tersely sums up the philosophy of Aristippus: "I purpose to subdue things to myself and not myself to things." The most eminent of the Hedonic school were Arete, the daughter of the founder, her son, surnamed from her teaching Metrodidaktos, Theodorus the Atheist, and his scholars, Bio and Euhemerus.

Heel Fly. See BOT-FLY.

Heer'mans, Forbes, American dramatist: b. Syracuse, N. Y., 25 Oct. 1856. He was graduated from Cornell University in 1878, and is author of the dramas: 'Love by Induction'

(1889); 'The Silent Witness' (1890); 'Between Two Foes' (1899); 'The Vagabond' (1893); 'Jess of the Bar' (1896).

Hegel, Georg Wilhelm Friedrich, gā-ōrg' vĭl'hĕlm frēd'rĭh hā'gĕl, German metaphysician: b. Stuttgart 27 Aug. 1770; d. Berlin 14 Nov. 1831. After attending the gymnasium of his native city he entered the theological institute at Tübingen (1788–93) diligently devoted to the study of theology and philosophy. On leaving the institute he was employed for six years as a private tutor, first at Berne, and then at Frankfort-on-the-Main; but on the death of his father, who left him some property, he took up his residence at Jena, where, through an intimate friendship with Schelling, the strong love which he had always felt for metaphysics was more fully developed. In 1806 he removed to Bamberg, and was employed on a newspaper till 1808, when he became rector of the gymnasium at Nuremberg. This situation he held for eight years, and then was appointed professor of philosophy first at Heidelberg in 1816, and next at Berlin, where in 1818 he succeeded to Fichte's chair. He had here gathered around him a large number of admirers, and was in the zenith of his fame, when he was suddenly cut off by cholera. He was buried beside Fichte. Among his numerous works, the most important, in the order of their publication, are his 'Phänomenologie des Geistes,' which appeared in 1807 as the first part of a system of sciences; 'Wissenschaft der Logik' (1812–16); 'Encyclopädie der philosophischen Wissenschaften' (1817); and 'Grundlinien der Philosophie des Rechts oder Naturrecht und Staatswissenschaft' (1821). The philosophy of Hegel, starting from the same position as that of Schelling, soon departed from it. As there are, according to him, three stages in the process of thought and existence, his system has necessarily a threefold division; first, logic; second, the philosophy of nature; and third, mental philosophy. Hegelianism has exercised a powerful influence on modern thought. For an exposition of his system consult: Stirling, 'The Secret of Hegel' (1865); E. Caird, 'Hegel'; J. Caird, 'Philosophy of Religion'; Wallace, 'Logic of Hegel' (1874); Erdmann, 'History of Philosophy'; W. T. Harris, 'The Logic of Hegel' (1890); Sterrett, 'The Ethics of Hegel.'

Hegira, hĕj'ĭ-ra, **Hejra,** or **Hijra,** an Arabic word meaning "going away," commonly used to indicate Mohammed's flight from Mecca, in 622 A.D. In 639 Caliph Omar instituted a new Moslem calendar, to begin with the first day of the first month of the year in which the flight took place. The Mohammedan year, as a lunar year, is shorter than ours by 10 days, 21 hours, and 14 2-5 seconds. A rough and ready method for finding the year in our calendar corresponding to a given year in the Mohammedan is to subtract from the latter 1/33 of itself and add 622 to the remainder. To find the precise year and day, multiply the year of the Hegira by 970,224, strike off from the product six decimal figures, and add 621.5774; this will give the year of the Christian era; and the day of the year is got by multiplying the decimal figures by 365.

Heidelberg, hī'dĕl'bĕrg, Germany, an old university town in Baden, on the left bank of the Neckar, here spanned by two bridges, 11 miles by rail east-southeast of Mannheim. It stands on a narrow strip between the river and the rock on which the castle is built, and chiefly consists of the Hauptstrasse, the long main street, and less important steeply-sloping cross and parallel street. The city has an electric street railway system. The imposing castle, on a height above the town, an immense ivy-clad ruin begun in the 13th century, exhibits elaborate examples of early and late renaissance architecture. In the town itself the principal buildings are: the Gothic church of St. Peter, the Gothic church of the Holy Ghost, the Roman Catholic Church, the university (q.v.), the town-house, the post-office, gymnasium, real-schule, and other schools. The manufactures, comparatively unimportant, include cement, tobacco, cigars, fire-extinguishing apparatus, shoddy, mathematical and surgical instruments, leather, etc., and there are also several breweries. One of the curiosities of the place is the well-known Heidelberg copper tun, kept in the cellar under the castle, and long ranking as the largest wine cask in the world, being 36 feet in length, 26 feet in diameter, and capable of holding 800 hogsheads. Heidelberg has fine public walks. The gardens around the castle are well laid out, and at every turn present the finest views of the Neckar, and the fertile and richly wooded valley through which it winds to join the Rhine. Behind the town and castle, a carriage-road leads by easy ascent to the top of the Königstuhl, the loftiest hill of the district, from which an extensive view is obtained of surpassing beauty. Heidelberg arose around its 13th century castle and was until 1719 the capital of the Palatinate. In 1622, 1688, and in 1693 the French captured and pillaged the city. In 1802 it was united to the Grand Duchy of Baden. Pop. (1900) 40,121.

Heidelberg Catechism, a religious work published at Heidelberg in 1563 by Zachariah Ursinus for the use of the Reformed Church, and published in the Palatinate. It was approved by the Synod of Dort, and was the model on which the Westminster Assembly framed the Shorter Catechism.

Heidelberg University, Germany, a renowned institution founded by Elector Rupert I. in 1386. It was organized by Marsilius von Inghen on the model of the University of Paris, and at the Reformation, from a Catholic became a Protestant stronghold of learning. It flourished till the period of the Thirty Years' War when it declined. In 1802 under the administration of the Grand Duke of Baden, a new era was inaugurated and the university rapidly became famous. It is very complete in its details, and comprises faculties of theology, law, medicine and philosophy; the famous library has over 500,000 volumes and 4,700 MSS. There are 150 professors and instructors, while the average annual attendance of students in all departments is over 1,450. Many of the most famous German scholars have been professors here — Melanchthon, Ursinus, Olevianus, Reuchlin, Œcolampadius, Spanheim, Puffendorf, Voss, Schlösser, Creuzer, Gervinus, Paulus, Kuno Fischer, Helmholtz, Bunsen, Blüntschli, etc. The quincentenary of the university was celebrated with elaborate ceremonial in 1886.

Heidelberg University, Ohio, a coeducational institution at Tiffin, founded in 1850, under the auspices of the Reformed Church in the United States. It has departments of theology, commerce, oratory, art, and music, and preparatory and summer schools. In 1902 it had 30 professors and instructors; 350 students; a library of over 25,000 volumes: the grounds and buildings were valued at $125,000; the productive funds amounted to $275,000, and the income to $20,000.

Heidenmauer, hī'dn-mow-ĕr. (1) A name given in Germany to the remains of old German and Roman fortresses and ramparts, some of which still exist, especially at Ottilienberg, a hill of the Vosges, in Alsace. (2) The title of a novel by James Fenimore Cooper, who laid the scene of his story in the Vosges during the Middle Ages.

Heights, Measurement of. See HYPSOMETRY.

Heilprin, hīl'prĭn, **Angelo,** American naturalist: b. Satoralja-Ujhely, Hungary, 31 March 1853. He is a son of Michael Heilprin (q.v.), and came with his parents to the United States in 1856, but received his education later in Europe, making a special study of natural history. On his return to America, his scientific ability was speedily recognized and he became successively professor of invertebrate palæontology and geology (1880–1900), and executive curator (1883–91) at the Academy of Natural Sciences, Philadelphia. From 1885 to 1890 he was professor of geology at the Wagner Free Institute. He was for five years president of the Geographical Society of Philadelphia, was leader of the Peary Relief Expedition in 1892 and made a journey of research to investigate the cause of the Mont Pelee (q.v.) disaster in 1902. His published works include: 'Contributions to the Tertiary Geology and Palæontology of the United States' (1884); 'Town Geology'; 'The Lesson of the Philadelphia Rocks' (1885); 'Geographical and Geological Distribution of Animals' (1887); 'Explorations on the West Coast of Florida and in the Okeechobee Wilderness' (1887); 'The Geological Evidence of Evolution' (1887); 'The Animal Life of our Seashore' (1888); 'The Bermuda Islands: a Contribution to the Physical History and Zoology of the Somers Archipelago' (1889); 'Principles of Geology' (1890); 'The Arctic Problem and Narrative of the Peary Relief Expedition' (1893); 'The Earth and its Story' (1896); 'Alaska and the Klondike' (1899).

Heilprin, Louis, American scholar: b. Miskolcz, Hungary, 2 July 1851. He is a brother of Angelo Heilprin (q.v.). In 1856 he came to the United States, where he was privately educated, and where he was connected with various works of an encyclopædic character. He published a valuable 'Historical Reference Book' (1884; 6th ed. 1899) in 'The Concise Knowledge Library.'

Heilprin, Michael, American author: b. Piobrkow, Russian Poland, 1823; d. New York 19 May 1888. Carefully educated by his father, in his 20th year he emigrated to Hungary, chafing under Russian conditions. For a time he had a book-store at Miskolcz and was on intimate terms with Kossuth and his party. When the Revolution was quelled, he went to London, there meeting Kossuth, who advised him to go to America. In 1859 he and his family emigrated to New York, where his literary activity was continuous for nearly 30 years. As co-editor of Appleton's 'Annual Encyclopedia' and reviewer on 'The Nation,' he won a distinct rank for his exact and versatile scholarship, especially in the line of Semitic literature. On the arrival of the Russian Jewish refugees in 1881–2, he took a prominent part in their welfare and personally supervised the colonization of many families. His published works include: 'The Historical Poetry of the Ancient Hebrew,' Vols. I. and II. (1880); 'Bibelkritische Notizen' (1893).

Heimburg, hīm'boorg, **Wilhelmine.** See BEHRENS, BERTHA.

Heine, Heinrich, hīn'rĭH hī'nė, German poet: b. Jewish parents at Düsseldorf 12 Dec. 1799; d. Paris 17 Feb. 1856. He studied law at Bonn, Berlin, and Göttingen, and took the degree of doctor at the last-mentioned place. In 1825 he became professedly a convert to Christianity, and was baptized in the Lutheran Church of Heiligenstadt. His conversion seems to have been a purely secular matter, having no connection with religious convictions, and professed mainly in order that he might be free to practise law now that he had obtained his doctor's degree. Nevertheless he showed no desire to become a practical lawyer, and soon all his energies were devoted to literature. At Bonn A. W. Schlegel had influenced him greatly, and later in Berlin his powers had been stimulated by the brilliant society which frequented the house of Madame Rahel, the wife of Varnhagen von Ense. He engaged in political journalism in Munich and elsewhere, and the revolutionary opinions expressed by him soon made his imprisonment very probable. The fear of such a result helped to strengthen the joy with which he welcomed the Parisian revolution of 1830. In that year he took up his residence in the French capital, and there he lived almost uninterruptedly till his death, and from 1836 till the revolution of 1848 received a pension from the French government. During the last years of his life he suffered much from disease of the spine, but his sufferings could not permanently cloud his spirit, and, so far from impairing his creative power, seem rather to have stimulated him to the production of some of his finest works. He began his literary career with a volume of poems ('Gedichte') (1822), and in the following year he printed two dramas entitled 'Almansor' and 'Radcliff.' Some years later the publication of the first two volumes of his 'Reisebilder' (Pictures of Travel) (1826–7) made him famous, and his fame was enormously increased by the appearance of his 'Buch der Lieder' in 1827. The third and fourth volumes of the 'Reisebilder' appeared in 1830–1, and among the prose writings of his French period, many of them of the *feuilleton* kind, are: 'Zur Geschichte der neuern schönen Litteratur in Deutschland' (1833); 'Französische Zustände' (1833), a collection of papers on French affairs; 'Der Salon' (1835–40), including an account of German literature and philosophy; 'Die romantische Schule' (1836); 'Shakespeare's Mädchen und

Frauen' (1839); and the bitter pamphlet 'Ueber Börne' (1840). His witty and cynical 'Neue Gedichte' appeared at Hamburg in 1844, and in 'Deutschland, ein Wintermärchen' he gives a characteristically satirical account of his last visit to his native country. Other poetical works are: 'Atta Troll' (1847); Romanzero' (1851); and 'Der Doktor Faust' (1851). The three volumes of 'Vermischte Schriften' published in 1854 contained his 'Geständnisse' (Confessions) and 'Lutetia.' His 'Letzte Gedichte und Gedanken' were published posthumously. As a poet, more especially in his earlier productions, Heine is remarkable for the simplicity and pathos of many of his lyric pieces. His powers of wit and raillery were also great, but in the use of these he has often transgressed all the bounds of propriety and decorum. Skepticism and oversensuousness are prominent characteristics of this writer. In private life he displayed many good qualities, showing himself generous and self-sacrificing, and ever ready to sympathize with and relieve distress. Heine has found many English translators. There is a complete translation of all his works by C. G. Leland (12 vols., 1891, et seq.); and among translations of parts may be cited: 'The Prose Writings of Heine,' by Havelock Ellis (1887); 'Travel Pictures,' by F. Storr (1887); 'Poems and Ballads of Heine,' by Sir Theodore Martin (1878). There are 'Lives in English,' by Stigand (1876) and Sharp (1888). See also 'Erinnerungen an Heinrich Heine und seine Familie' (1868), by his brother Max; 'Heines Familienleben' (1892; Eng. trans. by Leland, 1893), by Baron von Embden; and Karpeles, 'Heinrich Heine: Autobiographie' (1888); Eng. trans. by Dexter, 1894); Brandes, 'Heine in Litteratur des 19. Jahrhundert'; Arnold, 'Essays in Criticism.'

Heinemann, hī'nē-man, **William,** English publisher and author: b. Surbiton 18 May 1863. He founded the publishing house which bears his name in 1890. He has published under the pen name of "Kassandra Vivaria": 'Via Lucis'; 'The Garden of Olives'; 'The First Step,' a play (1895); 'Summer Moths,' a play (1898); 'War,' a play (1901).

Heinrich, H. H., American horologist: b. Cranz, Germany, 1822; d. Brooklyn, N. Y., February 1903. He was apprentice to a Hamburg watchmaker, studied with Martin Zeller of Vienna, in Switzerland became a manufacturer of watches and escapements, and there taught for 10 years in a horological school which he had established. He became known as one of the foremost European chronometer-makers, came to the United States and finally set up in business for himself in New York. In 1880 his time-recording instruments excelled all others at the prize tests held in Washington. He also received highest awards from the Berne exposition of 1858, the Paris exposition of 1889, and the Chicago exposition of 1893.

Heintzelman, hīnt'sĕl-man, **Samuel Peter,** American military officer: b. Manheim, Pa., 30 Sept. 1805; d. Washington, D. C., 1 May 1880. Graduated at the United States Military Academy 1826, and served during the Mexican War. In 1861 he commanded a division at Bull Run, where he was wounded 21 July. Afterward promoted brigadier-general of volunteers, Heintzelman, during the organization of the army in the winter of 1861–2, held command of a division. On the moving of the Army of the Potomac, in March 1862, the 3d Army Corps was placed under his command. His corps formed the right wing of Pope's army at the second battle of Bull Run 30 Aug. 1862. During the Maryland campaign he commanded the defenses at Washington, and was afterward appointed to the command of the Department of Washington, and of the 22d Army Corps, which he held during the battles of Chancellorsville and Gettysburg, in May and July 1863. He retired in 1869, with the rank of major-general.

Heir (Lat. *hæres*), in law, one entitled by descent and right of blood to lands, tenements, or other hereditaments. Hence it is an ancient apothegm, that "God only can make an heir." An heir is really one who is born or begotten in lawful wedlock, and on whom the law casts the estate, in lands, tenements, or hereditaments immediately on the death of his ancestor. The rights of heirs in most of the United States are determined by the principles of the common law unless specially modified by statute. It is a matter of judicial decision that the rights of heirs in the United States are statutory only. Hence they cannot plead, for instance, that an inheritance tax is unconstitutional. An heir presumptive is one who will be the heir at the death of the owner, as the elder son of a deceased brother in England, or all the children of a brother in the United States, where the owner has no children; for they will be heirs if he dies without issue. As an heir presumptive may lose his heirship by a change of circumstances, he does not become an heir apparent so long as this change is legally probably, though physically or naturally impossible. Thus the nephew of the owner can never be his heir apparent, however aged or feeble or near to death the owner may be; for in contemplation of law it is always possible that a son may be born to him, who would be an heir apparent, and who would therefore supersede an heir presumptive. An heir apparent is one who must be the heir if he survive the owner, as the eldest son in Great Britain, or all the children in the United States. But the phrase "heir apparent" is not strictly applicable here. In Great Britain the birth of a younger son cannot affect the rights of inheritance of the eldest son, for they are fixed, and he alone can be heir by descent. But in this country the younger son has an equal right with an elder son; and therefore the exclusive right of inheritance can never be fixed in any children living.

Heiss, hīs, **Michael,** American Roman Catholic prelate: b. Pfahldorf, Bavaria, 12 April 1818; d. Milwaukee 26 March 1890. He studied at the University of Munich and at the Catholic seminary at Eichstädt, and was ordained in 1840. In 1843 he came to the United States, and was first assigned to a church in Covington, Ky.; he next went to Milwaukee as missionary priest and secretary to the bishop. In 1868 he was consecrated as the first bishop of La Crosse, Wis.; in 1880 he was appointed coadjutor to the archbishop of Milwaukee, with the right of succession, and two years later became archbishop of Milwaukee. He has taken an important part in American councils, and was a member of the Vatican Council (1869–70). He has written:

'The Four Evangelists,' and a treatise on marriage (in Latin).

Heistand, Henry Olcot Sheldon, American soldier: b. near Richwood, Ohio, 30 April 1856. He was graduated from West Point 1878, and was assigned to 11th United States infantry as 2d lieutenant. He was appointed government inspector and instructor Ohio National Guard in 1892, and during the presidential campaign of 1896 was confidential secretary to McKinley. He was promoted lieutenant-colonel in 1900, and became adjutant-general and chief of staff in the China expedition for relief of Peking 1900. He has written: 'Alaska, Its History and Description' (1898).

Hejra, or Hijra. See HEGIRA.

Helen, in Greek legend, the most beautiful woman of Greece, daughter of Zeus by Leda. By advice of Ulysses her numerous suitors were bound by oath to respect her choice of a husband, and to maintain it even by arms. She chose Menelaus, but was afterward carried off to Troy by Paris, the Trojan war arising from the claim made by Menelaus for the fulfilment of the oath. After the death of Paris she married his brother Deiphobus. On the fall of Troy she returned to Sparta with Menelaus, but at his death was driven from the country, and was murdered at Rhodes by the queen of that island.

Helena, hĕl'ĕ-na, Saint, the mother of the Emperor Constantine the Great. She was of humble origin, probably the daughter of an innkeeper of Bithynia. She captivated Constantius Chlorus, and became his wife; but when Diocletian elevated him to the dignity of Cæsar, in 292 A.D. he was compelled to repudiate her. The succession of her son, and the influence she had exercised in educating him as a Christian, compensated her for previous humiliations, while her piety and zeal for the propagation of Christianity have made her a saint in the Roman Catholic calendar.

Helena, hĕl'ĕ-na or hĕ lē'na, Ark., city, county-seat of Phillips County, on the Mississippi River, and on the St. Louis, I. M. & S., the Yazoo & M. V., the Arkansas M. R.R.'s., and is the terminus of the Arkansas Central; about 75 miles below Memphis and 95 east by south from Little Rock. It has boat communications with all important river-ports. A conflict between the Federal and Confederate forces took place here 4 July 1863. The Union army, about 4,500, was under Gen. Prentiss, the Confederate, about 9,000, under Gen. Holmes. The Confederate loss was about 1,800, including killed, wounded and prisoners. Helena is in an agricultural and lumbering region; the chief manufactures are lumber, cottonseed-oil, and foundry products. It has cotton-compresses, a shingle-mill, brick-yards, and large lumber-yards. Some of its educational institutions are the Jefferson High School, and the Sacred Heart Academy; it has a public library, nine churches, and three banks. Pop. (1900) 5,500.

Helena, Mont., city, capital of the State, and county-seat of Lewis and Clarke County; on the Northern Pacific and the Great Northern R.R.'s; about 70 miles north by east of Butte. The city is surrounded on all sides by the Rocky Mountains; on the south and west the mountains are within two miles of the city, while to the north there is a wide valley between the city and the foothills, and the same condition exists on the east. The city is protected from severe wind storms, and in the winter season there is a difference in temperature between the city and the mountain country of from 10 to 20 degrees. The country tributary to the city is rich in both mineral and agricultural resources. The mines are principally gold-producing, while the products of the farms are cereals and the ordinary vegetables. Tributary to the city are large areas devoted to the raising of cattle and horses, but this industry is gradually being replaced by diversified farming.

Helena is noted as the richest city per capita not only in Montana, but in the entire Rocky Mountain country. It is principally a city of homes; cattlemen, miners, and others engaged in industries elsewhere in Montana have their residence in Helena because of its church, school, and social attractions. It is the best built city in the State; its hotels, office buildings, mercantile establishments and private residences being equal to any found in cities of 100,000 in the east.

The geographical situation of Helena has made it a great distributing centre. Before the days of the railroads, when stage lines and freight wagons drawn by oxen were the only means of transportation, the geographical position of the city brought to it many travelers and great stores of merchandise. From Helena the people and the goods were distributed to other settlements. The Northern Pacific Railroad, the first to reach the city, following the trend of business, built branch lines from Helena, and thus it retained its commercial supremacy. Later the Great Northern was also extended to the capital city, and it likewise reached out for trade in the surrounding country by building branches. The original of Helena was "Last Chance Gulch"; the town came into existence as a result of discoveries of placer gold. The first discovery of gold was made in 1864, by four prospectors, John S. Cowan, John Crab, D. J. Miller, and Robert Stanley. These four men started early in the spring of 1864 from Alder Gulch, now Virginia City, in the southern part of the State, to search for placer gold. They went first to western Montana, and finding nothing there started east, prospecting the streams. They finally found what is now known as Prickly Pear Creek, running through the valley north of Helena, and here they discovered a few traces of gold, but they continued their journey north. Provisions becoming scarce they retraced their steps, intending to return to Virginia City, and again they came to Prickly Pear Creek where they noticed a little gulch. One of them said: "Boys, this is our last chance to strike it. If we do not find gold here we must strike straight for Alder." On 16 July 1864, they sunk two holes to bedrock, and in each they found gold. It was the "last chance" that turned out favorably, and that was the name of the camp until 30 October of the same year. The news of the find spread, and soon there were 500 men in the camp. At the meeting to name the town, Pumpkinville, Squashtown, Tomahawk, and Tomah were suggested. Finally John Somerville suggested Saint Helena. This was amended to Helena, and on a ballot Helena won by two votes over Tomah.

The educational institutions are public and parish schools, the Montana Wesleyan University (M. E.), opened in 1890, Saint Vincent's Academy, and the State, city, and other libraries.

Among the principal buildings at Helena are the Government building, costing $500,000; State capitol, costing $400,000; the county courthouse, costing $100,000; the high school building, costing $150,000, and seven graded school buildings valued at $200,000. There are also Saint John's Hospital, Saint Joseph's Orphanage, and several fine churches. Twelve miles from Helena, on the Missouri River, is located the plant of the Missouri River Power Company. This company furnishes electrical power for operating street cars and lighting the city of Helena, and for manufacturing purposes. It also transmits electrical power to Butte for use in the mines, a distance of 100 miles. Four miles from Helena is located the smelter of the American Smelting and Refining Company. The principal gold mine now operated in the vicinity of Helena is the Big Indian, located in a gulch four miles south of the city. Marysville is the largest mining camp tributary to the city. Here is located the Drum Lummon mine, owned by an English company, and in the near vicinity are other mines which are large gold producers.

In the 20 years after the opening of the "Last Chance Gulch," gold to the amount of $25,000,000 was taken out of the gulch and the town grew to a city of 20,000 and became the capital of the State.

From the discovery of gold until 22 Feb. 1881, when the city government was organized under a charter from the State government, the government of the city was by a committee representing the merchants and bankers.

The government is now vested in a mayor, who holds office two years, and a council. The executive appoints, subject to the approval of the council, all the subordinate officials except the city treasurer and police magistrate, both of whom are chosen at a popular election. The assessed valuation of property in 1903 was $13,000,000.

Helena has been the capital of Montana since 1869. In that year the capital was removed by popular vote from Virginia City. After Montana was admitted as a State two elections were held for the permanent location of the capital, and in 1894 Helena was chosen.

The altitude of Helena is 4,200 feet. The climate is not severe, the average temperature in January and February, the two coldest months in the year, being 20 above zero, with no moisture in the air. In summer the average temperature is 75. The growth of the city from now on may not be as rapid as in the early days; but it promises to be a healthy, steady development. Pop. (1900) 10,770.

CHARLES D. GREENFIELD,
Editor 'The Helena Independent.'

Helena, Battle of. Helena, Ark., is on the west bank of the Mississippi River, about 82 miles below Memphis. Since 13 July 1862, when Gen. Curtis arrived there from western Arkansas, it had been occupied by Union troops, and on 4 July 1863, was held by a division of the Thirteenth corps, under Gen. Salomon, and a brigade of cavalry, in all 4,129 effective men, under command of Gen. B. M. Prentiss. The place is surrounded by hills, and those nearest the city were occupied by strong redoubts; Graveyard Hill in the centre, Fort Righter on the north or right, and Fort Hindman on the south or left, were all connected by a line of bastions and rifle-pits, both ends of which rested on the river. In the river lay a gunboat. Toward the middle of June it was determined by the Confederates to take the place, whereby it was hoped to raise the siege of Vicksburg or, if Vicksburg fell, still to keep the river closed. Gen. Holmes was ordered to move from Little Rock with about 7,600 men, Price's and Marmaduke's divisions, Fagan's brigade of infantry, and Walker's brigade of cavalry. Holmes bivouacked about four miles from Helena on the evening of 3 July, and at midnight advanced to within a mile of the outer works. The assault was ordered at daylight. On the Confederate right Fagan with 1,770 men advanced on Fort Hindman, carried all the outer entrenchments, and made a desperate attempt to take the fort, but was repulsed with a loss of over 400 men. On the Confederate left, Marmaduke's division of infantry and Walker's cavalry brigade, aggregating 2,780 men, attacked Fort Righter and were repulsed. Price, in the centre, with 3,100 men, made a strong assault, carried all the entrenchments in his front, seized Graveyard Hill, and ordered one brigade to move on the town and another to assault Fort Hindman in the rear, but the Union troops checked the advance of the two brigades and drove them back and, the attacks on the right and left being repulsed, the fire of the forts, rifle-pits, and gunboat was concentrated on Price, and at 10.30 A.M. Holmes gave the order to withdraw, and led his troops back to Little Rock. The Union loss was 57 killed, 146 wounded, and 36 missing; the Confederate loss was 173 killed, 687 wounded, and 776 missing. Consult: 'Official Records,' Vol. XXII.; Greene, 'The Mississippi'; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III.

E. A. CARMAN.

Hel'enin, a chemical substance extracted by hot alcohol from the root of the elecampane (*Inula helenium*). It has the formula C_6H_8O, and is nearly insoluble in water, but very soluble in alcohol. The first crystals obtained from the root-extract contain considerable quantities inula-camphor; but this may be removed by repeated crystallization from alcohol. Pure helenin crystallizes in white prisms or needles, melting at 232° F.

Helicidæ, hē-lĭs'ĭ-dē, the family of terrestrial pulmonate mollusks which includes most of the land and many fresh-water snails. See SNAILS.

Heligoland, hĕl'ĭ-gō-lănd, or **Helgoland,** hĕl'gō-lănt (Dan. "holy land"), a small island and popular sea-bathing resort in the North Sea, belonging to Germany, situated about 40 miles northwest of the mouth of the Elbe. It is about a mile long and one third of a mile broad, and has an area of about one quarter of a square mile. It consists of two parts, the Oberland, a flat-topped rock 206 feet high, affording a little soil for pasture and the growth of potatoes, etc., and communicating with the Unterland, a small stretch of shore at its foot, by 192 steps and an

elevator. Most of the houses stand on the Oberland. The Unterland gives partial shelter to the shipping. Steamboats ply between the island and Hamburg. The principal buildings are the church, lighthouse, and a royal Prussian biological station for the study of the fauna and flora of the North Sea. The bathing facilities, which attract so many visitors, are found in a dune or sand-bank separated from the main island by a channel about a mile wide. This Sandy Island, as it is called, is slowly being reduced in size by the inroads of the sea. The inhabitants are chiefly employed in fishing, and speak a Friesian dialect. The island is well fortified, and has cable communication with Cuxhaven and Wilhelmshaven. Christianity was first preached here by St. Willibrod in the 7th century. Taken from the Danes in 1807, it was ceded to Great Britain in 1814, but was transferred to Germany in 1890. Pop. (1900) 2,307, in the bathing season increased by several thousand visitors.

Heliocentric, hē″lĭ-ō-sĕn′trĭk, "having the sun as centre," a term applied to the Copernican system, as in opposition to the Ptolemaic system, which was geocentric, that is, "having the earth as centre" of the solar system. In modern astronomy the word is applied to calculations in which the sun is referred to as centre of the planetary system. Thus the heliocentric place of a planet is the position it would occupy at a given time when calculated from a point of view in the centre of the sun.

Heliodorus, hē-lĭ-ō-dō′rŭs, the earliest of the Greek writers of romance: b. Emesa, Syria, and lived near the end of the 4th century. He became a believer in the Christian religion, and bishop of Tricca in Thessaly. His youthful work, 'Æthiopica (that is, Æthiopic Affairs), or the Loves of Theagenes and Charicleia,' is a tale in poetical prose, with an almost epic tone. It is distinguished by its strict morality from the other Greek romances, and interests the reader by the wonderful adventures it recounts. One of the best editions is that of Hirschig in the 'Erotici Scriptores' (1856). An English translation by R. Smith appeared in 1855.

Heliogab'alus. See ELAGABALUS.

He'liograph, an instrument invented by De la Rue for obtaining photographs of the sun. Also an apparatus for telegraphing by means of the sun's rays. See HELIOSTAT; MILITARY TELEGRAPH.

Heliogravure, hē″lĭ-ō-grā′vūr. See PHOTOGRAVURE.

Heliom'eter, an instrument for measuring small distances on the sky, particularly the apparent diameters of the sun and of the moon. The heliometer of Bouguer is an astronomical telescope provided with two object-glasses, one of which is movable, and which form two distinct images of the same object, visible through the same eye-glass. A single object-glass cut into two parts, which are relatively movable by a screw, is always employed now. If, in contemplating a celestial body, the object-glasses are placed so as to bring the images to touch each other, the distance of the centres of the glasses gives the diameter of the image. In this manner the instrument gives, for instance, the difference of the diameter of the sun in perigee and apogee.

Heliopolis, hē-lĭ-ŏp′ō-lĭs ("City of the Sun"), Egypt, the On of the Hebrew Scriptures, on a site now partly occupied by Matarieh, six miles northeast of Cairo, was one of the most ancient and extensive cities during the reign of the Pharaohs, and so adorned by monuments as to be esteemed among the first sacred cities of the kingdom. During the flourishing ages of the Egyptian monarchy the priests and scholars acquired and taught all the learning of the Egyptians within the precincts of its temples. It may be regarded as having been the university of the land of Misraim, and at the time of Strabo, who visited this town 24 B.C., the apartments were still shown in which, four centuries before, Eudoxus and Plato had labored during 13 years to learn the philosophy of Egypt. Solon and Thales were also reputed to have visited its schools. Here Joseph and Mary are said to have rested with the infant Jesus. Near the village stands the Pillar of On, a famous obelisk, supposed to be the oldest monument of the kind existing in Egypt. Its height is 67½ feet, and its breadth at the base 6 feet. Hieroglyphical characters are sculptured upon it, but are partly illegible. A fierce battle was fought here, 20 March 1800, between the French under Kleber and the Turks, when the latter were defeated.

Heliornithidæ, hē-lĭ-ôr-nĭth′ĭ-dē, a family of tropical birds, the fin-foots or sun-birds, placed by some ornithologists among the *Cecomorphæ*, and by others, more probably, with the rails. They are about a foot long, mottled brown and white, with long pointed wings and long stiff tails; and frequent the borders of forest streams and ponds, in which they spend much of their time swimming and diving well. They feed on small fish, crustaceans, insects and seeds. The best-known species is *Heliornis fulica* of southern South America.

Helios, hē′lĭ-ŏs, in mythology, the god of the sun (Latin, *Sol*) in the Greek mythology; son of Hyperion and Theia, and brother of Eos (Aurora, the dawn) and Selene (Luna, the moon). He is frequently called by the name of his father. He dwells with Eos in the ocean behind Colchis. From the portals of the morning he rides through the air in an oblique curve to the gates of evening, and after having cooled his horses in the ocean, he drives his chariot into a self-moving golden vessel, made by Hephæstus (Vulcan), which with wonderful rapidity bears him during the night along the northern shore of the ocean back to Colchis, where he bathes his horses in the lake of the Sun, and rests till the dawn of the morning. Other accounts represent him as making this nightly passage while slumbering in a golden bed. His horses and chariot are first mentioned in the Homeric hymn on Helios. Among events in the history of Helios the poets relate his contest with Poseidon for the Isthmus of Corinth, his revealing the secret amours of Ares and Aphrodite, and his disclosure to Demeter of Pluto as the ravisher of her daughter. This idea of his omniscience seems to have been the reason why he was confounded and identified with Apollo, though they were originally quite distinct. As he was descended from the race of the Titans he is often called Titan. The famous Colossus of Rhodes was a representation of Helios.

He'lioscope is a telescope behind which the image of the sun is received upon a plane

surface. An astronomical telescope is drawn out a little farther than is necessary for common use, and directed toward the sun, and the image which is formed is received in a dark place. For this purpose a dark chamber is employed, or the telescope is placed in a dark funnel-shaped enclosure, the bottom of which is covered with oiled paper or closed with ground glass, on which the sun's image is formed. Upon the paper or glass a circle is described equal to the image, and it may be divided by concentric circles into rings. With this instrument the spots on the sun, eclipses, etc, may be observed.

Heliostat, hē'lĭ-ō-stăt, an instrument used in optical experiments with sunlight for keeping a beam always falling in the same direction in spite of the motion of the sun. It consists of a mirror mounted equatorially, and carried round by clock-work in such a way as to neutralize the apparent motion of a beam of sunlight reflected from it. This instrument has been employed among other purposes as a means of signaling. A beam of light being directed to the point to which it is intended to convey the signals, the dot-and-dash alphabet is made use of by the device of exhibiting and obstructing the light for longer or shorter periods. A short flash represents one letter, a long flash another, a short quickly followed by a long a third, and so on. As adapted to this purpose the heliostat has received the name of heliograph.

Heliotherapy (Gk. ἥλιος, sun + θεραπεία, service), the treatment of disease by the action of sunlight. See PHOTOTHERAPY.

Heliotrope, hē'lĭ-ō-trōp, a genus (*Heliotropium*) of plants of the borage family, characterized by the undivided ovary prolonged into a style, many of whose species have vanilla-scented blossoms. The one most in repute is a small shrub (*H. peruvianum*), originally South American, which has small fragrant flowers growing compactly together in the spikes. Cuttings taken from the young branches grow readily, and come soon into blossom. The *H. europæum,* or common heliotrope, is a flowering herb indigenous in the south and west of Europe. The heliotropes are natives of warm climates, and very numerous, several growing wild in the United States. Many delightful varieties have been produced as garden and greenhouse flowers.

Heliotrope, the bloodstone, is a variety of quartz partaking of the character of jasper and of chalcedony. It is of a deep green color, and is covered with red spots like drops of blood. Many fine antique Greek and Roman intaglios and cameos, also seal rings carved in bloodstone, are preserved in the great gem collections. It is found in Tartary, Persia, Siberia; in the island of Rum, Scotland, and many other places. It received the name heliotrope, or as some of the older writers give it, elitropia, because it was said that if the mineral be put into water contained in a basin rubbed with the juice of the plant heliotrope, and be exposed to the sun, the water will appear red and the sun blood-like, as if it was eclipsed.

Heliotropism, hē-lĭ-ŏt'rō-pĭzm, or **Phototropism,** the influence and effect of sunlight on organisms. When a seedling plant is placed in a transparent vessel of water within reach of the light of a window, the stem and leaves gradually bend toward, and the roots from, the light. The former phenomenon is termed positive, and the latter negative, heliotropism. The shoots and leaves of nearly all plants turn toward the light, and the turning of the sunflower toward the sun is familiar to every one. In the case of organs which are positively heliotropic the growth of the side next the light is retarded, and that of the opposite side increased; the result of these combined actions is a concavity on the former, and a convexity on the latter, thus causing a curvature toward the light. In the case of roots these actions are reversed. That these results are brought about by the action of light is evident; the cells on the concave side become less, while those on the convex side become more, turgid, thus forcing the organ to bend; but the cause of turgescence is unknown.

In animals a similar heliotropism is operative and is plainly manifested in some low forms, as hydra, where it is of great service in their almost automatic food-getting. Heliotropism is closely allied to, and much modified by chemotropism (q.v.) and other influences.

Heliozoa, hē"lĭ-ō-zō'a, the "sun animalcules," an order of rhizopods (q.v.) with or without silicious skeletons, and having slender and radiant pseudopodia, stable and rarely interlaced. The majority live in fresh water, but some are marine. A common and widespread example is the genus *Actinophrys.*

He'lium, a gaseous element, known to be present in the atmosphere and in certain minerals, and, like argon, characterized by a singular chemical inertness. The discovery of helium was a consequence of the discovery of argon, and on account of the close chemical, physical and historical relations of the two, reference should be made to the article ARGON, and to the references there given. Helium was known to exist in the sun many years before it was discovered upon the earth. During a total eclipse of the sun, in 1868, Jannsen observed a brilliant yellow line in the spectrum of the solar chromosphere, very close to the D lines of sodium, and yet not identical with either of them. The new line was assumed to be due to a previously unknown element, and in the same year Lockyer proposed the name "helium" for this hypothetical element, from the Greek word "helios," meaning the sun. No evidence of the existence of helium upon the earth was adduced until 1882, when an Italian scientist named Palmieri announced that he had obtained the spectrum of helium from certain of the lavas given off by Mt. Vesuvius. He made no attempt to isolate the new body, however, and while it is quite possible that his observations were correct, he can hardly be credited with the actual discovery of helium. No further progress was made in this direction until 1895. When argon had been discovered, and its chemical inertness had been established, Mr. Miers, mineralogist of the British Museum, pointed out that the mineral cleveite (q.v.) had been shown to contain nitrogen gas, apparently in the free state, and made the suggestion that part of what had been assumed to be nitrogen might in reality prove to be argon. Professor William Ramsay examined the gas from this source, and found that while it undoubtedly did contain argon, it also

showed a brilliant yellow line, which did not appear to coincide with either of the sodium lines, though it was very close to them. He sent a specimen of the gas to Sir William Crookes for a more careful examination, and Crookes promptly reported that the new line was indentical with the helium line. It was therefore proved that helium, which had previously not been certainly known except as a constituent of the solar chromosphere, is also a terrestrial element. Subsequent study revealed the presence of helium in several other minerals. It is given off from cleveite when that mineral is heated to about 400° F. in an exhausted tube, or when the mineral is treated with sulphuric acid, or with acid sulphate of potassium. All the minerals which contain any considerable quantities of helium also contain uranium, yttrium or thorium. It is not certainly known whether the helium is chemically combined with the mineral, or whether it is merely occluded by it. The latter supposition would appear to be the more probable, judging from the chemical inertness of the gas, and from the fact (presently to be noted) that radium appears to be generating helium continuously. Certain observations upon the mineral fergusonite, however, appear to give some color to the hypothesis that the helium is present in a state of chemical combination. Helium has also been found in solution in the waters of certain hot springs.

The presence of helium in the earth's atmosphere was established by means of subjecting the apparently pure argon that had been obtained from this source to a process of diffusion through a series of porous partitions of baked clay. Helium, being much lighter than argon, diffuses far more rapidly, and a mixture in which the two gases exist together may be partially separated into its constituents in this manner.

Helium, when pure, has a density of only 1.98, that of oxygen being taken as 8. Its atomic weight cannot be directly determined, because helium has not yet been made to combine with any other substance, although it has been subjected to the same experimental attempts as were tried in the case of argon (q.v.). It has been found, however, that the ratio of the specific heat of the gas at constant pressure to the specific heat at constant volume is about 1.65, and this indicates that helium is a monatomic gas (see GASES, KINETIC THEORY OF), and that its atomic weight is about $2 \times 1.98 = 3.96$; the atomic weight of oxygen being taken as 16. It therefore has the smallest atomic weight of any of the known elements except hydrogen. The chemical symbol He has been assigned to helium, although, as has been already noted, no compounds of it have as yet been obtained.

Dewar thought he had liquefied helium at the temperature of melting hydrogen (about 436° F. below zero), but this was not confirmed by subsequent experiments, and it is now believed that the liquefaction of helium is a problem still reserved for the future. Its critical temperature is probably still nearer to the absolute zero than that of hydrogen, and for this reason the gas is well adapted for use in thermometers intended for the measurement of exceedingly low temperatures. It has, in fact, been used for this purpose with success, in studying the properties of hydrogen.

A most remarkable and previously unparalleled fact in connection with helium remains to be recorded. It has been known for some time that helium occurs in cleveite, and in other minerals in which the newly discovered element radium is found; but whether this was to be regarded as a mere coincidence, or whether it has some actual physical and chemical significance, has been a subject of considerable discussion. The most striking experiment bearing upon this matter, is one that is due to Huggins, who caused the radiation from radium to pass through a spectroscope provided with a quartz prism, and to fall upon a sensitive photographic plate. Upon developing the plate after a prolonged exposure, he found that cold radium gives a line spectrum when treated in this manner; and he made the further discovery that nearly all of the lines in the spectrum so obtained are apparently coincident with lines in the spectrum of helium. The full significance of this fact is not yet known; but when taken in connection with the observations of Soddy and Ramsay, which indicate that helium occurs in the gaseous emanation that is given off by radium, it is considered by no means impossible that we have here an instance in which one element is being slowly but continuously transformed into another one. If this inference is corroborated by future experiments, it will throw an altogether new light upon the nature of the chemical elements, and upon their relation to one another. The case is the more noteworthy, since helium has a smaller atomic weight than any other element save hydrogen, and radium has a greater atomic weight than any other element save uranium and thorium. Radium, moreover, appears to be metallic in nature, while helium, by its chemical inertness, resembles nitrogen.

Helix, hē'liks, a curve generated by winding a line around in a coil of gradually increasing radius. (1) In anatomy, a prominent and incurved margin surrounding the thinner and larger portion of the pinna in the ear. (2) In architecture, the small volute under the abacus of a Corinthian column. Of these there are in every perfect capital 16: two at each angle, and two meeting under the middle of each face of the abacus. (3) In geometry, a curve the tangents to which make, with the horizontal plane, a constant angle. The edge of the path of a screw is a helix, as is also the path described by any point of the surface of the thread when moved in the nut. (4) In zoology, the typical genus of the snail family. See SNAILS.

Hell (A. Saxon, *hel*, from *helan*, to cover), signifies originally the covered or invisible place. In the Bible the word is used to translate the Hebrew *Sheol* (grave or pit), and *Gehenna* (properly the valley of *Hinnom*), as well as the Greek *Hades* (the unseen). In the Revised Version of the New Testament, hell is used only to translate Gehenna, Hades being left where it stands in the Greek. In common usage hell signifies the place of punishment of the wicked after death, its earlier meaning being lost. The distinctive Scriptural term for the place of future punishment of the wicked is Gehenna. The belief in a state of punishment after death for the finally impenitent is held by almost all sects of Christians, as an analogous belief in the future punishment of unexpiated guilt is a tenet of nearly all religions ancient or modern. The nature of the punishment of hell, its locality, and

its duration, have given rise to interminable controversies among Christian writers. The early Christian writers sometimes apply the word hell to a place of temporary purgation, in which the soul is freed from the stains of guilt contracted on earth preparatory to its enjoying the pure bliss of heaven. In this sense it corresponds in some degree with the Roman Catholic purgatory, and with the pagan idea of purification, as illustrated by Virgil in the sixth Æneid. Sometimes it is applied to the place of waiting of the just under the old law, till the coming of Christ should secure for them the completion of their reward; sometimes to the place where unbaptized children are detained because of unremitted original sin; and more frequently to the place of final and everlasting punishment for impenitent sinners. As to the locality of the scene of final punishment none at the present day makes a formal declaration. The terms above and beneath, as applied to heaven and hell, are merely relative, and though conventionally accepted convey no information. The Churches are not fully agreed as to the nature of hell-punishment. The prevailing idea among modern theologians is that the "fire" and the "worm" are significant emblems to give us the most correct and living conceptions of the reality that we can possibly attain in our present circumstances. They are fit emblems of anguish, and as such had laid hold of the Jewish imagination in connection with the word Gehenna, the term used in Mat. v. 22, 29, 30; Luke xii. 5. Gehenna, unlike Sheol and Hades, has never any intermediate signification, but is invariably applied to the place of punishment of the wicked after death. See IMMORTALITY.

Hell Gate, a narrow part of the East River between Long Island and Manhattan and on the east and west sides of Ward's Island. The passage between Ward's and Randall's Island is called Little Hell Gate. The rocks which were in Hell Gate were of such form and so situated as to make navigation dangerous, and the difference in the times and heights of the two tides which enter East River increased the dangers. The East River receives at one extremity the Sound Tide and at the other the tide from off Sandy Hook. "One sailing vessel out of every fifty" was the proportion damaged seriously when trying to pass through the channel between the reefs. Much had been said and written about the necessity of doing something to remove or at least lessen the dangers of Hell Gate, and officials of the United States navy, Lieutenants Davis and Porter, made a survey of Hell Gate in 1848. They reported the necessity of making the channel safe, and suggested the destruction of some of the most dangerous rocks; but nothing was done until the year 1851, when the work of destroying the rocks was begun. The process used was that of surface-blasting introduced by Maillefert. A portion of some of the rocks was removed, but this method of overcoming the dangers to navigation was found practically useless. In 1866 another survey was made by Brevet-Maj.-Gen. John Newton of the United States Engineer Corps, and in 1867 he submitted his report, in which he advised the removal of the reefs — the work to be done by blasting, and the drilling of the surface to be made from a fixed platform. Soon after the work of making Hell Gate safely navigable was resumed and placed in charge of John Newton. For the work Newton invented a steam-drilling cupola scow, which served as a transport and a working platform from which the drilling-engines were operated. The new machine proved satisfactory. A new system of explosion had to be devised in order to protect Ward's and Randall's Islands and Astoria. Diamond, Coenties, and Ways reefs were removed, also Pilgrim Rock, before operations were begun on Hallet's Point Reef. The last mentioned was an obstacle to both large and small vessels. The excavations, begun in October 1869, were completed in June 1875. The drilling was completed 25 March 1876. The area operated upon was about three acres. The method of explosion was most successful. No damage was done to the windows of buildings near; it had no perceptible effect on the air, but little on the water, and the underground shock was slight, but was perceptible on Manhattan and the western part of Long Island. The removal of Flood Rock, which was in the middle of Hell Gate, made the navigable capacity of the channel more than double. The work of removing this most formidable obstruction was begun 7 June 1875. Lack of funds caused delay, and the explosion did not take place until 10 Oct. 1885. For the removal of Flood Rock about nine acres were tunneled and drilled; and the aggregate length of the tunnels was 21,670 feet, and of the drill-holes, 113,102 feet. The object sought to be gained by removing the rocks and reefs was to make a channel of the uniform depth of 26 feet and of sufficient width for the largest steamers. The work as planned and designed by Gen. Newton has not been completed (1904).

Helladotherium, hĕl″ạ-dō-thē′rĭ-ŭm, an extinct genus of giraffes, found fossil in the upper Miocene (Pikermi) rocks of Attica. Its body was about as large as that of the existing giraffe, but the legs were of nearly equal length, and the skull was hornless.

Hellas, hĕl′ạs, the abode of the Hellenes, was first a town, and afterward, under the name of Phthiotis, a district in Thessaly. The ancients applied this name to the whole of Thessaly. With the spread of the Hellenic people the term embraced a gradually increasing territory, till it came to denote the whole of Middle Greece, and then the whole of Greece, with its islands and colonies. The Hellenes received this name in the belief that they were descended from Hellena, a mythical personage, a son of Deucalion and Pyrrha, or, according to others, of Zeus and Dorippe, and the father of Æolus, Dorus, and Xuthus, was said to have been king of Phthia. See GREECE.

Hell'bender, a large salamander (*Cryptobranchus alleghaniensis*) found chiefly in the streams emptying into the Great Lakes and those draining the western slope of the Appalachian Mountains. The hellbender is an ugly looking but perfectly harmless creature from 18 to 24 inches long; with the head and body much flattened and a prominent wrinkled fold of skin along the sides. Although entirely aquatic, no gills are present in the adult, and only a single pair of small pores represents the

gill-clefts; the lungs are simple sacs. The limbs are functional, the anterior with four, the posterior with five digits, and the tail is provided with a wide fin. A wide mouth with teeth in both jaws, very small eyes and a slimy skin of a deep mottled brown color are further external characteristics. The giant salamander (*Megalobatrachus maximus*) of Japan is the only known closely related form. The hellbender is a sluggish animal, active chiefly at night, when its voracity causes great annoyance to fishermen whose bait and fish it devours. It is extremely tenacious of life, and hibernates during cold weather. Although very common, its breeding habits are yet unknown.

Hellebore, a genus (*Helleborus*) of the crowfoot family (*Ranunculaceæ*), consisting of perennial erect herbs with scanty, palmately divided leathery leaves, and yellowish, greenish, or white terminal flowers. They are of interest on account of their poisonous and medical properties. About 10 species are natives of Europe and Asia, one of which (*H. viridis*) has become naturalized in the eastern United States. The Christmas rose (*H. niger*) is the source of the black hellebore of modern pharmacopœias, but the ancient black hellebore, a famous remedy for insanity, was probably obtained from other species. *H. viridis* and *H. fœtidus* have emetic and purgative properties, and the latter, which is poisonous, has become a common introduced weed along the eastern American seaboard. These plants are closely allied to the aconites.

White Hellebore is a very different plant, a species (*V. album*) of the genus *Veratrum* of the lily family, which contains several poisonous plants allied to colchicum. They are profusely leaved tall herbs growing in rich woods, and their roots contain the peculiar alkaloids veratroidin and jervin, to which their poisonous properties are mainly due. North America has a widespread species in the Indian poke (*V. viride*), which, like the European species, enters into the pharmacopœia, while its rootstocks are ground into the powder used as an insecticide.

Hellenes, hĕl'ēnz, a native name for the ancient Greeks.

Hell'enists, a name given the Jewish colonists who settled in Egypt after the destruction of the kingdom of Judah, about 600 B.C. Their number was increased by the many colonies of Jews planted by Alexander the Great (336 B.C.), and later by Ptolemy Lagus. Under the reign of the Emperor Augustus they amounted to nearly 1,000,000. They laid the foundation of a new epoch of Græco-Jewish literature, which, from its prevailing character, received the name of the Hellenistic. The Alexandrian Jews were the most influential in developing Hellenizing tendencies, and to them chiefly is to be referred the formation of the peculiar dialect termed the Hellenistic. In their literature the systems of Pythagoras and Plato were strangely combined with those Oriental phantasies which had been reduced to a system in Egypt, and with which the mystical doctrines of the Gnostics were imbued. The most noted Jewish Hellenistic philosopher was Philo of Alexandria, and the chief of the learned labors of the Alexandrian Jews was the Greek translation of the Old Testament.

Hellespont, hĕl'ĕs-pŏnt. See Dardanelles.

Hellgrammite, hĕl'grą-mīt, the large black aquatic larva of the insect Corydalus (q.v.), much used as bait for black bass and other game fish. It lives in streams, preying upon smaller animals, and just before pupation crawls under large stones, where it can be found at about the same time as the bass are biting. It is also called "Dobson" after a maker of artificial baits.

Helm, Israel, Swedish colonist in America: b. 1615; d. 1695. He settled on the Delaware River, in 1649; was collector of customs at Philadelphia 1659, and became a member of Captain Carr's council 1668. He was chief interpreter between the colonists and Indians, and rendered valuable service at the meeting of the New Jersey Indians, Governor Andros, and the Swedish authorities, in 1675.

Helmet-shell, a large gasteropod of the genus *Cassis*, family *Cassidæ*. Most of the species inhabit tropical shores, but a few are found on the coast of the Mediterranean. The shells of *C. rufa*, *C. cornuta*, and *C. tuberosa* (the queen conch), are the material on which shell cameos are usually sculptured.

Helmholtz, Hermann Ludwig Ferdinand von, hĕr'män lood'vĭg fĕr'dē-nänd hĕlm'hōlts, German scientist: b. Potsdam 31 Aug. 1821; d. Charlottenburg 8 Sept. 1894. He studied medicine in Berlin, and received the appointment of assistant-surgeon in the Charité Hospital there in 1842. Next year he went to Potsdam as a military surgeon, but in 1848 he returned to Berlin to assume the duties of teacher of anatomy at the Academy of Art and assistant in the Anatomical Museum. He was called to the chair of physiology at Königsberg in 1849, and six years later went to Bonn as professor of anatomy and physiology. In 1858 he was appointed professor of physiology at Heidelberg, whence he returned in 1871 to Berlin as professor of physics. In 1888 he was appointed to the post of president of the new Physikalisch-Technische Reichsanstalt (Imperial Physico-Technical Institute) in Charlottenburg. Helmholtz was distinguished alike in physical science, in mathematics, and in physiology; but his most valuable and most original work was done in those departments of physics which stand in intimate relations with physiology, especially acoustics and optics. He had an eminently philosophical mind, and his works are no less valuable for their masterly exposition of the methods of experimental science than for the important results contained in them. His scientific fame was securely established as early as 1847, when he published 'Über die Erhaltung der Kraft' (On the Conservation of Energy). This subject was pursued further in 'Über die Wechselwirkungen der Naturkräfte' (On the Interactions of Natural Forces) (1854). His greatest works are the 'Handbuch der Physiologischen Optik' (Handbook of Physiological Optics) (1856–66); and 'Die Lehre von den Tonempfindungen' (1862; 5th ed. 1896), translated into English by Ellis under the title 'Sensations of Tone as a Physiological Basis for the Theory of Music' (1875). A collection of 'Vorträge und Reden' reached a fourth edition in 1896, and has been translated into English as 'Popular Lectures on Scientific Subjects' (1873–81). An edition of his scientific treatises was pub-

lished at Leipsic in three volumes (1882–95), and in 1897 his 'Lectures on Theoretical Physics' appeared in one volume. In his 'Beschreibung eines Augenspiegels' (1851) he described the ophthalmoscope he had recently invented. In 1883 he was ennobled by the German emperor.

Hel'mont, Jan Baptista van, Flemish physician and chemist: b. Brussels 1577; d. near Brussels 30 Dec. 1644. He devoted his attention to scientific research, and although he put forth some visionary theories on the constitution of man, and on diseases, made some genuine discoveries in chemistry. He was probably the first to introduce the term "gas" into science, and was the earliest observer of the acid reaction of the gastric juice. He published 'Ortus Medicinæ' (1648); and 'Opuscula Medica Inaudita' (1644), works which still possess interest for students.

Hel'muth, William Tod, American physician: b. Philadelphia 30 Oct. 1833; d. New York 15 May 1902; graduated Homeopathic Medical College, Philadelphia, 1853; Hahnemann College, San Francisco, 1866. In 1877 he became professor of surgery and dean of the New York Homeopathic College and Hospital. He was an officer in numerous medical associations and a member of the Société Medicale Homeopathique of France. Among his published works were: 'Treatise on Diphtheria'; 'Medical Pomposity'; 'System of Surgery'; 'Scratches of a Surgeon'; 'Suprapubic Lithotomy.'

Heloderma, hē-lō-dĕr'mą. See GILA MONSTER.

Heloïse, ā-lō-ēz, or **Eloise.** See ABELARD.

Helots, hē-lŏts, were the lowest of the four classes into which the population of ancient Sparta was divided. They are generally supposed to have been the aboriginal population of the country, and to have been reduced to bondage by their Dorian conquerors, their numbers being swelled from time to time by the addition of peoples conquered in war. The name is generally derived from the town of Helos, the inhabitants of which were carried off and reduced to slavery by the Heraclidæ about 1000 B.C., though a more probable derivation is the Greek *helein*, to take, making the name signify captives. They were the property of the state, which alone had the disposal of their life and freedom. The state assigned them to certain citizens, by whom they were employed in private labors, though not exclusively, as the state still exacted certain services from them; and they were attached to the soil — that is, each citizen received the number that belonged to his allotment, without any power to sell or free them. Agriculture and all mechanical arts at Sparta were in the hands of the Helots, since the laws of Lycurgus prohibited the Spartans from all lucrative occupations. But the Helots were also obliged to bear arms for the state, in case of necessity. Their dress, by which they were contemptuously distinguished from the free Spartans, consisted of sheep's skin and a leather cap of a peculiar shape. They were sometimes liberated for their services or for a sum of money; but they were not admitted to the full dignity of citizenship. In 424 B.C. 2,000 of the Helots, who had conducted themselves with distinguished bravery in war, were treacherously put to death. They several times rose against their masters, but were always and finally reduced.

Helper, Hinton Rowen, American author: b. near Mocksville, N. C., 27 Dec. 1829. He published in 1857 'The Impending Crisis of the South,' which the Republican party used as a campaign document with great effect. Later works by him are: 'The Three Americas' Railway' (1881); 'Nojoque' (1867); 'The Negroes in Negroland' (1868); 'The Land of Gold'; 'Oddments of Andean Diplomacy.'

Helps, Sir Arthur, English essayist and historian: b. Streatham 10 July 1813; d. London 7 March 1875. He was educated at Eton and Cambridge; became private secretary to Lord Monteagle as chancellor of the exchequer, and was afterward commissioner of French, Danish, and Spanish claims. In 1860 he was appointed clerk of the privy council, and held this post till his death. He was created K.C.B. in 1872. As an essayist he was one of the most popular writers of his day, and his historical works had an extended reputation. He possessed very wide and general culture and sound judgment, was painstaking and accurate in details, and in his historical works displayed considerable breadth of view. His principal works are: 'Thoughts in the Cloister and the Crowd' (1835); 'Essays Written in the Intervals of Business' (1841); 'Friends in Council' (1847–57); 'Conquerors of the New World and their Bondsmen' (1848–52); 'Companions of my Solitude' (1851); 'History of the Spanish Conquest of America' (1855–61); 'Oulita the Serf, a Tragedy' (1858); 'Life of Pizarro' (1869); 'Realmah' (1869); 'Casimir Maremma' (1870); 'Brevia, Short Essays and Aphorisms' (1870); 'Life of Hernando Cortes and Conquest of Mexico'; 'Thoughts upon Government' (1871); 'Life and Labors of Mr. Brassey' (1872); 'Social Pressure' (1874).

Helsingfors, hĕl'sĭng-fŏrs, Russia, a seaport town, capital of Finland, on a small peninsula in the Gulf of Finland, 180 miles by rail west-northwest of St. Petersburg. It is defended by the fortress of Sveaborg about three miles distant, and is the residence of the governor of Finland, the seat of important courts and public offices. Its university, removed from Abo in 1827, has a library of over 190,000 volumes. There are manufactures of linen, sail-cloth, tobacco, etc., and an important trade is carried on. Pop. (1903) 94,000.

Helve'tian Republic, the designation of the republic established in Switzerland by France in 1798. See SWITZERLAND.

Helvet'ic Confession, the name of a document drawn up by Martin Bucer in 1536 to settle the controversy between the Lutherans and the Zwinglians; and also of one drawn up by Bullinger (1566) at the request of Friedrich III., elector of the Palatinate, and adopted in Switzerland, the Palatinate, France, Hungary, Poland, and Scotland.

Helvetii, hĕl-vē'shĭ-ī, a former Gallic or Celtic nation living between the Rhone and the Rhine, the Jura, and the Rhætian Alps. They were more numerous and warlike than the neighboring Gallic tribes. They first appear in history 107 B.C., but were not known to the Romans until the time of Julius Cæsar, who, as governor of Gaul, prevented their intended emigration, and

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after many bloody battles, in which even the Helvetian women fought, pressed them back within their frontiers. The story of their meditated irruption into and seizure of southern Gaul is circumstantially related in the First Book of the Commentaries of the Roman general, who not only repulsed them with terrible slaughter, but almost exterminated them. Not a third of those who left their homes on this ill-fated expedition ever returned. Helvetia, which was less extensive than the present Switzerland, was divided into four districts, which had an entirely democratical constitution. Cæsar subjected the country to the dominion of the Romans, who established several colonies there. After the death of Nero, the Helvetii, for refusing to acknowledge Vitellius as emperor, were mercilessly punished by Cæcina, one of his generals, and thenceforth they almost disappear as a people.

Helvétius, Claude Adrien, klōd ā-drē-oṅ ĕl-vā-sē-ŭs, French metaphysician: b. Paris Jan. 1715; d. there 26 Dec. 1771. At the age of 23 he obtained the lucrative post of farmer-general, where he was distinguished by his mildness and indulgence from his colleagues, whose base practices filled him with indignation. He therefore resigned his office, and purchased the place of *maître d'hôtel* to the queen. Aspiring after literary fame he first directed his efforts to mathematics, then attempted to rival the dramatic fame of Voltaire by writing a tragedy. In 1758 he published 'De l'Esprit,' the materialism of which drew upon him many attacks. It was condemned by the doctors of the Sorbonne, and publicly burned in accordance with a decree of the Parliament of Paris. Helvétius went in 1764 to England, and the year afterward to Germany, where Frederick the Great and other German princes received him with many proofs of esteem. A complete edition of his writings was published at Paris in 1795.

Hem'ans, Felicia Dorothea Browne, English poet: b. Liverpool 25 Sept. 1793; d. near Dublin, Ireland, 16 May 1835. She displayed the bent of her genius when a mere child, and wrote some tolerable poetry in her 9th year. She first appeared as an author, in 1808, in a volume entitled 'Early Blossoms,' but it was subjected to harsh criticism, which she took very seriously to heart. A second volume, published in 1812, 'The Domestic Affections,' was much more successful. The same year she married Captain Hemans, from whom she was separated in 1818. She then resumed her literary pursuits, made herself acquainted with Latin and modern languages, and wrote much in the periodicals of the time. At the suggestion of Reginald Heber, afterward bishop of Calcutta, she wrote a tragedy entitled 'The Vespers of Palermo,' which, owing partly to Sir Walter Scott, who wrote an epilogue for it, was favorably received at the Edinburgh theatre, though it had previously, in 1823, proved unsuccessful at Covent Garden. Before this time she had added greatly to her popularity by her poems entitled 'The Restoration of the Works of Art to Italy'; 'The Skeptic'; 'Modern Greece'; and 'Dartmoor.' Later works were 'Lays of Many Lands'; 'Forest Sanctuary'; 'Records of Woman'; and 'The Songs of the Affections' (1830). She visited Sir Walter Scott at Abbotsford, and Wordsworth at Rydal Mount, and left with each the impression of a singularly graceful and gifted woman. Her poetry is essentially lyrical and descriptive, and is always sweet, natural, and pleasing. In her earlier pieces she was imitative, but she ultimately asserted her independence, and produced many short poems of great beauty and pathos. Mrs. Hemans had no dramatic power, her effusions being always intensely subjective.

Hem'atin, or **Hæmatin.** See Hæmoglobin.

Hem'atite, native sesquioxide of iron, Fe_2O_3, a mineral widely distributed, and constituting a valuable ore of iron. It crystallizes in the rhombohedral system, and also occurs in massive form, sometimes forming beds of great thickness. It has a hardness of from 5.5 to 6.5, and a specific gravity ranging from 4.9 to 5.3. It is usually dark gray or black in color, with a metallic lustre, and is sometimes slightly magnetic, occasionally even showing magnetic polarity. Hematite occurs in the rocks of every age. The extensive masses that occur in metamorphic rocks are believed to have been deposited, originally, in marshes, undergoing metamorphosis at the same time as the rocks with which they are now associated. Fibrous and columnar forms of the mineral, brownish-red or black in color, are also known, and to these the name "red hematite" is sometimes applied In crystalline and metamorphic rocks a variety known as "specular iron" is met with, which is distinguished by the presence of crystals having a splendent lustre. Hematite occurs in vast quantities in various parts of the United States, notably in upper Michigan, in the Marquette district, and in Menominee and Gogebic counties; in Northern Wisconsin; and in St. Louis County, Minnesota. Iron Mountain, Missouri, is a hill about 200 feet high, the surface of which consists of loose blocks of hematite, many of which weigh as much as 10 or 20 tons. The name "hematite" is from a Greek word signifying "blood," and was given to the mineral by the ancients from its fancied resemblance to coagulated blood. Hematite is sometimes called "bloodstone" at the present time, though that name is more properly applied to a green variety of quartz, which contains small spots of red jasper. An allied mineral, consisting of hydrated sesquioxide of iron and known to mineralogists as limonite, is often popularly called "brown hematite."

Hemianæsthesia, hĕm-ĭ-ăn-ĕs-thē'sĭ-ạ, loss of sensation on one half of the body, right or left.

Hemiplegia, hĕm-ĭ-plē'jĭ-ạ (lit. "half a stroke," that is, of paralysis), paralysis of one side of the body. It is usually caused by hemorrhage in the brain cavity, commonly known as apoplexy; often a local accumulation of serum, or a tumor is the cause. The paralysis falls on the side of the body opposite to the lesion in the pyramids of the brain, unless the lesion occurs below the decussation of brain fibres. The treatment of hemiplegia requires the services of a physician. It is amenable to timely remedies, and a cure is generally obtained after the first attack, if it result from apoplexy; but the patient is liable to subsequent attacks.

Hem'ipode. See Button-quail.

Hemiptera, hē-mĭp'tē ra, an order of insects. It contains two leading groups, the *Homoptera* and *Heteroptera.* In the former the two pairs of wings when present are applied in rest pent-house fashion to the sides of the body. Several families are wingless. Cicadas, plant-lice (*Aphis*) and the like come here. In the second group the wings, when at rest, placed horizontally across the body, the second pair covered by the upper, which are *hemielytra,* that is, the basal half is leathery, the distal portion membranous. See Bug.

Hemlock, one of various plants. (1) A highly poisonous umbelliferous herb of the genus *Conium,* one species of which is European and the other African. The well-known officinal European one (*C. maculatum*) has become extensively naturalized as a weed in the United States. It is easily recognized by the wavy, crenate ridges of its short, laterally compressed fruit, and also by the disagreeable mouse-like odor when bruised (see Conium). (2) The water hemlocks or cowbanes of the closely allied genus *Cicuta,* which is also both European and American. The common American species is *C. maculata,* which grows in swamps and wet places, and is also dangerously poisonous, especially in its turnip-like cavernous root. See Cicuta.

Hemlock-spruce, an American coniferous tree of the genus *Abies* (or *Tsuga*) of which two species are recognized, the common northern one (*T. canadensis*), and a lesser one of the Southern Alleghanies (*T. Caroliniana*). The wood is too soft, weak, and brittle to be of extensive use as lumber, but the bark is of great importance in tanning. See Fir.

Hemlock, Water. See Hemlock.

Hem'meter, John Cohn, American physician: b. Baltimore, Md., 25 April 1864. He studied at the Royal Gymnasium, Wiesbaden, Germany; Baltimore City College; and University of Maryland; and became clinical professor of medicine in the last named institution, and director of the clinical laboratory. He is associate editor of 'Archives for Digestive Diseases,' Berlin, and author of: 'The Special Pathology and Treatment of Diseases of the Digestive Organs' (1896); 'Diseases of the Stomach' (1897); 'Diseases of the Intestines' (1901); 'Theodore Billroth, a biography' (1900). He is also a composer, and has composed 'Hygeia' (cantata); 'Prelude and Choral Music to the 23d Psalm' and other works.

Hem'orrhage. See Bleeding.

Hemp. The hemp plant proper, or "common hemp," is *Cannabis sativa,* an annual shrub belonging to the *Urticaceæ.* The term hemp, however, is used to designate many other kinds of fibre which are in no way related to the species of common hemp, such as Manila hemp, from a plantain, sisal hemp from an agave, bow string hemp, from a liliaceous plant, and 30 or more other kinds. The different kinds of common hemps are also specially designated, with prefixes, as Breton hemp, Piedmontese, Russian, English, China, and Japanese hemps, and many others, some of these being trade names, or the names of varieties. The hemp plant proper is a native of that part of Asia which includes India and Persia, though, like flax, its culture has been extended to many portions of the world in both temperate and tropical climes. It was used by the Scythians 2,500 years ago, and it was probably known to the Chinese and Europeans many centuries earlier. The Romans used it for sails and cordage, but not until after the dawn of the Christian era. It grows wild in many parts of India, where it is regarded more for its product known as chang or hasheesh than for its fibre. It flourishes on both the east and west coasts of Africa, and has been naturalized in Australia, as well as in several South American countries. In Europe it is cultivated chiefly in France, Italy, Germany, and central and southern Russia, and it will grow in Great Britain and Sweden. The plains of Hungary are peculiarly adapted to its culture. It is a favorite textile in China and Japan, the fibre from the last named country being particularly strong and fine, and at the same time, better prepared than many European hemps. The plant is an annual shrub, the fibre being produced in the bark of the straight stiff stalks or stems, and is therefore a bast fibre. In the experiments of Roxburgh and others, Russian hemp is taken as the standard of comparison for all other fibres. The stems vary from 3 to 20 feet long, dependent upon the variety and the soil in which grown. The best kinds have a hollow stem, the wood of which breaks down readily when cleaned for the fibre. While hemp is produced commercially in very few localities of the United States, it will thrive from ocean to ocean, and from the Gulf to Canada. Its cultivation as a fibre crop is confined chiefly to Kentucky, Illinois, Missouri, Nebraska, and California, though considerable hemp, in past time, has been produced in New York. Lately it has been experimented with in the South, notably in Mississippi and Texas. The bulk of the crop is grown at the present time in Kentucky and California.

The Kentucky hemp industry is very old, for the fibre was cultivated in the early part of the last century. The annual production, in 1859, reached a total of 75,000 tons, but 20 years later it had fallen off to such an extent that 5,000 tons only were recorded for the entire country. Since that time it has fluctuated between 5,000 and 12,000 tons as the total crop of the country, the annual production at the present time being less than the smaller figure. In late years the price has ruled at about 3½ cents per pound, though now it is quoted at 4½ cents. American hemp was at one time used to some extent for the rigging of vessels, although its largest use was for bagging. As early as 1824 it was employed in the navy, and efforts were made later by the government toward the production of better grades of hemp by water retting. The fibre has also been used for twines, and for woven fabrics. In late years the demand has been largely for a low grade fibre that could be manufactured into binder twine, though the bulk of the binder twine is made from manila and sisal. Very recently there has been a demand for a better grade of fibre, which has resulted in more careful methods, particularly on the Pacific coast, where a fibre has been produced fit for fine twines and cordage. Kentucky, Illinois, and Nebraska hemps are coarse, dark in color, and are not carefully prepared, which is the reason for the low price of 3½ cents against 8 and 10 cents per pound for finer imported hemps. The best hemp comes from Italy,

chiefly from the provinces of Bologna and Ferrara, the fibre being very white, very well prepared, and of superb strength. Breton hemp from France is almost as good, but rarely imported. Russian comes in several grades, some light, but not as light as the Italian, some dark like the native fibre, and low in grade. Some good hemp comes from Austria-Hungary, and a trifle from other portions of Europe. Little if any of the Japan fibre reaches this market, though the best Japanese is as good as the Italian. We consume annually less than 10,000 tons, including both the native and imported.

There are many varieties of the hemp plant, four or five having been grown in the United States, though it is said that the bulk of the seed at present sown is the China hemp and a Japanese variety. Five varieties are cultivated in Europe, a common form reaching a height of 5 to 7 feet; Piedmontese or Bologna, an Italian variety that averages 12 feet in height; China hemp, introduced in 1846; a small hemp found in the valley of the Arno, and around Tuscany, and Arabian hemp, cultivated for the resinous principle or drug.

Limestone soils and the alluvial soils of the river bottoms are best adapted to hemp culture, and the seed bed should be almost as carefully prepared as for flax. One to three bushels of seed are sown per acre broadcast, and lightly covered. The planting, in Kentucky, usually begins in April, and the crop may be harvested in 100 days. For further particulars regarding the culture and preparation of this fibre, see Special Reports Nos. 1, 8, and 11, office of Fibre Investigations of the Department of Agriculture, and Hemp Culture in the United States, Year-book of Agriculture for 1901. See also the 'Dictionary of the Economic Products of India.'

While some 300 patents have been issued in this country for hemp machines, the bulk of the fibre is extracted by means of the old-fashioned, clumsy wooden "slat brake" that has been employed from time immemorial and without improvement or change. With one of these brakes a Kentucky negro can extract perhaps 150 pounds of fibre in a day. The brakes used in European hemp countries are little better, though they are smaller and less clumsy. The best foreign hemps are water retted, the stalks dried with great care, often in kilns, and therefore are more evenly prepared, and the fibre soft, strong, and light in color — almost white as in the Italian and French hemp. On the contrary most of the American hemps are dew retted, and are exposed to alternate freezing and thawing, as the stalks lie on the ground, giving an inferior product, uneven, and very dark in color, often a slate gray. See CORDAGE; CORDAGE INDUSTRIES; FIBRE; FLAX; MANILA HEMP; RAMIE; SISAL.

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Hemp-agrimony. See EUPATORIUM.

Hemp-nettle, a genus (*Galeopsis*) of European plants of the mint family, two species of which have become naturalized as weeds in the eastern United States.

Hemp'hill, James C., American journalist: b. Due West, Abbeville County, S. C., 18 May 1850. Was graduated at Erskine College in his native town in 1870 and entered journalism as editor of the Abbeville, S. C., 'Medium' in 1871. In 1880 he joined the staff of the Charleston *News and Courier*, of which since 1888 he has been manager and editor.

Hempl, George, American philologist: b. Whitewater, Wis., 6 July 1859. He was graduated at the universities of Michigan in 1879 and of Jena in 1889, and was appointed instructor in German at Johns Hopkins University in 1884. After spending three years abroad (1886–9) in study at Göttingen, Tübingen, Strasburg, and Berlin, he became junior professor of English in the University of Michigan, where he has been professor of English philology and general linguistics since 1897. He has been a voluminous writer, and among his technical works may be mentioned 'German Orthography and Phonology' (1897); 'German Grammar' (1901).

Hemp'stead, N. Y., village, in the town of the same name, in Nassau County; on the Long Island Railroad; about 15 miles east of the borough of Brooklyn, and 10 miles from the ocean. The village was settled in 1643 by people from New England. The Presbyterian Society of Hempstead claim the oldest Presbyterian organization in the country, dating their beginning in this village in 1644. Hempstead is located in a section of Long Island in which there are many summer homes. During the war with Spain an encampment for State troops was located at Hempstead; it was called Camp Black after the then governor of the State. The chief industrial interests are market gardening, farming, and the manufacturing of cork insoles, phosphates, and carriages. Pop. (1900) 3,582.

Hempstead, Texas, town, county-seat of Waller County; on the Houston & T. C. railroad; about 50 miles northwest of Houston and 113 miles east by south of Austin. It is situated in a fertile agricultural region, noted for its cotton fields and its vegetable products. It has a cottonseed-oil mill, cotton-gins, and its trade is chiefly in cotton, grain, fruits, and vegetables. Pop. 1,978.

Hems, or Homs, hōms (Lat. *Emesa*), Syria, an ancient city, near the Orontes and the Lake of Homs, 86 miles northeast of Damascus. Its temple of the sun-god Elagabalus was famous, and one of its priests became emperor of Rome, assuming its title, in 218. Here in 272 Zenobia was defeated by Aurelian, and in 1832 the forces of the sultan of Turkey by Ibrahim Pasha. The town is still surrounded by its ancient walls now in a ruinous condition. It has some manufactures of silk goods and gold ornaments, and a trade in oil and agricultural produce. Pop. est. 30,000.

Hem'street, Charles, American journalist and author: b. New York 20 Sept. 1866. He entered the profession of journalism as a reporter in 1886, and was connected with the City Press Association until 1900, when he resigned to devote himself to literature and historical research. He has published: 'Manhattan' (1888); 'Nooks and Corners of Old New York' (1899); 'The Calendar of Old New York' (1900); 'History of New York City' (1901); 'When Old New York was Young' (1901).

Hem'yng, Bracebridge, English author: b. London 1832; d. 1891. In early life a journalist he began at the age of 35 a series of sensational tales for boys known as the 'Jack Hark-

away' stories, which for a dozen years had great vogue in Great Britain and the United States. He wrote not only some 20 serial stories having to do with the adventures of 'Jack Harkaway,' but upward of 40 volumes of sensational fiction, none of which, however, found readers in America.

Hen-hawk, or **Chicken-hawk,** any kind of hawk which attacks poultry, or is supposed to do so. Two or three large buzzard-hawks are popularly so called in the eastern United States, and at least two smaller falcons. In the West, and in other parts of the English-speaking world, are other species of the same repute, more or less well-deserved. In England the analogue of the American marsh-hawk (q.v.) is known as "hen-harrier." Certain owls everywhere kill much poultry where it is not safely housed at night. In North America the best known hen-hawks are the broad-winged, red-tailed, and red-shouldered (q.v.; also BUZZARD). They are comparatively harmless to poultry, however, feeding mainly on squirrels, mice, frogs, etc. The broad-wing (*Buteo pennsylvanicus*) is one of the most familiar of our hawks, breeding numerously in the woods all over the country. It is 16 inches long, with the tail 7 inches, and the wing 11 inches. The upper parts are dull umber-brown, the tail almost black, crossed by two to four pale brown bands; the lower parts are dull rufous brown, nearly unbroken on the breast. It is rather sluggish in temperament, though capable of swift and bold action, and feeds mainly on mice, but will now and then seize young chickens, ducklings, etc. On the whole, as in the case of the other buzzard-hawks, it is of more service than injury to the agriculturist. The real culprits are two small, swift, agile falcons, Cooper's (*Accipiter cooperi*), and the sharp-shin (*A. velox*). The former is nearly two feet long, grayish-brown on the upper parts and white below, with the sides and breast barred with dusky red-brown, and tail barred with blackish. The sharp-shin has much the same colors, but is little more than half as large, and is further distinguished by the triangular shape of the tarsus, giving it an edge in front. These bold and active falcons live mainly on birds, and on farms prey largely on chickens and house-sparrows, compensating somewhat for the former by killing the latter. Consult Fisher, 'Hawks and Owls of the United States' (Washington 1893).

Henbane, a dangerous plant (*Hyoscyamus niger*) of the order *Solanaceæ*, which contains the tobacco, stramonium and other plants abounding in narcotic poisons. The black henbane (*Hyoscyamus niger*) represents some 15 species of the Mediterranean region, and springs up in waste places throughout Great Britain and the eastern United States, where it has become naturalized. It is an annual, somewhat bushy, about two feet high, with large sinuated or sharply lobed leaves without leaf-stalks, and large dingy yellow flowers with purplish veins. The whole plant is covered with unctuous hairs, and has a nauseous smell. The seeds contain in largest quantity the specific alkaloid hyoscyamin, which crystallizes in stellated acicular crystals of a silky lustre. The symptoms of poisoning by henbane are similar to those produced by other narcotic poisons, and the proper treatment is the same as in cases of poisoning by opium. In medicine henbane is employed both externally and internally. The leaves are the part commonly used; they are gathered and quickly dried when the plant is in full flower. Fomentations of henbane are applied to painful glandular swellings, parts affected with neuralgia, etc., and are often found to afford relief. An extract of henbane is sometimes employed instead of belladonna to dilate the pupil of the eye. Tincture and extract of henbane are often administered in cases of annoying cough, spasmodic asthma, and other diseases requiring sedatives and anti-spasmodics. For many cases it has one great advantage over laudanum, in not producing constipation. The other species of henbane possess similar properties. The dried stalks of *H. olbus* are used by smoking in Greece to allay toothache.

Hen'derson, Charles Hanford, American educator and author: b. Philadelphia 30 Dec. 1861. He was graduated from the University of Pennsylvania in 1882, was lecturer at the Franklin Institute 1883–5, 1885–6; lecturer on education at Harvard 1897–8; and director of Pratt Institute, Brooklyn, 1898–9. He has published 'Elements of Physics' (1900); 'John Percyfield: the Anatomy of Cheerfulness' (1903); 'The Children of Good Fortune' (1904).

Henderson, Charles Richmond, American educator: b. Covington, Ind., 17 Dec. 1848. He was graduated from the University of Chicago in 1870, and has been professor of sociology there since 1892. He was president 26th National Conference of Charities 1898–9, and vice-president National Prison Association. He has published 'Social Spirit in America' (1896); 'Social Settlement' (1897); 'Social Element' (1898).

Henderson, David Bremner, American statesman: b. Old Deer, Scotland, 14 March 1840; d. Dubuque, Iowa, 25 Jan. 1906. He was educated in the public schools and Upper Iowa University; in 1861 entered the army as lieutenant of the Twelfth Iowa regiment; lost a leg at Corinth (1863), and was discharged from the service. He then became commissioner of the board of enrolment in the 3d Iowa district, but re-entered the army as colonel in 1864. He studied law and was admitted to the bar in Iowa in 1865, and was United States district attorney in the northern division of Iowa 1869–71. He early became prominent in the local politics of his district, and was a delegate to three Republican national conventions. In 1882 he was elected to the House of Representatives, and was re-elected biennally till 1902. He was for many years one of the leaders of the Republicans in the House, served on the committee of appropriations for 10 years, and was chairman of the judiciary committee and a member of the committee on rules in the 54th and 55th Congresses. He assisted Speaker Reed (q.v.) in the making of the "Reed rules," was consistently an advocate of sound money, and a strong supporter of President McKinley's Cuban policy. At the organization of the 56th Congress in 1899 he was chosen speaker of the House, and re-elected in 1901; he was an impartial presiding officer and took important part in shaping the legislation made necessary by the Spanish war and the acquisition of new territory. In 1902 he

declined a unanimous renomination from his district, because he could not support the policy of tariff revision then made a prominent issue by Iowa Republicans.

Henderson, Isaac, American journalist and novelist: b. Brooklyn, N. Y., 13 Feb. 1850. He was graduated from Williams College in 1872, and the same year joined the staff of the New York *Evening Post*, of which journal he became publisher in 1876. He sold his interests in 1880, and went abroad in 1888, making his home in London and Rome. Author of 'The Prelate' (1898); 'Agatha Page' (1900).

Henderson, James Pinckney, American soldier and politician: b. Lincoln County, North Carolina, 21 March 1808; d. Washington, D. C., 4 June 1858. He practised law in Mississippi; went to Texas in 1836, and became secretary of state of the Texan Republic 1837–9. In the latter year he was sent as a minister to England and France to secure the recognition of Texan independence, and went to Washington in 1844 to secure annexation. He was a member of the Texas constitutional convention 1845, and the following year was elected first governor of the State. In 1857 he was appointed senator from Texas as a State Rights Democrat. Henderson fought in the Mexican War and Congress gave him a sword for his gallantry.

Henderson, Mary N. Foote, American writer on domestic science: b. New York 1842. She was married to J. B. Henderson, and in 1876 organized the St. Louis School of Design. She is the author of 'Diet for the Sick,' 'Practical Cooking and Dinner Giving.'

Henderson, Peter, American horticulturist: b. Porthead, Scotland, 1823: d. Jersey City, N. J., 17 Jan. 1890. He came to America in 1843, and opened a seed-store in New York city in 1862. He has been called "the father of horticulture and ornamental gardening in the United States." He published 'Practical Floriculture' (1867); 'Gardening for Profit' (1866); 'Gardening for Pleasure' (1875); 'Garden and Farm Topics' (1884); 'How the Farm Pays' (1884).

Henderson, Richard, American pioneer: b. Hanover County, Virginia, 1734; d. North Carolina 1785. He studied law and in 1769 was appointed associate justice of the superior court of North Carolina. After the adoption of the Declaration of Independence he declined re-election to the bench, in order to participate in the scheme of the Transylvania Land Company. By this scheme the company organized as a political community with president, legislature, and judges, all the territory lying between the Cumberland River, the Cumberland Mountains, and the Kentucky River. The State of Virginia annulled the deed of sale of this tract of territory which the Cherokee Indians had given to the Transylvania Land Company, but as a reward for the pioneer work of the company, granted them an area 12 miles square on the Ohio River, below the mouth of the Greene River.

Henderson, William James, American musical critic and author: b. Newark, N. J., 4 Dec. 1855. He was graduated from Princeton College in 1876, and joined the staff of the New York *Tribune*, the following year becoming musical critic of the New York *Times*. He was associate editor of 'The Standard Dictionary' (1892–4), and has published: 'The Story of Music' (1889); 'Preludes and Studies' (1891); 'Sea Yarns for Boys' (1894); 'Afloat with the Flag' (1895); 'Elements of Navigation' (1895); 'The Last Cruise of the Mohawk' (1897); 'What is Good Music?' (1898); 'How Music Developed' (1899); 'The Orchestra and Orchestral Music' (1899); 'Richard Wagner' (1901).

Henderson, Ky., city, county-seat of Henderson County; on the Ohio River, and on the Illinois C., the Louisville & N., the Louisville, H. & St. L. R.R.'s; about 10 miles below Evansville, Ind., and 103 miles, in direct line, southwest of Louisville. It has regular steamboat connection with Louisville, Evansville, Memphis, and other river ports. It is one of the oldest settlements on the Ohio River, but it was not incorporated until 1797. It is situated in a fertile agricultural region, rich in timber and coal. The chief manufactures are cotton and woolen goods, flour, hominy, lumber, tobacco products, furniture, carriages and wagons, foundry products, car-works, and agricultural implements. Large shipments are made of corn, wheat, and tobacco. It has large coal and lumber yards, grain-elevators, tobacco-stemmeries, fine fairgrounds, and Atkinson Park, the area of which is about 100 acres. It has a sanatorium and a number of well-built churches and schools. The charter of 1893 provides for a mayor, who holds office four years and is not eligible for re-election, and a common council. The city owns and operates the electric-light and gas plants and the waterworks. Pop. (1900) 10,272.

Henderson, N. C., town, county-seat of Vance County, on the Southern and the Seaboard A. L. R.R.'s; about 12 miles east of Oxford and 42 miles north of Raleigh. Henderson was settled in 1820, but was not incorporated until 1842. It is situated in a cotton and tobacco region of the State. The chief industrial establishments are cotton-gins, cotton-seed oil mills, cotton-mills, knitting-mills, tobacco warehouses, wagon-factories, flour-mills, and lumber-yards. Its chief trade is in cotton and tobacco. Pop. (1890) 4,191; (1900) 3,746.

Henderson, Texas, town, county-seat of Rusk County; on a branch of the International & G. N. railroad; about 122 miles southeast of Dallas and 165 miles north by east from Houston. It is situated in an agricultural section, and the chief industries are connected with agricultural products. Its chief industrial establishments are a foundry, a pottery, and cotton-gins. The trade is in manufactured articles, live-stock, cotton, and vegetables. It is the seat of a normal college.

Hen'dersonville, N. C., town, county-seat of Henderson County; on the Southern Railway; about 21 miles south of Asheville and 100 miles west of Charlotte. It is situated in a mountainous portion of the State, but in the valleys are fertile farm lands. The chief industrial establishments are a furniture factory, a tannery, a canning factory, and a lumber yard. Apples and vegetables are among the agricultural products shipped to other markets. Hendersonville has a large number of summer

guests owing to the healthfulness of the climate and the beauty of the scenery. Pop. (1900) 1,917.

Hen'dricks, Thomas Andrews, American politician, 21st Vice-President of the United States: b. near Zanesville, O., 7 Sept. 1819; d. Indianapolis, Ind., 25 Nov. 1885. He was graduated at South Hanover College, Indiana, in 1841; studied law and was admitted to the Indiana bar in 1843. In 1845 he was elected to the legislature, and in 1850 and 1852 to Congress. In 1860 he was the Democratic candidate for governor of Indiana, but was defeated. He was a United States senator 1863–9; and at the Democratic National Convention of 1868 received 132 votes for the Presidential nomination. In the same year he was again defeated for the governorship of Indiana, but in 1872 was elected. In the Democratic National Convention of 1876 he was nominated for the Vice-Presidency, but the ticket, headed by Tilden, was defeated. Hendricks was again nominated for the Vice-Presidency in 1884, however, on the ticket with Cleveland, and on this occasion was elected.

Hen'drix, Eugene Russell, American Methodist bishop: b. Fayette, Mo., 17 May 1847. He was graduated from Wesleyan University, Middletown, Conn., 1867; and the Union Theological Seminary 1869. Appointed bishop of the Methodist Episcopal Church South, in 1886, he has since made official visits to China, Japan, Korea, Mexico, and Brazil. He is the possessor of John Wesley's manuscript 'Journal' written in America 1736–7. He has written 'Around the World' (1878); 'Skilled Labor for the Master' (1900).

Hengist, hĕng'gĭst, Saxon founder of the kingdom of Kent in Great Britain: d. about 488. He and his brother Horsa were renowned among the Saxons for their bodily strength and the antiquity of their family, which derived its origin in a direct line from Odin. In 449 the Britons sued for aid from the Saxons against the inroads of the Scots and Picts. Under command of Hengist and Horsa the Saxons landed at the mouth of the Thames, attacked the enemies of the Britons, and defeated them near Stamford in 450 A.D. As soon as they had received reinforcements from home they sought occasion for a quarrel, and uniting with the Scots and Picts they attacked the Britons, who were forced to flee or submit to the Saxons. Some fled to Armorica (Haute-Bretagne), to which they gave their name. Hengist, who had lost his brother in the battle near Eglesford (now Aylesford) in 455 A.D., founded the kingdom of Kent. He established his residence in Canterbury. By some of our writers Hengist and Horsa are regarded as mythical personages.

Hening's Statutes, the first complete collection of the laws of any American State, including those of its colonial times, those repealed and those dropped in revision. These were the "Statutes at Large of Virginia, 1619–1792," in 13 volumes, published at Richmond 1809–23, by William Waller Hening, clerk of the court of chancery; Jefferson is said to have suggested the publication. It is highly valued as a historical source.

Hen'ley, William Ernest, English poet, critic, and journalist: b. Gloucester 23 Aug. 1849; d. Woking 12 July 1903. He entered on a journalistic career in London, and in 1877 became first editor of the magazine 'London.' He was then editor successively of the 'Magazine of Art' (1882–6), of the 'Scots'— later the 'National Observer'— (1888–93), and of the 'New Review' (1893–8). His first publication, 'In Hospital: Rhymes and Rhythms' (1888), was inspired by his own experiences as a patient in Edinburgh Infirmary. Its contents were subsequently included in 'A Book of Verses' (1888). A second volume of poems, 'The Song of the Sword,' appeared in 1892 (2d ed. as 'London Voluntaries' 1893). Both of these books were incorporated in the collection of his 'Poems' (1898). Later poetical works were: 'For England's Sake' (1900); and 'Hawthorn and Lavender, and Other Verses' (1901). Henley collaborated with Stevenson four plays, 'Deacon Brodie,' 'Beau Austin,' and 'Admiral Guinea' and 'Macaire.' He also edited, either alone or in cooperation with others, the following anthologies and collections: 'Lyra Heroica' (1891), an anthology of English patriotic verse; 'A London Garland: from Five Centuries of English Verse' (1895); 'Book of English Prose' (1896); 'English Lyrics, 1340–1809' (1897); 'The Works of Lord Byron' (1897); 'The Poetry of Wilfrid Blunt' (1896); and 'London Types' (1898), and was editor of a series of 'Tudor Translations.' The 'Centenary Burns' (1896–7) is an important work edited by him with the cooperation of T. F. Henderson. The fourth volume contains an elaborate estimate by Henley of Burns as poet and man, published separately in 1898. His critical work appears at its best in 'Views and Reviews: Literature' (1890), and 'Views and Reviews: Painting and Sculpture' (1901). Both as poet and critic he was prejudiced and aggressive, but keen, vigorous, and often distinguished in style. A paper on Stevenson contributed to the 'Pall Mall' in 1901 aroused much unfavorable comment by its arraignment of Balfour's 'Life.'

Henley-on-Thames, England, a market-town and municipal borough of Oxfordshire, on the Thames, 35 miles by rail west of London. The town is especially famous for its annual regatta in July, a notable event in the British sporting world. The university boat races are held on the river here, and Americans frequently take part in the various open events. Pop. (1901) 5,984.

Henlopen. See CAPE HENLOPEN.

Henna, a shrub (*Lawsonia inermis*) resembling the privet, but of the order LYTHRACEÆ. It grows in moist situations throughout the north of Africa, Arabia, Persia, and the East Indies, and has acquired celebrity from being used by the inhabitants of those countries to dye the nails of their fingers and the manes, hoofs, etc., of their horses. For this purpose the leaves are dried, powdered, and made into a paste with hot water, which imparts a yellow color, requiring renewal every three or four weeks. It is cultivated extensively in Egypt, and the powdered leaves form a large article of export to Persia and Turkey. Henna is supposed to be the *kopher* of the Hebrew, translated *camphire* in the Song of Solomon.

Hennepin, Louis, loo-ē ĕn-păn or hĕn'ĕ-pĭn, French Franciscan missionary and explorer in North America: b. Ath, Belgium, about 1640; d. Utrecht, Holland, about 1706. He entered a convent, and being sent by his superiors to Calais and Dunkirk, the stories he heard from the sailors inspired him with a desire to visit distant countries. At length he embarked for Canada, and arrived at Quebec in 1675. In 1676 he went to the Indian mission at Fort Frontenac, whence he visited the Five Nations and the Dutch settlement at Albany. In 1678 he was attached to La Salle's expedition, and, in company with the Chevalier de Tonty and the Sieur de la Motte, was ordered to sail from Fort Frontenac to Niagara, and there construct a vessel for navigating the Lakes above the falls. This accomplished, La Salle joined the party, and on 7 Aug. 1679 the adventurers began their voyage on Lake Erie. They passed through Lakes Erie, Huron, and Michigan, to the mouth of the St. Joseph's River, ascended this in canoes to the portage, carried their frail barks several miles by land to the Kankakee, and floated down this stream and the Iroquois to the Illinois, on the banks of which they built Fort Crèvecœur near the present site of Peoria. After a delay of two months at this place, La Salle returned to Fort Frontenac for supplies, charging Father Hennepin with a voyage of discovery to the sources of the Mississippi, which had never been explored above the mouth of the Wisconsin. Accompanied by Picard du Gay and Michel Ako, he set out in a canoe 29 Feb. 1680, followed the Illinois to its mouth, and ascended the Mississippi to the Falls of St. Anthony, which he was the first European to see, and which he named in honor of his patron saint. This was on 30 April. Arriving at the mouth of the St. Francis River, in what is now the State of Minnesota, he traveled by land about 180 miles along its banks, naming it in honor of the founder of his order, and visited the Sioux Indians, whom he mentions by the names Issati and Nadouessioux. He stayed with them three months, being, according to his own account, held in captivity, and then, meeting a party of Frenchmen who had come into the country by way of Lake Superior, returned with them to Canada, descending the Mississippi to the Wisconsin, and passing up that river and down the Fox, and so through Green Bay to Lake Michigan. From Quebec he sailed for France, where he published in 1683 his 'Description de la Louisiane Nouvellement Découverte au Sud-Ouest de la Nouvelle-France, etc.,' containing the fullest published account of La Salle's first expedition, a history of his second voyage, and of Hennepin's own explorations, with a description of the upper Mississippi. Notwithstanding the writer's vanity and fondness for exaggeration, the work is valuable. He put off his clerical dress in Holland about 1697, but to the end of his life seems to have written himself: "Recollect missionary and apostolic notary." In 1697, 10 years after La Salle's death, Hennepin published his extraordinary 'Nouvelle Découverte d'un Très-Grand Pays Situé dans l'Amérique entre le Nouveau Mexique et la Mer Glaciale, etc.,' reprinted the next year under the title 'Nouveau Voyage dans un Pays Plus Grand que l'Europe, etc.' In this work, which embodies his 'Description de la Louisiane,' written anew and enlarged, he claims to have descended to the mouth of the Mississippi, and to have been the first European who floated on that river. He gives a description of the scenery, Indian tribes, and distances along the route, with a minuteness which easily gained him credit for veracity, and explained his long silence on this important point by saying that he feared the enmity of La Salle, who had ordered him to follow a different course, and who prided himself upon his own claims as the first who descended the Mississippi to the Gulf of Mexico. Notwithstanding the utter impossibility of reconciling the dates given in Hennepin's narrative, the story obtained general credence until its falseness was exposed by Jared Sparks. (See 'Life of La Salle' by Sparks in the 'Library of American Biography.') Consult: Saint-Genois, 'Les Voyageurs Belges du XIII. au XIX. Siècle' (1867); Van Hulet, 'Notice sur le Père Louis Hennepin' (1845); Shea, 'Discovery of the Mississippi' (1852); Parkman, 'La Salle and the Discovery of the Great West'; Winsor, 'Narrative and Critical History of America,' Vol. IV. (1884).

Hen'nessey, William J., Anglo-American artist: b. Thomastown, County Kilkenny, Ireland, 1839. He was brought to New York when 10 years of age, and became a student of the Academy of Design in 1856. He paints in oil and water colors, with a preference for landscape, and draws in black and white as an illustrator. In 1863 he was elected a National Academician, and since 1870 has lived in London, England.

Hennessy, John, American Roman Catholic bishop: b. Ireland 20 Aug. 1825; d. Dubuque, Iowa, 4 March 1900. He came to the United States in 1847, and pursued his theological studies in Carondelet Seminary, near St. Louis. After serving several years as a missionary in Missouri he became professor in Carondelet Seminary in 1854, and its president in 1857. He was afterward pastor in St. Joseph, Mo.; became bishop of Dubuque in 1866, and archbishop in 1893.

Hennessy, John Joseph, American Roman Catholic bishop: b. County Cork, Ireland, 19 July 1847. He came to America in early life and was graduated at the Christian Brothers' College, St. Louis, Mo., in 1862. He was ordained priest in 1869; founded the Railroad Men's Benevolent Union 1871; established the Ursuline convent, Arcadia, Mo., 1877; and edited 'The Youth's Magazine,' St. Louis, 1880–6. He was consecrated bishop of Wichita, Kan., in November 1888.

Hen'niker, Hon. Mrs. **Arthur,** English novelist. She is a daughter of Richard Monckton Milnes (q.v.), 1st Baron Houghton, and was married to Hon. Arthur Henniker in 1882. Her books, which have had an American as well as English circulation, include: 'Sir George' (1891); 'Foiled' (1893); 'Outlines' (1894); 'In Scarlet and Gray' (1896); 'Sowing the Sand' (1898); etc.

Hen'ningsen, Charles Frederick, American military officer: b. in England, of Swedish parents, 1815; d. Washington, D. C., 14 June 1877. He joined the Carlists in Spain in 1834, and later was a follower of Kossuth in the Hungarian Revolution. He went to Nicaragua in 1856, where he distinguished himself in the de-

fense of Granada, and in the victory at Quer-esma. During the Civil War he served in the Confederate army, becoming a brigadier-general. He directed the construction of the first Minie rifles manufactured in the United States. His publications include 'Eastern Europe'; 'Past and Future of Hungary'; 'Sixty Years Hence'; 'Personal Recollections of Nicaragua'; 'The White Slave'; etc.

Henri, Robert, American painter: b. Philadelphia, Pa., 1865. He began his art studies in his native city and became an instructor in the Philadelphia School of Design. He has exhibited in Paris, and his picture 'Snow' was purchased by the French government and hangs in the Luxembourg. While in Paris he gathered round him a group of pupils in his studio, and as a landscape painter did much to impress younger men with his breadth and vigor of style. While he is a landscape painter of notable attainment, his portraits also are admirable for the power of individualization and the directness which characterizes them.

Henriet'ta, Duchess of Orleans: b. Exeter 16 June 1644; d. St. Cloud, France, 30 June 1670. She was the daughter of King Charles I. Her mother fled with her to France where she was educated a Roman Catholic. Her marriage with the brother of Louis XIV., Philip of France, Duke of Orleans, was celebrated in March, 1661. Louis XIV. was desirous of detaching her brother, Charles II., from the triple alliance with Holland and Sweden, in order to accomplish his plan of obtaining possession of a part of Holland. She went, therefore, in 1670, with the court to Flanders, and, under pretense of visiting her brother, passed over to Dover, where Charles was awaiting her arrival, and there succeeded in obtaining his signature to the secret treaty of Dover. Shortly after her return she died so suddenly as to excite the suspicion of her being poisoned. Bossuet pronounced her funeral oration.

Henrietta Maria, queen of Charles I. of England: b. Paris 25 Nov. 1609; d. Colombes, near Paris, 31 Aug. 1669. She was the youngest child of Henry IV. of France. Her marriage ceremony was celebrated by proxy at Paris in 1625. On Henrietta's first arrival in England she enjoyed great popularity with her husband's subjects, but her attachment to the Roman Catholic faith, combined with her hauteur and despotic ideas as to divine right, soon dissipated these favorable prepossessions. Much of Charles' subsequent arbitrary and injudicious procedure, may be traced indirectly to the influence of his queen. On the breaking out of the civil war Henrietta proceeded to Holland, where she procured money and troops for the assistance of her husband, and afterward joined him at Oxford. She again returned to the Continent, and took up her abode in France.

Henriet'ta, Texas, town, county-seat of Clay County; on the Little Wichita River, and on the Missouri, K. & T., and the Fort Worth & D. R.R.'s; about 90 miles northwest of Fort Worth and 128 miles northwest of Dallas. It is situated in an agricultural and stock-raising region, and the building-stone quarries in the vicinity add to the industrial wealth of the town. The chief manufactures are flour and lumber. The town has cotton-gins, grain elevators, lumber-yards, and stock-yards. The trade is chiefly in live stock, grain, flour, lumber, cotton, and building-stone. Pop. (1900) 1,614.

Hen'rotin, Ellen M., American social reformer; b. Portland, Maine, July 1847. She was educated in Europe and in 1869 was married to Charles Henrotin, Belgian consul at Chicago. In 1893 she was vice-president of the Congress Auxiliary of the World's Columbian Exposition; the same year she was decorated by the Sultan of Turkey with the order of Chafkat and made an Officier de l'Academie by the French Republic, 1899. She was president from 1894 to 1898 of the General Federation of Women's Clubs.

Henry I., king of England, surnamed Beauclerc, youngest son of William the Conqueror: b. Selby, Yorkshire, 1068; d. Rouen, France, 1 Dec. 1135. He was hunting with William Rufus in the New Forest when that prince received his mortal wound in 1100, and instantly going to London, caused himself to be proclaimed king, to the prejudice of his elder brother Robert, then absent in the Crusade. To reconcile the people to his usurpation Henry issued a charter containing concessions to public liberty, and also performed another popular act, by recalling Anselm, archbishop of Canterbury. In November 1100 he married Matilda, daughter of Malcolm III., king of Scotland. This union strengthened his party, when his brother landed an army in 1101, with a view of asserting his claim to the crown. Actual hostilities were prevented by Anselm, who induced Robert to accept a pension; and it was agreed that in the event of the death of either of the brothers without issue, the other should succeed to his dominions. He subsequently invaded Normandy, and in 1106 took Robert prisoner, and reduced the whole duchy. His usurpation of Normandy involved him in continual war, but although William, son of Robert, escaped out of custody, and was assisted by the king of France, Henry maintained possession of the duchy. His only son William was drowned in 1120 in returning from Normandy, and Henry was never seen to smile afterward. He married his only daughter, Matilda, to the Emperor Henry V., and when she became a widow married her a second time to Geoffrey Plantagenet, son of the Count of Anjou. Henry was succeeded by Stephen.

Henry II., king of England, the first of the line of the Plantagenets, b. Normandy 1133; d. Castle of Chinon, near Saumur, France, 6 July 1189. He was the son of Geoffrey, count of Anjou, and the empress Matilda, daughter of Henry I. He was invested with the duchy of Normandy, by the consent of his mother, in 1150. The next year he succeeded his father in the possession of Anjou and Maine, and by a marriage with Eleanor of Guienne, just divorced from Louis VII., king of France, annexed that province with Poitou to his other dominions. He succeeded Stephen as king of England in 1154. Although involved with his brother Geoffrey, who attempted to seize Anjou and Maine, and in a temporary dispute with France, he reigned prosperously till the memorable contest with Thomas Becket. Anxious to dominate the clergy, Henry in 1164 summoned a general council of nobility and prelates at Clarendon, which assembly passed the famous

constitutions named from that place, the effect of which was to render the church and ecclesiastical dignitaries subject to the temporal authority. (See CLARENDON, CONSTITUTIONS OF.) After the murder of Becket Henry receded from his position and restored the Church to its rights. Before this matter was terminated, Henry, in 1171, undertook an expedition into Ireland, and having left Earl Richard in the post of seneschal of Ireland he returned to England — proceedings so important to the future destinies of both countries having occupied only a few months. Being an indulgent father Henry had assigned to each of his four sons a provision out of his extensive territories. The eldest son, Henry, was not only declared heir to England, Normandy, Anjou, Maine, and Touraine, but actually crowned in his father's lifetime. On paying a visit to the court of his father-in-law, Louis VII. of France, the prince was induced by the French monarch to demand of his father the immediate resignation either of the kingdom of England or of the dukedom of Normandy. This request being refused he withdrew from his father's court, and was openly supported in his claim by Louis. Henry's various gallantries, exemplified in the popular and not altogether unfounded legend of fair Rosamond, or Rosamond Clifford, also embroiled him with his queen, Eleanor, who incited her other sons, Richard and Geoffrey, to make similar claims. A general invasion of Henry's dominions was in this way concerted, and began in 1173 by an attack on the frontiers of Normandy, but the king presently subdued his opponents and entered into an accommodation with his sons on less favorable terms than they had previously rejected. Henry now employed himself in regulations and improvements which equally manifest his capacity and love of justice. He partitioned England into four judiciary districts, appointed itinerant justices to make regular excursions through them, revived trial by jury, discouraged that by combat, and demolished all the newly erected castles as shelters of violence and anarchy. The turbulence of his sons still disquieted him; but Henry, the eldest, was cut off by fever in 1183, and three years after the death of the equally restless Geoffrey occurred. Philip Augustus, then king of France, however, continued to foment the differences between Henry and his sons, and Richard was again prompted to rebel. A war followed, the event of which was so unfavorable to Henry, that he was at length obliged to agree that Richard should receive an oath of fealty from all his subjects. He also stipulated to pay a sum of money to the French king, and to grant a pardon to all Richard's adherents. The mortification of Henry at these humiliating terms was aggravated to despair when he saw the name of his favorite son John at the head of the list of delinquents whom he was required to pardon. Henry II. ranks among the greatest kings of England. His wisdom and love of justice were acknowledged by foreign potentates, who made him arbiter of their differences, and regarded him as the first prince of the age. Consult: Stubbs, 'The Early Plantagenets' (1876); Mrs. J. R. Green, 'Henry II.' (1888); Norgate, 'England Under the Angevin Kings' (1887).

Henry III., king of England: b. Winchester 1 Oct. 1207; d. Westminster 16 Nov. 1272. He was the son of John, whom he succeeded in 1216. As Henry approached to manhood he displayed a character wholly unfit for his station. One of his first false steps was to discard his most faithful and able minister Hubert de Burgh. In 1236 Henry married Eleanor of Provence, which increased the dislike which his subjects already felt toward him; for she brought a train of foreigners to the court, and encouraged her husband in extravagant courses which forced him to all kinds of oppressive exactions to raise money. He received frequent grants of money from Parliament, but always on condition of confirming the Great Charter, which had been extorted from King John. Henry at length raised the national discontent to such a pitch that the nobles rose in rebellion under Simon de Montfort, the earl of Leicester, the husband of the king's sister; and in 1258, obliged the king to sign a body of resolutions, which threw all the legislative and executive power into the hands of an aristocracy of twenty-four barons, assisted by a lower house, consisting of four knights chosen from each county. By the aid of his son Edward, Henry was gradually restored to authority; on which Leicester, calling in Llewellyn, prince of Wales, involved the kingdom in a civil war. The power of the barons was by this means partially restored; but both parties agreed to abide by the award of Louis IX., king of France. This being favorable to the king, Leicester and the barons refused to submit to it, and a battle was fought near Lewes, in which Henry was taken prisoner, and the person of Prince Edward also ultimately secured. A convention provided for the future settlement of the kingdom; but in the meantime Leicester ruled without control. To him, however, was owing the first example of a genuine House of Commons in England; for in a Parliament summoned by him in 1265, deputies from boroughs were sent, as well as knights of shires. Prince Edward at length escaped, and, assembling an army, defeated Leicester's son. The decisive battle of Evesham (1265) quickly followed, in which Leicester himself was slain. Replaced upon the throne Henry remained as insignificant as ever. He died in the 64th year of his age, and the 56th of his reign, the longest in English history, except those of George III. and Victoria. He was succeeded by his son, Edward I.

Henry IV., king of England, first king of the house of Lancaster: b. Bolingbroke 3 April 1367; d. 19 March 1413. He was the eldest son of John of Gaunt, duke of Lancaster; fourth son of Edward III. by the heiress of Edmund, earl of Lancaster, second son of Henry III. In the reign of Richard II. he was made Earl of Derby and Duke of Hereford, and while bearing the latter title appeared in the Parliament of 1398, and preferred an accusation of treason against Mowbray, duke of Norfolk. The latter denied the charge, and offered to prove his innocence by single combat, which challenge being accepted, the king appointed the lists at Coventry; but on the appearance of the two champions at the appointed time and place, Richard would not suffer them to proceed. Both were banished the kingdom, Norfolk for life, and Hereford for 10 years, shortened by favor to four, with the further privilege of immediately entering upon any inheritance which might accrue to

him. On the death of John of Gaunt in 1399 he succeeded to the dukedom of Lancaster, and laid claim, according to agreement, to the great estates attached to it; but Richard retained possession of the estates. The duke, therefore disregarding the unfinished term of his exile, landed with a small retinue at Ravenspur in Yorkshire, where he was quickly joined by the Earls of Northumberland and Westmoreland, and soon found himself at the head of 60,000 men. Richard falling into the hands of his enemies, was brought to London by the duke, who now began openly to aim at the crown. A resignation was first obtained from Richard, who was then solemnly deposed in Parliament; and Henry unanimously declared lawful king under the title of Henry IV. The death of Richard soon removed a dangerous rival; yet a short time only elapsed before the nobles rebelled against the king of their own creation. The first plot, in 1400, was discovered in time to prevent its success, but an insurrection in Wales, under Owen Glendower, proved more formidable. That chieftain having captured Mortimer, earl of March, who was descended from Lionel, duke of Clarence, the second son of Edward III., and therefore the lineal heir to the crown, Henry would not suffer his relation, the Earl of Northumberland, to treat for his ransom. He thus offended that powerful nobleman, who, with his son, the famous Hotspur, soon after joined Glendower. The king met the insurgents at Shrewsbury, and a furious battle ensued, 21 July 1403, which ended in the death of Percy, and the defeat of his party. A new insurrection, headed by the Earl of Nottingham and Scrope or Scroop, the archbishop of York, broke out in 1405, which was suppressed by the king's third son, Prince John. The archbishop afforded the first example in this kingdom of a capital punishment inflicted upon a prelate. The rest of this king's reign was comparatively untroubled. Henry was succeeded by his son of the same name.

Henry V., king of England: b. Monmouth 19 Aug. 1387; d. Vincennes, France, 31 Aug. 1422. He succeeded his father, Henry IV., in 1413. His dissipated youth, and fondness for joviality and low company, gave his father much uneasiness; but circumstances occurred, even in the midst of his wildness, which showed that better principles were latent in his mind. His conduct when he ascended the throne justified the best expectations. The circumstances of France, torn asunder by the opposing factions of the dukes of Orleans and Burgundy, afforded a tempting opportunity to an ambitious neighbor, and Henry was easily induced to revive the claims of his predecessors upon that country. He accordingly assembled a great fleet and army and landed near Harfleur, 14 Aug. 1415. He took that town after a siege which so much reduced his army that he was advised to return to England by sea. But Henry determined to march on Calais, and on his way was met on the plain of Agincourt by a French army ten times as numerous as his own. A battle took place there on 25 October, in which the French host was totally defeated, with a comparatively trifling loss on the side of the English. In 1417, the liberal grants of the Commons enabled Henry once more to invade France with 25,000 men. By the famous Treaty of Troyes (21 May 1420), Henry engaged to marry the Princess Catharine, and to leave Charles in possession of the crown, on condition that it should go to Henry and his heirs at his decease, and be inseparably united to the crown of England. Henry, after espousing Catharine, took possession of Paris, and then went over to England to raise recruits for his army. All his great projects seemed about to be realized, when he was attacked by a disease which carried him off at the age of 34, and in the 10th year of his reign. He was succeeded by his son Henry VI. Henry V., as the gallant, youthful, and successful conqueror of France, is a favorite name in English history; but he was inferior in wisdom and solid policy to many of his ancestors.

Henry VI., king of England: b. Windsor 6 Dec. 1421; d. London 21 May 1471. He was crowned at Westminster in November 1429, and at Paris in December 1430. As he was not nine months old at the death of his father Henry V., John, duke of Bedford, a brother of the late king, was appointed Regent of France; and Humphrey, duke of Gloucester, another brother of the same, Protector of the realm of England, with a council at his side appointed by Parliament. A few weeks after Henry's succession, Charles VI. of France died, when, according to the provisions of the Treaty of Troyes, Henry was proclaimed King of France. But the French did not quietly submit, and a war began at first favorable to the English, but in the end, after they had been roused to more effectual efforts by the heroism of Joan of Arc (q.v.) (1428–30), resulted in the almost total loss to the English of their possessions in France. In 1453 nothing remained to them in that country but Calais. In April 1445, Henry married Margaret of Anjou, daughter of René of Provence. Two years later the Earl of Suffolk acquired the chief power in the kingdom, and was created first marquis and then duke. His government was very unpopular, which caused the people to look to the claim of Richard, duke of York. The insurrection of Cade followed, and the Duke of York was by Parliament declared Protector of the kingdom. The York and Lancaster parties were now in such a state that the sword only could decide between them; and that course of civil contention commenced, the first bloodshed in which occurred at St. Albans in May 1455, and as far as the reign of Henry was concerned, the last in the battle of Tewkesbury in 1471. When the latter took place the king was a prisoner in the Tower, where he soon after died, but whether by a natural or violent death is uncertain. Henry was gentle, pious, and well-intentioned, but weak. Eton College reveres Henry as its founder, as does likewise King's College, Cambridge.

Henry VII., king of England, first sovereign of the house of Tudor: b. Wales 28 Jan. 1457; d. Richmond, Surrey, 22 April 1509. He was the son of Edmund, earl of Richmond, son of Owen Tudor and Catharine of France, widow of Henry V. His mother, Margaret, was the only child of John, duke of Somerset, grandson of John of Gaunt. After the battle of Tewkesbury he was carried by his uncle, the Earl of Pembroke, to Brittany, to seek refuge in that court from the jealousy of the victorious house of York. On the usurpation of Richard the young Earl of Richmond was naturally turned to as the representative of the house of Lan-

caster. In 1485 Richmond landed at Milford Haven, where he was immediately joined by some leaders of rank, but had only 6,000 men when Richard met him at Bosworth, with an army twice as numerous in appearance; but the defection of Lord Stanley with his forces, who joined Richmond during the battle, obtained for the latter a complete victory. Henry was proclaimed king on the field of battle, and his right was subsequently recognized by Parliament. In 1486 he married Elizabeth, daughter of Edward IV., and heiress of the house of York, and thus united the claims of the rival houses of York and Lancaster. The reign of Henry VII. was troubled by repeated insurrections. The project of France for annexing the province of Brittany, by marriage with the heiress, induced Henry to declare war, but his measures were so tardy and parsimonious that the annexation was effected. He then raised large sums on the plea of the necessity for hostilities; and landing a numerous army at Calais in 1492, almost immediately accepted a large compensation for peace. The Duchess-dowager of Burgundy, governess of the Low Countries, now advocated the cause of Perkin Warbeck, a youth who gave himself out to be Richard Plantagenet, the younger of the two sons of Edward IV., supposed to have been murdered in the Tower of London, and the justice of his claim has been maintained even by some historians of a recent date. The duchess professed to be satisfied with the proofs of his identity, and acknowledged him as her nephew. He was so far successful as to secure a large following, with which he marched to Taunton; but there his heart failed him, and he fled. Captured by Henry he confessed himself an impostor, and was sent to the Tower, where he became acquainted with the Earl of Warwick, and persuaded him to accompany him in an attempt to escape. They were both retaken, and Warwick was recommitted to the Tower and Perkin Warbeck hanged at Tyburn (1499). Soon after, the king ordered the Earl of Warwick also to be executed. After a long negotiation he brought about a match between the Infanta Catharine, daughter of Ferdinand of Aragon and of Isabella of Castile, and his eldest son Arthur; and on the death of the latter, in order to retain the dowry of this princess, caused his remaining son Henry to marry the widow by Papal dispensation, an event which, in the sequel, led to a separation from the See of Rome. He married his eldest daughter to James IV., king of Scotland, from which union there ultimately resulted the union of the two crowns. His reign was, upon the whole, beneficial to his country. Being conducted upon pacific principles it put a period to many disorders, and gave an opportunity to the nation to flourish by its internal resources. His policy of depressing the feudal nobility, which proportionably exalted the middle ranks, was highly salutary; and it was especially advanced by the statute which allowed the breaking of entails and the alienation of landed estates.

Henry VIII., king of England: b. Greenwich 28 June 1491; d. Westminster 28 Jan. 1547. He succeeded his father, Henry VII., in 1509. His disposition for show and magnificence soon squandered the hoards of his predecessor. James IV., king of Scotland, having made an incursion with a numerous body of troops into England, was completely defeated and slain at the battle of Flodden Field. Henry, however, granted peace to the Queen of Scotland, his sister, and established an influence which rendered his kingdom long secure on that side. The aggrandizement of Cardinal Wolsey now began to give a leading feature to the conduct of Henry, that prelate being appointed chancellor in 1515. His favor was now sought by Maximilian I., emperor of Germany, who hoped to secure the support of England against France, and as Wolsey was at first neglected by the French king the German emperor gained his point; but when Maximilian was succeeded by Charles V., hereditary king of Spain as well as emperor of Germany, Francis found it expedient to gain Wolsey, and for that purpose entered into an amicable correspondence with them. In order to cement this new friendship the two monarchs had an interview near Calais, the magnificence of which gave the place of meeting the denomination of the Field of the Cloth of Gold (1520). Notwithstanding these indications, a prospect of the papacy being artfully held out to the cardinal by the young emperor Charles, his interest at length gained a preponderance in the English councils. The principles of the Reformation were now making rapid strides, and Henry himself wrote a Latin book against the tenets of Luther, which he presented to Pope Leo X., who favored him in return with the title of defender of the faith. After being married to Catharine for about 18 years, Henry began to feel some scruples as to the validity of the marriage, on the ground that she had previously been his brother's wife, and his scruples were no doubt increased by the fact of his having conceived a passion for Anne Boleyn, one of the queen's maids of honor. He accordingly applied in 1527 to Pope Clement VII. for a divorce, and the Pope appointed cardinals Wolsey and Campeggio to try the case. Wolsey had at first been favorable to the project of a divorce, but when he perceived the desire of Henry to marry Anne Boleyn, fearing that this marriage would result in winning over Henry to the side of the reformers, since Anne Boleyn's friends belonged to that party, he did all in his power to prolong the inquiry, until the commission was at last withdrawn, and it was decided by the Pope that the case should be tried at Rome. This procrastination on Wolsey's part led to his own ruin. Henry, disgusted at these delays, eagerly caught at the advice of Thomas Cranmer (q.v.), afterwards archbishop of Canterbury, to refer the case to the universities, from whom he got the decision desired. In May 1533 his marriage with Catharine was declared null, and as he had by that time privately married Anne Boleyn, this second marriage was a few days later declared lawful. As these decisions were not recognized by the Pope, an act of Parliament was obtained in the following year (1534), setting aside the authority of the chief pontiff in England, which was followed by another in 1535 declaring Henry the supreme head of the church. Thus was effected the great revolution by which, in ecclesiastical annals, this reign is so much distinguished. The birth of a daughter by the new queen produced a bill for regulating the succession, which settled it on the issue of this marriage, and declared

the king's daughter by Catharine illegitimate. But although Henry discarded the authority of the Roman Catholic Church, he adhered to its theological tenets. While he executed Bishop Fisher and Sir Thomas More (who had been appointed chancellor after the fall of Wolsey) for refusing the oath of supremacy, he displayed an aversion to the principles of the reformers, and brought many of them to the stake. Finding that the monks and friars in England were the most direct advocates of the papal authority, he suppressed the monasteries by act of Parliament. The fall of Anne Boleyn was, however, unfavorable for a time to the reformers. Henry then married Jane Seymour, and the birth of Prince Edward in 1537 fulfilled his wish for a male heir, although his joy was abated by the death of the queen. Henry now resolved to marry again, and Thomas Cromwell, a Protestant, who had succeeded More as first minister, recommended Anne of Cleves. The marriage took place in January 1540, and Henry created Cromwell Earl of Essex; but his dislike to his new wife hastened the fall of that minister, who was condemned and executed upon a charge of treason. At the same time Henry procured from the convocation and Parliament a divorce from Anne of Cleves. He then married Catharine Howard, niece to the Duke of Norfolk, but Henry now found that his new queen, of whom he was very fond, had proved false, and on further inquiry her conduct before marriage was discovered to have been loose and criminal. She was therefore accused and brought to the block in 1542. In 1543 he married his sixth wife, Catharine Parr, widow of Lord Latimer, a lady of merit, secretly inclined to the Reformation.

Henry was succeeded by his son, Edward VI. The complete union of Wales with England, and the conversion of Ireland into a kingdom, date from the reign of Henry VIII. Consult: Histories of England by Lingard (1854–5); Froude (1870); and Green (1879 and 1884); also Brewer, 'History of the Reign of Henry VIII. to the Death of Wolsey' (1884); Dixon, 'History of the Church of England from the Abolition of the Roman Jurisdiction' (1884–91); Froude, 'The Divorce of Catharine of Aragon' (1891).

Henry I., king of France: b. 1005; d. Vitri, 4 Aug. 1060. He was the third son of Robert II. He succeeded to power in 1031. His reign was a continuous series of difficulties with the nobility and with the growing power of the clergy. His younger brother, Robert, led a revolt against him, but this he suppressed with the aid of Duke Robert of Normandy.

Henry II., king of France: b. St. Germain-en-Laye 31 March 1519; d. 10 July 1559. He succeeded his father, Francis I., 31 March 1547. He severely persecuted the Huguenots, and was involved in wars with the Emperor Charles V. and Philip II. of Spain. The Constable de Montmorency was defeated at St. Quentin (10 Aug. 1557); the Marshal de Thermes at Gravelines (13 June 1558), and the peace of Cateau-Cambrésis (3 April 1559) lost to France most of the advantages previously gained. Henry was a monarch of slight capability, despite his regal bearing.

Henry III., king of France: b. Fontainebleau 19 Sept. 1551; d. by assassination St. Cloud 2 Aug. 1589. He was the third son of Henry II. He fought, as Duke of Anjou, against the Huguenots, was elected king of Poland in 1573 and crowned 15 Feb. 1574, but in June 1574 left Poland and succeeded his brother, Charles IX., as king of France. The Peace of Beaulieu (1576), confirmed by the Edict of Poitiers (1577), granted to the Huguenots so many privileges that the Holy League was formed, seeking openly Catholic supremacy and secretly the elevation of Henry of Guise to the French throne. When all privileges granted to Huguenots were repealed by the Edict of Nemours (1585) war broke out. Henry of Navarre was victor at Coutras, while Henry of Guise drove the king from Paris. The king then caused the murder of Guise and Guise's brother, the Cardinal of Lorraine, in consequence of which the doctors of the Sorbonne absolved the people from obedience to him. He then joined cause with Henry of Navarre, with whom he marched against Paris; but in camp at St. Cloud was stabbed by Jacques Clément, a fanatical Dominican, 1 Aug. 1589. Henry III. was the last of the branch of Orléans-Angoulême of the stock of the Valois.

Henry IV., known as Henry of Navarre, king of France: b. Pau 13 Dec. 1553; d. 14 May 1610. He was a son of Anthony of Bourbon, Duke of Vendôme, and of Jeanne d'Albret, daughter of Henry, king of Navarre, and herself afterward queen of Navarre. Educated by his mother in the Calvinistic faith, he early joined, at her wish, the Protestant army of France, and served under Admiral Coligny. In 1572 he married Margaret of Valois, sister of Charles IX., and after the massacre of St. Bartholomew, which took place during the festivities in connection with this marriage, adopted the Roman Catholic creed. For the next four years he was compelled to reside in Paris, but 3 Feb. 1576 succeeded in making his escape, and after retracting, at Tours, the abjuration of Calvinism which he had made at Paris, put himself at the head of the Huguenots, and took a leading part in all the subsequent religious wars. He occupied a still more important position, when, in 1584, the death of the Duc d'Anjou, brother of the king (Henry III.), made him presumptive heir to the crown, as descended from Robert, Count of Clermont, the sixth son of Louis IX. Rejected by the Roman Catholic party and the League as a heretic, Henry found himself obliged to resort to arms to assert his claims. On 20 Oct. 1587 with an inferior force, he defeated the army of the League at Coutras. In 1589 he became king through the assassination of Henry III. (q.v.)., but found innumerable difficulties in establishing his claims. His Protestant religion was brought forward by all the competitors to prejudice the Catholics against him. At the head of the opposite party stood the Duke de Mayenne. Philip II. of Spain also claimed the French throne, and sent aid to the League. Henry IV. defeated his enemies in the celebrated engagement of Ivry (14 March 1590). In consequence of this victory Paris was besieged, and Henry IV. was upon the point of compelling the citizens to surrender by famine, when the Spanish general, Alexander, Duke of Parma, by

a skilful maneuver, obliged him to raise the siege. Convinced that he should never enjoy quiet possession of the French throne without professing the Catholic faith, Henry at length yielded to the wishes of his friends, was instructed in the doctrines of the Roman Church, and professed the Catholic faith, 23 July 1593, in the church of St. Denys. He was anointed king at Chartres in 1594; and entered the capital amid the acclamations of the people. He quickly brought France entirely into subjection, and concluded the war against Spain in 1598, by the Peace of Vervins, to the advantage of France. The same year was signalized by the granting of the Edict of Nantes, which secured to the Protestants entire religious liberty, and freed them from all political disabilities. Henry made use of the tranquillity which followed to restore the internal prosperity of his kingdom, and particularly the wasted finances. In this design he was so successful, with the aid of his prime minister Sully, that the national debt of 350,000,000 livres was diminished by 125,000,000, and 41,000,000 livres were laid up in the treasury. As Henry was riding through the streets of Paris he was stabbed by the fanatic Ravaillac. The great benefits which Henry IV. bestowed upon France entitle him to the designation which he himself assumed at an assembly of the Notables at Rouen in 1596, the Regenerator of France. His benevolent mind, his paternal love to his subjects, his great achievements, his heart, always open to truth, though it exposed his own faults, have preserved his memory in the hearts of the nation. To the end of his life he had to contend against the governors of provinces, Protestant as well as Catholic, who had rendered themselves almost independent under the last kings of the house of Valois. Many of the acts of his internal government show that, while he aimed at restoring the prosperity of the nation by encouraging agriculture, commerce, and manufacturing industries, he was determined by all means in his power to strengthen the authority of the crown. In his foreign policy Henry IV. revived the projects of Francis I. and Henry II. against the house of Austria, and re-established the influence of France in the Catholic states of Italy. He supported Holland in its revolt against Spain; allayed the bitterness of feeling between the Lutherans and the Calvinists, and induced them to form the Evangelical Union. Consult: Lacombe, 'Henri IV. et sa Politique' (1878); and Willert, 'Henry of Navarre and the Huguenots in France' (1893).

Henry V. (of France). See CHAMBORD, COMPTE DE.

Henry I., emperor of Germany: b. about 876; d. Memleben 2 July 936. He was the son of Otho I., the Illustrious, duke of Saxony, who had refused the regal dignity offered him in 912. Henry, on the death of his father, became duke of Saxony and Thuringia. He was chosen king of the Germans by the Franks and Saxons, April 919, at Fritzlar. The surname DER FINKLER or DER VOGLER (the Fowler), sometimes applied to him, did not arise until the 12th century, and is based upon the unauthentic legend that the princes who notified him of election found him at fowling. He subdued Duke Giselbert of Lorraine, and in 924 concluded with the Hungarians a nine-years' treaty of peace, with the condition that he should pay a yearly tribute. This tribute he finally refused (933), whereupon the Hungarians invaded his realm with two large armies which he defeated, the one near Göttingen, the other at Riade (Riethenburg). In 934 he waged a victorious contest against the Danes. He thoroughly reorganized the German defensive military system, built fortified cities, and fortified others. Though he did not technically possess the title of emperor, he was the real founder of the mediæval German empire, and is recognized as a wise ruler and skilful military leader.

Henry II., THE LAME, emperor of Germany: b. 6 May 973; d. Grona, near Göttingen 13 July 1024. He was the last of the Saxon line, a son of Henry the Quarreler of Bavaria, and great-grandson of the Emperor Henry I. He inherited Bavaria on the death of his father in 995. On the death of Otho III. in the beginning of 1002 he laid claim to the kingdom, and was crowned at Mainz 7 June. He was for a time busily occupied in wars with Duke Boleslav II. of Bohemia, the Margrave Henry of Schweinfurt, and the Margrave Ernest of Austria. In 1004 and 1013 he was obliged to make expeditions to Italy, where Arduin of Ivrea was twice chosen king. Having thoroughly defeated his opponent, he was invested with the imperial insignia at Rome by Pope Benedict VIII. 14 Feb. 1014. His somewhat protracted struggle with Boleslav of Poland ended without any considerable success. At the call of the Pope he fought against the Greeks in lower Italy. For his zeal in the interests of the Church he was canonized by Eugenius III. in 1146.

Henry III., variously surnamed the OLD, the BLACK, and the PIOUS, emperor of Germany: b. Osterbeck, Netherlands, 28 Oct. 1017; d. Botfeld 5 Oct. 1056. He was the second of the house of the Salian Franks, son of the Emperor Conrad II., whom he succeeded in the imperial dignity 1039. He had already been chosen king in 1026. He weakened the power of the nobles by keeping the great fiefs when they became vacant for himself or members of his family, or by bestowing them upon less powerful nobles than had previously possessed them. He also extended the power of the empire by forcing the duke of Bohemia in 1042, and the king of Hungary in 1044, and again in 1047, to accept their dominions as imperial fiefs. His influence was paramount in Italy, especially in the south, where the Normans in Apulia and Calabria paid homage to him as their feudal chief. On the occasion of his first visit to Italy (1046) he put an end to the contention between Benedict IX., Sylvester III., and Gregory VI. for the papacy, causing them all to be deposed, and Suitger, bishop of Bamberg, to be elected in their stead with the title of Clement II. His efforts were now directed toward rooting out the evils which were rife among the clergy, but not less toward securing the permanence of the influence of the empire over the See of Rome. Henry III. was not only a powerful ruler, but also a patron of arts and sciences. He founded numerous schools in connection with the monasteries, and built the cathedrals of Worms, Mainz, and Spires.

Henry IV., emperor of Germany: b. 11 Nov. 1050; d. Liège 7 Aug. 1106. He was the

son of Henry III. He was crowned at Aix-la-Chapelle in 1054. His reign was from the first disturbed by contests with his vassals. The Saxons joined with the inhabitants of Thuringia, drove Henry from Saxony (1073), and destroyed many of the castles which he had built to overawe the inhabitants. But some churches having been destroyed by the populace, Henry accused the Saxons to the pope of sacrilege, and thus gave him an opportunity to interfere as umpire. The Saxons offered to make every satisfaction; but Henry suddenly invaded their territory with a powerful army, and attacked them 9 June 1075, at Hohenburg, on the Unstrut, where they suffered a total defeat. He imprisoned nobles and ecclesiastics, and aroused the attention of the papacy. Gregory VII. (Hildebrand), who had been elevated to the papal chair some years before, without the consent of the imperial court, eagerly seized this opportunity to challenge Henry's usurpation of the power of investing bishops with the spiritual insignia of office, and in December 1075 presented to the king a list of charges, and demanded proofs of obedience to the Church. Henry then instigated the bishops, assembled by his order at Worms, to renounce their obedience to the pope (24 Jan. 1076). Gregory, however, pronounced the sentence of excommunication against him (22 Feb.), and absolved his subjects from their allegiance, and Henry soon found himself deserted. In this state of affairs he was obliged to go to Italy and make his submission to the pope. He found Gregory at Canossa, not far from Reggio, a strong castle belonging to Matilda, countess of Tuscany, whither he had retired for security. Three days successively, in the depth of winter, Henry appeared in a penitential dress, in the court of the castle, before the intercession of Matilda obtained for him an audience of the pope (28 Jan. 1077), when he was, after all, released from the sentence of excommunication only upon submitting to the most humiliating conditions. Some of the Italian princes, who had long been dissatisfied with Gregory, and were desirous of deposing him, gathered round Henry, who was not disposed to fulfil the hard conditions imposed upon him, and offered him their assistance. The German princes, however, at the instigation of the pope, assembled at Forchheim in 1077, and elected Rudolf, Duke of Swabia, king. Henry hastened back to Germany and overcame his rival, who lost his life in battle at Merseburg, in 1080. Gregory again excommunicated Henry; but at the councils of Brixen and Mainz in 1080, he was declared deposed by the German bishops as a heretic and a sorcerer, and Guibert, archbishop of Ravenna, set up in his place, with the title of Clement III. In 1081 Henry marched into Italy to take vengeance on Gregory, and appeared at Easter before Rome. He was not able in that year, however, to pursue the siege of the city, which did not fall into his hands till 1084. He was forced by a conspiracy of the majority of the nobles, led by his son, Henry V., to abdicate at Ingelheim 31 Dec. 1105.

Henry V., emperor of Germany: b. 11 Aug. 1081; d. Utrecht 23 May 1125. He was the son and successor of Henry IV. He was crowned emperor in 1111. His reign was continually disturbed by troubles with the papacy. He was excommunicated no less than four times, and finally in the concordat of Worms (23 Sept. 1122) conceded the advantage to the pope. He also carried on wars with Flanders, Hungary, and Poland, and with various German nobles. He was the last of the Salic or Frankish family of emperors, which was succeeded by the Swabian house.

Henry VI., the CRUEL, emperor of Germany: b. 1165; d. Messina 28 Sept. 1197. He was the son of Frederick I. (Barbarossa), was crowned king in 1169, and succeeded his father as emperor in 1190. He was involved in wars in Italy to assure his possessions there. It was during his reign that Richard Cœur de Lion, returning from Palestine, was imprisoned by Leopold of Austria and surrendered to the emperor, who exacted a heavy ransom.

Henry VII., OF LUXEMBURG, emperor of Germany: b. 1269; d. Buonconvento, Italy, 24 Aug. 1313. He was son of the Count of Luxemburg, and was chosen king of the Romans 27 Nov. 1308, and crowned at Aix-la-Chapelle 6 Jan. 1309. In 1311 he received the iron crown of the Lombards, and 29 June 1312 was crowned emperor at the Lateran. His march into Italy at the head of a Ghibelline army (October 1310) was hailed by Dante, who did homage at some time and place unknown. His sudden death immediately after reception of the Eucharist led to the unfounded rumor that he had been poisoned.

Henry, prince of Portugal, surnamed the NAVIGATOR: b. 4 March 1394; d. 13 Nov. 1460. He was a grandson of old John of Gaunt; nephew of Henry IV. of England; and great-grandson of Edward III. His father, King João or John, who formed a close English connection by marrying Philippa of Lancaster, was the first king of the house of Avitz, under which Portugal, for two hundred years, rose to its highest prosperity and power. The career of Portugal in exploration and discovery, due to the genius and devotion of Prince Henry, his biographer characterizes as "a phenomenon without example in the world's history, resulting from the thought and perseverance of one man." Prince Henry had become one of the first soldiers of his age when, in 1420, he refused offers of military command, and undertook to direct, at Sagres (the extreme point of land of Europe looking southwest into the Atlantic Sea of Darkness), plans of exploration of the unknown seas of the world lying to the west and south. His idea was to overcome the difficulties of the worst part of that immense world of storms, that lying west of Africa, and thereby get round Africa to the south and sail to India, and China, and the isles beyond India. Every year he sent out two or three caravels; but his great thought and indomitable perseverance had yielded only "twelve years of costly failure and disheartening ridicule," when, in 1434, the first great success was achieved by Gil Eannes, that of sailing beyond Cape Bojador. Prince Henry made his seat at Sagres, one of the most desolate spots in the world, a school of navigation, a resort for explorers and navigators. His contemporary Azurara says of him: "Stout of heart and keen of intellect, he was extraordinarily ambitious of achieving great deeds. His self-discipline was unsurpassed; all his days were spent in

hard work, and often he passed the night without sleep; so that by dint of unflagging industry he conquered what seemed to be impossibilities to other men. His household formed a training-school for the young nobility of the country." Consult: Major, 'Life of Prince Henry the Navigator' (1868).

Henry, prince of Prussia, German naval officer: b. Berlin 14 Aug. 1862. He is a brother of Emperor William, and married Princess Irene, daughter of the late Grand Duke Ludwig IV. of Hesse, in 1888. He succeeded Vice-Admiral von Diederichs in command of the German fleet in Chinese waters, in March 1899. In January 1902, Emperor William requested that the president's daughter, Alice, should christen the royal yacht then building in the United States. After receiving the consent of President Roosevelt, the Emperor informed the President that he had ordered his yacht, the "Hohenzollern," to be present at the ceremony, and had appointed his brother, Admiral Prince Henry of Prussia, to represent him on the occasion. The Prince arrived in New York city on 23 February and left on 12 March, after receiving many national, municipal, and social honors.

Henry, surnamed THE LION, duke of Saxony and Bavaria: b. Ravensburg 1129; d. Brunswick 6 Aug. 1195. He was the son of Henry the Proud, and the head of the Guelphs. He greatly enlarged his domains, and so increased in power as finally to become a dangerous rival of the Emperor Frederick I., Barbarossa. His refusal to support Frederick was among the chief causes of the latter's defeat at Legnano (29 May 1176). He was summoned to appear at three diets, and, having failed to attend was placed under the imperial ban (1180). Later he was allowed to retain Lüneburg and Brunswick upon condition of going for three years into exile. He was finally reconciled with Henry VI.

Henry, Alexander, American traveler: b. New Brunswick, N. J., 1739; d. 1824. He joined the Canadian expedition under Amherst against the French (1760) and when peace followed he went to Michilimackinac and engaged in the fur trade. After the massacre of the English by the Indians in that place he being one of the few survivors, remained a captive among the Ojibways at Sault Ste. Marie for 12 months, when he escaped and resumed the fur trade. In the pursuit of this business he traveled between Montreal and the Rocky Mountains. He also interested himself in the copper mines on Lake Superior and for many years made an effort to establish a company for their exploitation.

Henry, Edward Lamson, American painter: b. Charleston, N. C., 12 Jan. 1841. He began his artistic studies at the Philadelphia Academy and in 1860 went to Paris where he studied for three years under Saisse and Courbet. In 1869 he was elected a member of the National Academy. He has frequently revisited Europe for the purpose of sketching the scenery, although his specialty is domestic genre, and history. In the Corcoran Gallery at Washington is one of his most characteristic pictures, which shows his careful grouping of figures, his attention to detail as well as the stiffness of his drawing and his deficiency in the sense of color which recalls Wilkie, whose swing and movement he lacks, though he exhibits some of the humor of the Scottish master. The picture referred to is a crowded canvas of fifty figures with the title 'Initial Excursion of the First Railway Ever Constructed in New York State.' Among his historical pictures the best are 'Battle of Germantown,' owned by William Astor, 'Declaration of Independence,' owned by J. W. Drexel, and 'Reception to Lafayette.'

Henry, Guy Vernon, American soldier: b. Fort Smith, Indian Territory, 1839; d. Ponce, Porto Rico, 1899. He was graduated at West Point 1861, and went to the front in the Civil War, taking part in four years of the hardest fighting, from Bull Run to Cold Harbor. At 23 he was commissioned colonel of the 40th Massachusetts volunteers. After the Civil War he was transferred to the 3d Cavalry, and in 1874 was in Arizona. He continued his Indian campaign, though severely wounded on one occasion, and compelled to be invalided. He served through the outbreak of the Sioux in 1890, and was also on service at Porto Rico during the Spanish-American War, where he died of typhoid fever.

Henry, Joseph, American physicist: b. Albany, N. Y., 17 Dec. 1797; d. Washington, D. C., 13 May 1878. He was educated at the Albany Academy, after graduation undertook the study of chemistry, anatomy and physiology with a view to adopting the medical profession. During the years 1824–5, he contributed occasional scientific papers to the Albany Institute, his especial subjects being chemistry and mechanics, and was appointed assistant engineer on the survey instituted for a road between Lake Erie and the Hudson. In the spring of 1826 he was elected teacher of mathematics and natural philosophy in the Albany Academy and in the latter part of 1827 read a very important paper before the Albany Institute, 'On Some Modifications of the Electro-Magnetic Apparatus.' He made his first public demonstration of his magnetic discoveries in exhibiting before the Institute small electro-magnets wound with silk-covered wire. These magnets had a greatly multiplied lifting power over any that had yet been known. In this lay the essential point of his first discovery, for he was undoubtedly the earliest physicist to adopt insulated or silk-covered wire for the magnetic coil, and to employ spool winding for the limb of the magnet. He demonstrated also for the first time, by a very intelligent experiment, the difference of action in a quantity magnet excited by a quantity battery of a single pair, and an intensity magnet with a long fine wire coil excited by an intensity battery of many elements, having their resistances suitably proportioned. The first of these two forms was not capable of being employed for telegraphic purposes, while the intensity magnets with their attachments could be so applied. The quantity magnets which he exhibited caused a good deal of excitement in the scientific world. Their attractive power was at that time quite unprecedented. One of them had sufficient power to raise as much as 3,500 pounds.

Henry was the first to show that iron could be magnetized at a distance, and to invent a suitable combination of magnet and battery for the production of this result. In 1831 he made this experimental demonstration. He suspended a mile of insulated copper wire round a chamber in the Academy, and so placed a bell at one extremity of it that it was struck by the polarized

armature of an intensity battery connected with the other extremity. This was the earliest example of the magnetic telegraph, for the galvanometer or needle had been the principle on which all preceding experiments had been conducted. It was not long after that he invented a machine, and finally constructed it, which is recognized as the first electro-magnetic engine with automatic pole-changer. In 1832 after repeated experiments he discovered how to give greater intensity to a magnetic discharge by the induction of a current on itself in a long spiral or helical wire. These progressive steps in magnetic science gained for him an extended reputation, and soon after the publication of the last experiment in Silliman's 'American Journal of Science' Henry was elected professor of natural philosophy in Princeton College. The discovery of the spiral or helical conductor suggested to him further experiments, and his extended researches and their results were announced by him in a paper published 1834, under the title 'On the Influence of a Spiral Conductor in Increasing the Intensity of Electricity from a Galvanic Arrangement of a Single Pair.' He supplemented these discoveries by many others, and by his experiments produced electrical combinations which were undoubtedly precursors of later relay and receiving magnets, while his demonstration of the conditions and range of induction from electrical currents, and the successive orders of induction in the passage of frictional electricity, as well as his discovery of the oscillatory nature of electricity, paved the way for that great scientific and practical resolution which was to consummate by the genius of Morse and his confrères.

In 1846 Henry was called to a new sphere of activity, in which he exhibited his usual zeal and enthusiasm. The Smithsonian Institution had just come into existence, and during the formative period of the great museum, he was appointed to be its secretary. The office did not so far engross his attention as to make him neglectful of practical work in science. He found time to investigate the acoustics of public buildings, meteorological changes of the atmosphere and methods for telegraphic transmission of meteorological observation from all points of the continent. From 1868 up to his death he was president of the National Academy of Sciences, and of the Philosophical Society of Washington from 1871, when it was first organized.

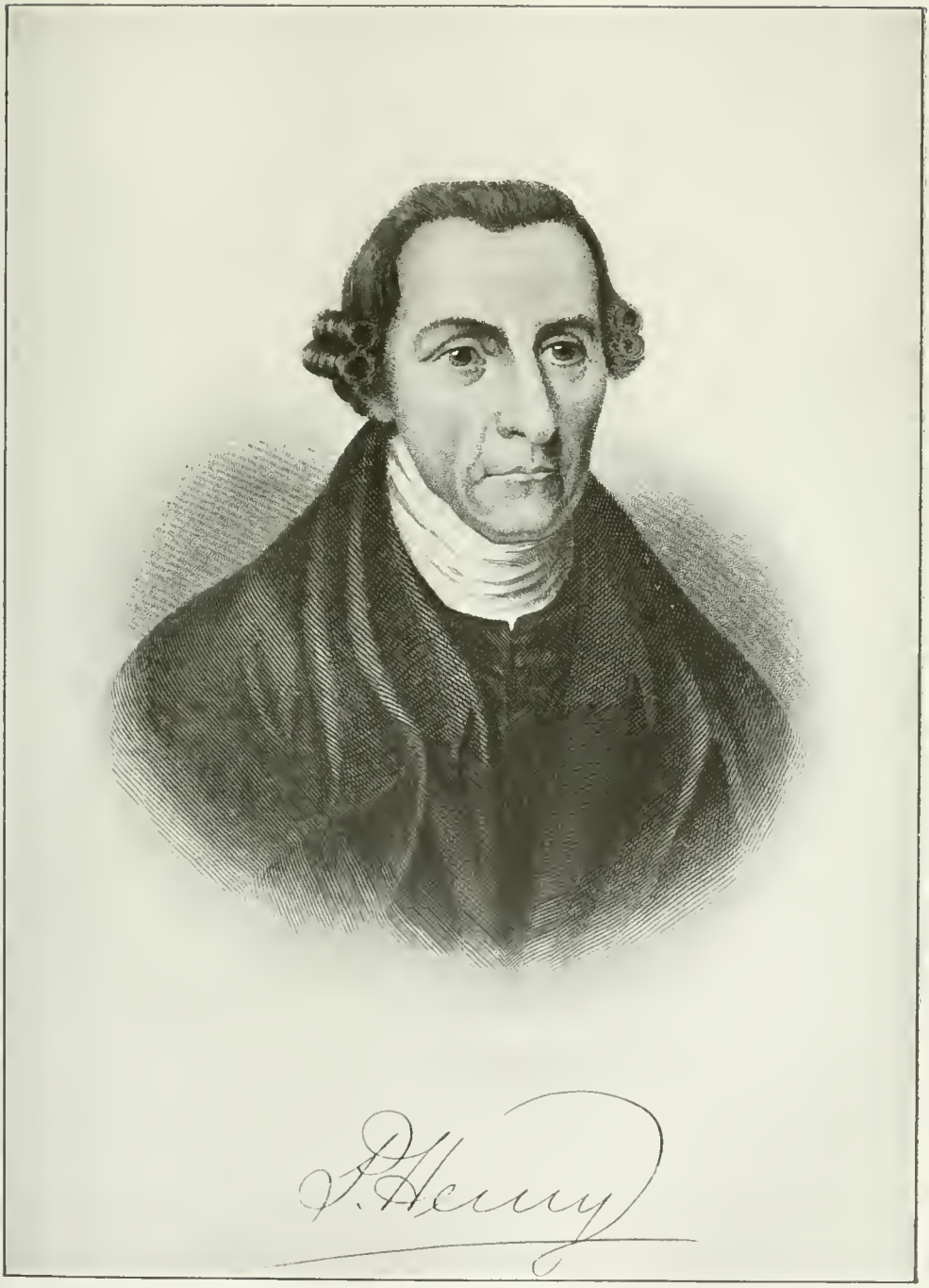
Henry, Matthew, English Nonconformist clergyman: b. Broadoak, Flintshire, Wales, 18 Oct. 1662; d. Nantwich, Cheshire, 22 June 1714. In 1686, having qualified himself for the ministry, he began to preach: and in the succeeding year he was settled as pastor to a congregation at Chester, and continued to discharge the duties of his office for 25 years, when he removed to Hackney, London, where his clerical labors were still more extended. Besides his greatest work, 'Expositions on the Bible' (1710), he was the author of 'A Discourse on Schism'; 'A Scripture Catechism'; 'Family Hymns'; etc.

Henry, Patrick, American orator and statesman: b. 29 May 1736, in Hanover County, Va., within a few miles of the birthplace of Henry Clay; d. 6 June 1799, in Charlotte County, Va. His father, John Henry, was a well-educated Scotchman, presiding judge of the Hanover court. He was a cousin of William Robertson, author of the 'History of the Emperor Charles the Fifth.' Another relative of his was Henry Brougham, the radical Scotch writer, who became lord chancellor of England. Of Patrick Henry's mother, "a portly, handsome dame," a pleasing portrait is left us by William Byrd, of Westover, the genial litterateur of colonial Virginia.

Poor as were the schools in his neighborhood, Patrick seems to have profited little by them. From his uncle, the rector of the parish, he gained a rudimentary knowledge of the classics and mathematics. He was a frolicsome and vagrant youth, fond of hunting and frontier life in general. At 18 years of age, and without money or employment, he married Sarah Shelton, a poor girl of the neighborhood. He kept a store and failed; he tried farming, and failed; then he returned to the store, only to fail again. He now turned to law, and spent a few weeks in reading upon that subject. Having received his license, he began to practise in his native county, while he assisted in the tavern kept by his father-in-law.

In 1763 Henry singled himself out as a born orator by his impassioned plea in "The Parsons' Cause." The king had annulled a statute of the Virginia burgesses, which compelled the clergy to accept the depreciated currency of the colony in payment of their annual salaries, in lieu of 16,000 pounds of tobacco as theretofore, a product which was then selling at a high price. Henry startled the court and the countryside by asserting "that a king, by annuling or disallowing acts of so salutary a nature, from being the father of his people, degenerates into a tyrant, and forfeits all right to his subjects' obedience." Henry's utterance on this occasion was in keeping with the bold address, two years previous, of James Otis, who declared that the tyranny lurking in general search warrants had "cost one king of England his head and another his throne."

Henry became a member of the House of Burgesses in May 1765, just at the time of the arrival of the Stamp Act. Unabashed by his rustic appearance and inexperience in legislative matters, he brought forward a series of resolutions to the effect "that the general assembly of this colony have the only sole and exclusive right and power to lay taxes." In the bloody debate which followed he was "opposed by Randolph, Bland, Pendleton, Nicholas, Wythe, and all the old members, whose influence in the House till then had been unbroken," so we learn from Jefferson, then a college student, who was present at the session of the burgesses. In pleading the injustice of the Stamp Act, Henry used the famous words: "Caesar had his Brutus; Charles the First, his Cromwell; and George the Third ['Treason!' shouted the Speaker. 'Treason,' 'treason,' echoed others. After a moment's pause, the orator completed the interrupted sentence in a manner that showed no less defiance than adroitness] and George the Third may profit by their example. If this be treason, make the most of it." As the royal governor of Massachusetts wrote the ministry: "The Virginia resolves proved an alarm bell to the disaffected." By his intrepidity, his oratory, and his intuition, at once patriotic and prophetic, Patrick Henry became henceforth the protag-


P. Henry

onist of the colonial cause, sharing with Otis, Gadsden, and Samuel Adams the high honor of launching the American Revolution.

Henry represented Virginia in the first colonial congress, which met at Philadelphia 5 Sept. 1774, when he gave final expression to the feeling of nationality: "The distinctions between Virginians, Pennsylvanians, New Yorkers, and New Englanders are no more. I am not a Virginian, but an American." With this speech compare Christopher Gadsden's remark nine years before at the Stamp Act congress in New York: "There ought to be no New England men, no New Yorkers, known on the continent, but all of us Americans."

On 23 March 1775, Henry, as a member of the second Virginia convention, which met in St. John's Church, Richmond, moved that the colony be armed, and again electrified the patriots with his eloquence in support of this radical measure. "Gentlemen," said he, "may cry peace, peace — but there is no peace. The war is actually begun! The next gale that sweeps from the North will bring to our ears the clash of resounding arms! Our brethren are already in the field! . . . Is life so dear, or peace so sweet, as to be purchased at the price of chains and slavery? Forbid it, Almighty God! I know not what course others may take; but as for me, give me liberty, or give me death." Col. Edward Carrington, listening at a window in the east end of the church, was so transported by the eloquence of Henry, that he exclaimed, "Let me be buried at this spot," a wish that was respected at his death in 1810. Such was the universal testimony of those present as to the overmastering effect of Henry's speech at that crisis.

On 5 Aug. 1775, Henry was made commander-in-chief of the Virginia troops. In May of that year he had made a dash against Lord Dunmore, on account of the governor's secret seizure of some powder belonging to the colony. Deeming himself slighted by the Committee of Public Safety, which acted during the interim as the executive of Virginia, Henry, with some heat, threw up his military commission, 28 Feb. 1776.

Fortunate was it for the colonial cause that Henry was again at liberty to exert his forensic powers in the councils of the State. Representing Hanover County in the convention which met at Williamsburg 6 May 1776, he contributed greatly to the constructive work of that celebrated body, notably the motion for a declaration of American independence and the framing of a constitution for Virginia. Among the convention papers in the State Library at Richmond were found three endorsed by the clerk, "Rough Resolutions. Independence." William Wirt Henry, after minute comparison of the handwriting of these, concluded that the first was penned by Patrick Henry; the second by Meriwether Smith; and the third by Edmund Pendleton; and that the resolution actually introduced by Nelson was the one written by Henry. On the other hand, Edmund Randolph, who was a member of the convention, says that the resolution declaring for independence "was drawn by Pendleton, was offered in convention by Nelson, and was advocated on the floor by Henry."

On 29 June 1776, the natal day of the commonwealth of Virginia, Patrick Henry was elected governor, took the oath of office 5 July, and served for three annual terms in succession. As governor he commissioned, on 2 Jan. 1778, Col. George Rogers Clark to enlist seven companies of men for the expedition against the British garrisons in the Northwest Territory. After leaving the executive office, Henry settled in Henry County, on an estate of about 10,000 acres, called Leatherwood, where he lived until he became governor for the fourth time, on 30 Nov. 1784. In the Virginia convention of 1788, which was called to ratify the Constitution of the United States, Henry led the opposition on the ground that such a federal government encroached too far upon the rights of the several States. While the arguments of Madison and the influence of Washington happily prevailed on that critical occasion, Henry was a chief agent in securing the amendments which constitute a bill of rights in the national instrument. His objection to the Constitution was stated concisely in his first speech before the convention: "That this is a consolidated government is demonstrably clear; and the danger of such a government is, to my mind, very striking. . . . Who authorized them (the framers) to speak the language of *we the people*, instead of *we the States?* States are the characteristics and the soul of a confederation. If the States be not the agents of this compact, it must be one great, consolidated, national government of the people of all the States." Such was his clear discernment of the real nature of the government established by the Constitution of the United States.

S. C. Mitchell,
Professor of History, Richmond College, Richmond, Va.

Henry, William Arnon, American educator: b. Norwalk, Ohio, 16 June, 1850. He obtained his early education in the Holbrook Normal School at Lebanon, Ohio; studied at Ohio Wesleyan University from 1867–9, and at Cornell University from 1876–80, receiving the degree of B. S. Agr. He was appointed professor of botany and agriculture in the University of Wisconsin in 1881, professor of agriculture in 1883, director of the agricultural experiment station in 1887, and since 1891 has been dean of College of Agriculture in that university. He has had charge, from the beginning, of the agricultural college and experimental station of the University of Wisconsin, which now has buildings valued at $300,000 and 450 pupils. He has written: 'Rush's Special Report on Diseases of Cattle and Cattle Feeding' (Part II. 1892); 'Handbook on Northern Wisconsin' (1895); 'Feeds and Feeding' (1898), etc.

Henry, William Wirt, American historian and lawyer: b. Red Hill, Va., 14 Feb. 1831; d. 5 Dec. 1900. He was educated at the University of Virginia, and took up the practice of law, later being elected to the legislature for four terms. He preferred, however, historical research to his law practice, and spent much of his time in that pursuit. He was president of the American Historical Association and of the Virginia Historical Society. He is chiefly noted for his 'Life, Correspondence, and Speeches of Patrick Henry' (3 vols. 1890–1).

Henry College, a coeducational institution, founded in 1892, in Campbell, Texas. At the close of 1902 there were connected with the school 10 professors and instructors, with 150

students in attendance. The estimated value of the grounds and buildings is $125,000.

Henry Documents, 26 letters of 1809 between John Henry and several British officials — Sir James H. Craig, governor of British North America, his secretary Ryland, and the English foreign secretary Lord Liverpool, with related papers. Tempted by the hostility of the New England Federalists to the Embargo (q.v.), and the threats of secession by the extremists, Craig sent the adventurer Henry in January 1809 to sound the people as to reunion with Great Britain. Henry remained till June, and sent back the most extravagant reports of the secession feeling, but the British ministry not paying him as he thought fitting, he sold the copies of the letters and other documents to the United States government in February 1812 for $50,000. Madison used them to hurry forward the War of 1812, by sending them to Congress on March 9 with a special message, in which he accused Great Britain of attempting to dismember the Union by intrigue and annex the North to itself. So far as the New Englanders were concerned, however, the papers contained nothing incriminatory of secession movements.

Henry Phipps Institute, The, for the study, treatment, and prevention of tuberculosis, was founded at Philadelphia, 1 Feb. 1903 by Henry Phipps. The incorporators were Henry Phipps, George E. Gordon, Lawrence F. Flick, Miss Amy Phipps, and S. P. Harbison. The scientific work of the Institute is in the hands of a medical staff, consisting of a medical director, an assistant medical director, clinicians, bacteriologists, and pathologists. In the Institute's organization there are a number of paid fellowships open to any member of the staff and a number of honorary fellowships open to any person throughout the world who has done distinguished work in the cause of the study, treatment, or prevention of tuberculosis. The eleemosynary work of the Institute contemplated is the care of the consumptive poor in their homes, the care and treatment of consumptives in hospital beds, and the care and treatment of consumptives in a sanatorium. Consumptives in their homes are to be cared for and treated through a dispensary. The patients come to the dispensary where they are prescribed for and given medicines and supplies for the prevention of tuberculosis. They are instructed in preventive measures, and during the intervals between their visits to the dispensary are supervised in the carrying out of these instructions by a visitor from the dispensary. The consumptive who is entirely destitute and who cannot be cared for in his home even with such assistance as can be given is brought into the hospital and treated as a ward of the Institute. The scientific work of the Institute contemplated is education in preventive measures, study of the disease, dissemination of knowledge about the disease among physicians, stimulation of effort on the part of scientific men throughout the world, and encouragement of workers in the cause. This work is to be pursued through lecture courses, laboratory and clinical experiments, distribution of literature, organization of the workers in the cause of prevention of tuberculosis, and public receptions to persons who have done distinguished work. The Institute will seek to aid all workers in the crusade against tuberculosis. It will act as a bureau of information and with this end in view will index literature on the subject of tuberculosis and collect objects of various kinds which have a bearing upon the prevention or treatment of the disease. The Institute has inaugurated an international course of lectures by the foremost workers in the crusade against tuberculosis. One lecture a month is given during the fall and winter months. The Institute will publish annually a report of its work which will be distributed gratuitously to the libraries of the world.

LAWRENCE F. FLICK,
Of the Henry Phipps Institute.

Henschel, Georg, gā-ōrg' hĕn'shĕl, German composer and concert singer: b. Breslau, 18 Feb. 1850. He began his musical education under the pianist Moscheles, the contrapuntist Richter, and the vocal teacher Gosse in the Conservatory at Leipsic. In 1870 he sang with great success at the Beethoven celebration at Weimar, and toward the end of the same year went to Berlin to complete his studies in musical science and vocalization. He met with a brilliant reception in his professional tour through Cologne, Düsseldorf, and the lower Rhine provinces, and his fame spread over all Germany, Austria, Holland, and Russia (1874–7). He was received with immense applause in London, and crossing the Atlantic was appointed musical director in Boston (1883–5); when he returned to London and became teacher of singing in the Royal College of Music. He wrote among his numerous compositions many songs and duets, such as 'Wanderlieder'; 'Duette in Kanonform,' 'Serbisches Liederspiel'; etc. He married in 1881 Lilian Jane Bailey (d. 1901) a well known American singer.

Hens'ley, Sophia Almon, American lecturer and author: b. Nova Scotia 31 May 1866. She studied in England and Paris, and moved to New York in 1889. She has been interested in the study of social problems and actively identified with the work of the "Mother's Congress." She has served as president of the Society for the Study of Life in New York city and as vice-president of the New York City Mothers' Club, and lectures frequently. She is author of 'Woman's Love-Letters' and 'Souls.'

Hen'son, Herbert Hensley, English Anglican clergyman: b. London 8 Nov. 1863. He was graduated at Oxford and elected fellow of All Souls College in that university 1884. He was head of the Oxford House at Bethnal Green, 1887–8, and since 1900 has been canon of Westminster Abbey and rector of St. Margaret's. He has attracted wide attention as a fresh and powerful preacher by his utterances on national topics of social and political interest, and among his published works may be noted: 'Light and Leaven' (1897); 'Cross Bench Views of Current Church Questions' (1902).

Henson, Josiah, American negro slave and clergyman: b. Port Tobacco, Md., 1787; d. 1883. His early life was one of great hardship, but he finally escaped to Canada (1828), where he became a Methodist clergyman with a charge at Dresden, Bothwell County, Ontario. He also

lectured in the United States. Upon the story of his slave career was based the character of Uncle Tom in Harriet Beecher Stowe's 'Uncle Tom's Cabin' (1852).

Henty, George Alfred, English writer of novels and stories for boys: b. Trumpington, Cambridgeshire, 8 Dec. 1832; d. Weymouth, Dorsetshire, 16 Nov. 1902. He was educated at Westminster and Cambridge; he went to the Crimea during the war with Russia, and served there in the purveyor's department of the army. Soon afterward he went to Italy to organize the hospitals of the Italian legion. As special correspondent of the *Standard* newspaper he went through the Austro-Italian, Franco-German, Turco-Servian, Abyssinian, and Ashanti campaigns, besides accompanying Garibaldi in the Tyrol. He described two of these campaigns in the works 'The March to Magdala' (1868) and 'The March to Coomassie' (1874). He wrote eight novels, among which are: 'A Woman of the Commune' (1895); 'The Queen's Cup' (1897); and 'Colonel Thorndyke's Secret' (1898); but he is much more widely known as the author of a large number of stimulating stories of adventure for boys, many of them based on famous historical events. Among these are: 'The Young Franc-Tireurs' (1871), a story of the Franco-German war; 'The Young Buglers,' a tale of the Peninsular War (1879); 'In Times of Peril,' a tale of India (1881); 'Under Drake's Flag' (1882); 'The Lion of the North' (1885), a story of Gustavus Adolphus; 'With Lee in Virginia' (1889); 'By Pike and Dyke' (1889), a story of the Dutch War of Independence; 'In the Irish Brigade' (1900); and 'Out with Garibaldi' (1900).

Hepat'ica, a genus of plants, the liverworts, of the crowfoot order (*Ranunculaceæ*), closely related to *Anemone.* The best-known species is *H. hepatica,* found wild throughout North America as well as Europe in woods, and widely cultivated for its attractive and fragrant star-like blue, white, or purple-red flowers, which open in early spring. It is, indeed, the earliest of American spring flowers. Sometimes even under the snow its buds, well wrapped up in a warm down, lie upon the broad, furry liver-shaped leaves, awaiting the first warmth to induce them to open. In the southern Alleghanies its leaves are dried and steeped into a medicinal tea. A more southern species is *H. acuta.*

Hepburn vs. Griswold, 1869: the great case in which the Supreme Court of the United States decided that the government had no power to make its own notes legal tender; reversed through a change in the constitution of the court in Knox *v.* Lee and Juilliard *v.* Greenman. Mrs. Hepburn of Kentucky had given Henry Griswold a note for 11,250 "dollars," payable 20 Feb. 1862; it was not paid when due, and five days subsequently the government passed the act authorizing $150,000,000 in notes (see GREENBACKS), receivable for public and private debts. In 1864 Griswold brought suit in the chancery court of Louisville for principal and interest; $12,270 in greenbacks was tendered in settlement, but refused, on the claim that the act did not extend to debts contracted before its passage. The court decided for Mrs. Hepburn; Griswold carried the case to the Kentucky court of appeals, which reversed the decision; Mrs. Hepburn carried it to the Supreme Court, which on account of the far-reaching importance of the case, and at the request of the attorney-general, laid it over till 1868, when it was reargued, and finally decided in the December term 1869. Chief Justice Chase, for five justices against three, decided that the act extended to all debts, contracted as well before as after its passage, and that the question therefore must be whether the government had the power to make anything but coin a legal tender; that it could not do so, under the Constitution, because at the time of its adoption no money but gold and silver was recognized; that as paper money never rose above coin and almost always fell below it, each particle of depreciation was so much abstracted from the value understood by the parties to the contract, and was therefore an unlawful deprivation of private property; that the power of Congress to use "necessary means" to carry out its power of making war did not convey this right, because this was no more a special means of carrying out war powers than any other powers, and would enable it to issue bills of credit and make them legal tender just as much in the post-office business or the patent business as the war. The minority admitted that it was so impairing the obligation of contracts, but asserted that Congress was given the power to do so; and this is now law. See LEGAL-TENDER CASES.

Hephæstus, hĕ-fĕs'tus, a god of the ancient Greeks, identified by the Romans with their Vulcanus. He presided over fire, and was the patron of all artists who worked in iron and metals. He was the son of Zeus (Jupiter) and Hera (Juno). Homer says that his mother was so disgusted with the deformities of her son, that she threw him into the sea as soon as born, where he remained for nine years. He afterward returned, but for taking the part of his mother on one occasion against Zeus was thrown down by the latter a second time. He was a whole day in passing from heaven to earth, and fell in the island of Lemnos. He broke his leg by the fall, and ever after remained lame of one foot. He fixed his residence in Lemnos, where he built himself a palace, and raised forges to work metals. The Cyclopes of Sicily were his ministers and attendants; and with him they fabricated not only the thunderbolts of Zeus, but also arms for the gods and the most celebrated heroes. His forges were supposed to be under Mount Ætna, in the island of Sicily, as well as in every part of the earth where there were volcanoes. Aphrodite (Venus) was the wife of Hephæstus. Her infidelity is well known. Her amours with Ares (Mars) were discovered by Phœbus, and exposed to the gods by her own husband. He appears on some monuments with a long beard, disheveled hair, half naked, and a small round cap on his head, while he holds a hammer and pincers in his hand.

Hep'tarchy, seven Anglo-Saxon kingdoms into which England was at one time or other supposed to be divided, although the kingdoms were founded at different times, and at no one time were they all independent monarchies together. In 827 King Egbert of Wessex united

them into one kingdom, and claimed the title King of England. See ENGLAND.

Hep'tasophs, Improved Order of, a benefit society, organized in 1878 as an independent branch of the Order of Heptasophs (q.v.). At the time of secession the Heptasophs had not adopted the benefit system. The constitution and ceremonies are identical with those of the parent order. At the close of 1902 it had 722 conclaves, a membership of 52,825, and since its organization had disbursed in benefits nearly seven million dollars.

Heptasophs, Order of, a benevolent society in the United States founded in New Orleans 1852 by Alexander Leonard Saunders, and other Freemasons, originally called "The Seven Wise Men." The ritual of its ceremonial is elaborate; the membership of each chapter is seven, or a multiple of that number. In 1872 the adoption of a death benefit system was agitated, and the discussion led to the secession in 1878 of the Zeta Conclave of Baltimore, which organized the Improved Order of Heptasophs (q.v.). In 1880 the Order of Heptasophs adopted the benefit system. Members must be white males and profess a belief in the Supreme Being. Their number in 18 States amounts to about 4,000.

Hep'worth, George Hughes, American clergyman, journalist, and author: b. Boston 4 Feb. 1833; d. 7 June 1902. He was brought up a Unitarian, and after leaving the Harvard Divinity School held Unitarian pastorates at Nantucket, Boston, and New York. He advocated preaching in theatres and conducted theatre meetings in various cities, but being not wholly at ease in the Unitarian denomination, entered the Congregationalist ministry in 1872. He subsequently quitted the ministry and became attached to the editorial staff of the New York *Herald*. He published: 'The Whip, Hoe, and Sword' (1864); 'The Criminal, the Crime, the Penalty' (1865); 'Starboard and Port' (1876), record of a yacht cruise; a book entitled '! ! !'; 'Rocks and Shoals'; 'Brown Studies'; 'Hiram Golf's Religion'; 'They Met in Heaven'; 'Through Armenia on Horseback' (1899). Consult S. H. Ward, 'George H. Hepworth; the Story of his Life' (1903).

Hera, hē'rä or -rē, a mythological goddess of the Greek pantheon, identified by the Romans with their Juno, the sister and wife of Zeus (Jupiter), and daughter of Kronos (Saturn) and Rhea (Cybele). The poets represent Zeus as a faithless husband, and Hera as a violent, jealous and vindictive wife. She was worshipped in all Greece, but her principal seats were at Argos and at Samos. The companions of Hera were the Graces and Hours. Iris, a personification of the rainbow, which seems to stretch from heaven to earth, was her messenger. Her usual attribute is a royal diadem. The temples built in her honor were called Heræa. The principal one was at Argos, which city was considered to be especially under her protection. She is represented by Homer as taking the part of the Greeks in the Trojan war, being actuated by revenge for the slight passed on her by the Trojan Paris, who gave the golden apple inscribed "To the Fairest" not to her, but to Aphrodite.

Her'acles. See HERCULES.

Heracli'tus, Greek philosopher: b. Ephesus, who flourished about 513 B.C. He traveled in different countries, particularly in Africa. On his return to Ephesus he was offered the chief magistracy, but refused it. He left a work on nature, in which he treats also of religion and politics. Some fragments only of this work remain. He is considered as belonging generally to the Ionic school of philosophers, though he differed from it in important particulars. He considered fire as the first principle of all things, describing it as an ethereal substance, "self-kindled and self-extinguished," from which the world is evolved (not made) by a natural operation. It is also a rational principle, and the source of the human soul. Phenomena exist in a constant state of flux, always tending to assume new forms, and finally returning again to their source.

Heraclius, hĕr-ạ-klī'ŭs, Roman emperor of the East, from 610 to 641: b. Cappadocia about 575 A.D. He was the son of Heraclius, exarch of Africa, who had gained great renown by his victories over the Persians, the elder Heraclius of the East was applied to by a powerful body of insurgents to claim the throne for himself. This he declined, but sent his son Heraclius to do so. Heraclius the younger therefore ascended the throne, and though he undoubtedly possessed considerable talents, the Roman Empire in the East was tottering to its fall, and nothing he was able to do could save it. Before his death Mohammed had carried his victorious arms on every side, and Syria, Palestine, Mesopotamia, and Egypt had fallen under the dominion of the caliphs. He was permitted, however, to die in peace, and to transmit the succession to his son, who mounted the throne under the title of Constantine III.

Heraldry is the whole group of ceremonial duties discharged by the heralds of a court, an army, a great noble, or the like, with the assistance of their pursuivants, and under the direction of the Earl Marshal, King-at-Arms, the College of Arms, or other chief of the confraternity. These duties are generally divisible into heraldry proper, or the business of regulating ceremonial occasions such as coronations, marriages among princes, proclamations of important events, and the like; and armory, or the art or quasi-science of armorial bearings. In the first of these divisions but little remains of any interest at the present day, for only in Great Britain is the herald of any consequence. There, however, he still has some direction, as at the eventful proclamation of 1 Jan. 1877, when the Queen of Great Britain assumed the title of Empress of India. In the second branch of the subject, the order and marshaling of arms, the Germans are perhaps at the head of modern writers, though the English and Scottish treatises on the subject are more numerous and more widely used. The Germans' thoroughness of investigation has marked their treatment of this subject, which is eminently a branch of mediæval and subsequent history serving to elucidate genealogical research.

Modern heraldry is no older than the tournaments of the Middle Ages. No linking evidences of the science occur during the Dark Ages, although badges and emblems are found

of shields and helmets discovered in the ruins of antiquity, while in Biblical times the men of Israel were directed to pitch their tents, every man by his own camp and standard with the ensigns of his father's house. Greek and Roman writers describe devices on shields and helmets; the golden eagle on the shields of the kings of Media; the standards and brilliantly colored shields borne by the ancient Germans in battle. The office of herald is as ancient as that of priesthood. Spartans, Greeks, and Romans had heralds, the Roman officers being divided into three classes: *caduceatores*, heralds of peace; *fetiales*, heralds of war and peace; and *præcones*, judicial criers or messengers. The *caduceator* on a mission carried a wand of laurel or olive (*caduceus*, q.v.), as a symbol of his office and for his security. The *fetiales* are thought to have had a college of 20 members founded by Numa, who formulated the procedure and ceremonies connected with the declaration of war and the making of treaties. The *præcones* were employed to proclaim matters of public interest to the people at religious ceremonies, in the *comitia*, at public sales, judicial trials, in the senate, on the publication of laws which they read, at funerals, at games, in the army when a general wished to address his men, at executions, and at all public meetings. The heralds of the Middle Ages had duties which in part resembled those of the heralds of antiquity. Thus, they carried messages of peace and of defiance, and yet even in the earlier years of feudality their office was an inferior one, they being replaced by ambassadors, diplomats almost in the modern sense, statesmen in whose suite the heralds and pursuivants went to the foreign court. So it was that the chief duty of the herald came to be the care of armories.

The first known tomb or monument with escutcheons in the period of modern history is stated to be the eleventh century tomb in the Church of St. Emmeran at Ratisbon, where are the bearings of Varmond, a count of Vasserburg; but this may be a later addition. Another very old specimen and certainly genuine is the shield at Le Mans of Geoffrey Plantagenet, who died in 1150. The use of coats of arms seems to have first become general in the 12th century. Rolls of arms in England are extant in the reigns of Henry III., Edward I., and Edward II. Surcoats displayed armorial bearings in the reign of Henry III. The Roll of Caerlaverock, a poem in Norman-French, contains the names and armorial bearings of the knights and barons who attended Edward I. at the siege of the Castle of Cærlaverock, Dumfriesshire in 1300, and exhibits heraldry already in a developed form. On coins also, no armorial ensigns are found till the 13th century; but then both coins and the seals of nobles and monasteries display them; the use of arms on the Great Seal of England was introduced by Richard I.

The study of armory became essential when at mediæval tournaments aged knights were appointed, whose duties were to act as arbiters, and to pass judgment on coats of arms and the right of knighthood. Whenever a new knight appeared at a tournament, the herald had to *blasen* — that is to blow — the trumpet, and proclaim and explain the bearing of his shield or coat of arms. Hence to blason (*blasen*) came to mean, to describe and explain a display of bearings. The heralds were also the chroniclers of the times and were present on all occasions of public ceremony. In France the first herald — *roi-d'armes* — was crowned and consecrated with religious ceremonies, and was called *Montjoie*, from the war-cry of the French royal armies. The heralds were united in associations, and their duties formed a branch of science which was communicated only to the members. If any person pretended to the character of a herald, who on examination was found not to belong to the corporation, he was driven away with insults and frequently with violence. The heralds in modern courts are masters of ceremonies. In England there are now three kings at arms; the highest is the Garter king at arms; the second, known as *Clarencieux*, is for the southern counties; the third, styled *Norroy*, for the northern provinces. These three kings at arms with six subordinate heralds and four pursuivants form under the presidency of the Earl Marshal, always the Duke of Norfolk, the herald's college or herald's office, established in 1340. The use of arms by private persons in the British Isles was forbidden by proclamation in the reign of Henry V. All persons who had not borne arms at Agincourt were prohibited from assuming them unless by hereditary descent, or with the sanction of the constituted authorities. Periodical circuits called visitations were held afterwards by the provincial heralds to take cognizance of the arms, pedigrees, and marriage of such as were entitled to the use of armorial bearings. These visitations continued till about the end of the 17th century; their records, many of which are preserved in the British Museum and elsewhere, contain much genealogical information and are still consulted for evidence of the hereditary right to bear arms.

The practice of *blazoning the arms* is frequently referred to in the poetry of the Troubadours of the 12th and 13th centuries. Those knights who asserted a right to appear at tournaments did so by the blazoning of their arms, and from the Germans this custom was transmitted to the French, for tournaments were held in Germany before they became general in France. The French, however, carried to far greater perfection the tournament, and the blazon of heraldry connected with it, as they did the whole system of chivalry; the French language prevailing at the court of England after the Norman Conquest, pure French expressions came to be preserved in British heraldry. German heraldry, on the contrary, contains almost pure German expressions.

The whole display of any person's arms is called an achievement, also spelled atchievement. Only the escutcheon, however, is of vital importance. This is the broad surface upon which the bearings are charged. It is always assumed to be a shield in the case of a man not an ecclesiastic; but churchmen's arms are charged upon an oval or other architectural form, a sort of cartouche, and women's bearings are charged upon a lozenge set vertically. The arms of husband and wife, however, may be charged on a shield divided vertically in the middle, and are then said to be dimidiated or impaled; thus we might say that such an escutcheon bears the arms of Smith impaling the arms of Jones — Smith and Jones standing

for the two spouses. It is rare to charge the wife's arms unless she was an heiress, that is to say, the owner of real estate in her own right. These rules, however, are those of Great Britain; they differ widely in other countries.

A single escutcheon may be complete with one simple division. Thus, a horizontal line divides the chief or top of the field at one third of its height from the remainder of the field. If that chief is, say, of gold, while the rest of the field is blue, that by itself makes a very respectable and honorable heraldic statement. The chief is one of the honorable ordinaries, and others are almost as simple. They are the pale, the vertical stripe in the middle of the shield and one third of its width; the fess, a horizontal stripe; the bend, which goes diagonally from the left hand upper corner to the right hand lower part, stopping against the rounded border of the shield; the bend sinister, which is a bend turned the other way (but see below, dexter and sinister); the chevron, which is a pair of stripes meeting in the middle, forming a figure like the letter A without the cross-bar; the cross, the two arms of which are usually of one quarter the width of the escutcheon; and the saltire, which is a diagonal cross. A shield upon which there is any one of these honorable ordinaries and nothing else, is most respectable. In general the simpler shields are the older; thus the old family Erskine, with a black pale on a silver field, or the family of Beauchamp with a gold fess on a red field, occupy the most enviable position in having such a plain escutcheon. There are ordinaries of the second rank, such as the quarter or canton, the orle, and besides these there are very many bearings in common use, especially those which are diminutives of the honorable ordinaries. Thus, the pallett is a smaller pale, and the shield of Aragon has four red palletts side by side on a gold ground. These again may be used to charge upon the greater ordinaries. Thus, the escutcheon of Loreyn bears a blue bend sinister on a gold field and the bend itself is charged with three golden six-pointed stars. That also is a simple and presumably ancient armory.

In describing the escutcheon the side on the left of the spectator is called the dexter and that on his right is called the sinister side; that is because the shield, when carried on the arm with the man-at-arms behind it would be to him so disposed. The escutcheon is supposed to be divided into a certain number of imaginary points or divisions for the fixing and placing of the bearings when they are described in words. When there are nine points, the three at the top following each other from the dexter to the sinister side are dexter chief, middle chief and sinister chief, and a similar nomenclature is used throughout. A modern and fuller arrangement is to give eleven points, the honor point interposed between the top horizontal row and the middle one; and the nombril point spaced between the middle row and the lowermost one. A small bearing as a mullet (a five-pointed star) may be located as being in the dexter chief or the like.

The main business of armory is to present simple patches of bright colors which can be recognized at a great distance. The tinctures used in Great Britain are nine — two metals, *or* and *argent* (gold and silver); five colors, *gules* (red); *azure* (blue), *sable* (black), *vert* (green), *purpure* (purple); though this last is very rare and green is not very common. There are also two furs, which are represented by curious conventional patterns supposed to represent the patchwork of small skins sewed together which make a garment or the lining of a garment. These furs are ermine and vair, but each has many curious variations known by different names. Thus "ermine" shows black tails on a white field, or in modern times a flower-like pattern suggested by the real ermine; but erminois has the same pattern in black on a gold field.

Dimidiation and impaling, mentioned above, are varieties of the great general subject of marshalling. The more elaborate form of marshalling is to divide an escutcheon into quarters. Thus, the son of a married pair who have borne their arms impaled, may divide the escutcheon into four quarters and will put his father's arms on the first and fourth quarters (dexter chief and sinister base) and those of his mother on the second and third quarters. This quartering may be quartered again, and so on indefinitely. Thus, the escutcheon of the Prince of Wales during the reign of Queen Victoria (of him who is now King Edward VII.) is too elaborate to describe fully here. This is because his bearings as Duke of Rothsay, Lord of the Isles, Duke of Cornwall, Baron Renfrew, and the like are all charged together, so that the number of small subdivisions is remarkable. Now, there are different ways of charging these. Those which his escutcheon must bear are the royal arms of England differenced (see differencing above) with the label of the heir apparent, which is a label of three points *argent*, and this escutcheon will bear in the middle a small shield with the arms of Saxony. Even in this the inescutcheon is out of place when we are considering his arms as heir to the crown. It is held by many that the Prince of Wales should display two shields: the first as simple as possible, with only the quarters for England, Scotland, and Ireland; while the second should display all his primary and secondary arms, including those of his wife, who, in the case assumed above, was the Princess Alexandra of Denmark. Again, a system is adopted by which a large shield bears those royal arms upon it, an inescutcheon with the secondary arms of Cornwall, Rothsay, Chester, Dublin, Lordship of the Isles, Carrick, Renfrew, Wales as a principality, and over all a small escutcheon of pretense charged with the arms of Saxony for Saxe-Coburg-Gotha. But even these do not include the arms of the Princess, his wife, which should rightly occupy the sinister side of the shield, while all the achievement described above should be charged upon the dexter side. It is evident, then, that a person whose family has formed many dignified alliances may have an indefinitely great number of quarterings. But let us take the escutcheon of a king of the House of Hanover, as George IV., and we shall find that the four quarters of the shield are filled in this way: the first quarter (dexter chief) in *gules*, bearing three lions *passant gardant*, and the fourth quarter (sinister base) exactly the same. These two quarters are England. The second quarter (sinister chief) is Scotland, a field *or*

with a lion *rampant gules*, framed in a *bordure fleur-de-lisée*, also gules. The third quarter (dexter base) is Ireland, the Irish harp *or* on a ground *azure*. Upon this shield is set an inescutcheon, divided in a curious way into three parts, for Hanover, and having above it a royal crown. Upon this inescutcheon is still a second inescutcheon, very small, simply *gules* with a bearing *or*, which is supposed to stand for the imperial crown of Charlemagne, this in commemoration of the electoral dignity of the sovereign of Hanover, who was called the elector until after the Napoleonic wars. It is a rule never to place metal upon metal or color upon color. Thus, if your shield is argent, any bearing put upon it must be in one of the colors — never in *or*. But there is one curious exception; that of the Latin Kingdom of Jerusalem (which lasted only from 1099 to 1187, but which is perpetuated by the addition of its bearings to many private shields) was *argent*, a cross potent between four crosses *or*. This means a large gold cross, at the end of each arm of which is a cross head like the handle of a crutch; and in the little corners left by the cross, four small Greek crosses; all these in gold on a silver ground.

No two persons should bear the same arms at the same time, therefore a distinction is made between the escutcheons of younger children. Even the heir may distinguish his bearings from his father's by a special mark, apart from the quartering described above. The term marks of cadency is used for these distinctions. Many different plans have been followed, and one which has been much accepted is the label. This is a band with pendant strips hanging from it, usually three; and this is laid right upon the escutcheon near its head, and crosses it, partly concealing all the bearings. This label will be plain for the oldest son, differenced by a bearing like a crescent, *or*, a mullet for the second son, another bearing for the third son, and so on.

The practical functions of the herald developed into blazoning, historifying, passing judgment on, and marshalling coats of arms. Blazoning is the methodical description of a bearing. In the first place the shield is described according to its tinctures, figures and partitions. The inferior parts of an escutcheon are then blazoned — the helm with its insignia which are trumpet, wings and plumes, men and animals, or their members; then the wreath and its tinctures; after which the coronet, cap, etc.; finally the supporters, the mantle, the device and other secondary addenda. To historify in heraldry is to explain the history of a coat of arms, its origin, and the changes it has undergone. If the herald is to explain a bearing historically, he must show that this figure is the proper emblem of the family or country. He derives, for instance, from historical sources the proof that the double-headed eagle of the German king was first introduced in the beginning of the 14th century under Albert I., and that previously from the time of Otho II. the royal eagle had but one head; and he records the privilege given to wear that eagle on a private escutcheon. So he shows that the three leopards (lions passant gardant) in the English arms were first derived in 1127 under Henry I. from the Norman house. The marshalling of arms is especially important in the preparation of new escutcheons. In this matter, the herald either follows the orders of the sovereign, or he invents the idea, and makes the plan of the escutcheon according to his own judgment, or he composes a new escutcheon from several coats of arms.

When color is not used, a system of conventional expression is substituted; thus, *argent* is plain white, *or* is white with black dots, *azure* by horizontal black lines on white, *gules* by vertical black lines, *sable* by crossing black lines horizontal and vertical, *vert* by lines from the dexter chief to the sinister base, *purpure* by lines from the sinister chief to the dexter base. The furs have peculiar patterns and surfaces of their own.

The crest is the highest part of an achievement of arms and is set above the escutcheon. It is called crest from the Latin word *crista*, which signifies a comb or tuft, such as many birds have upon their heads. Crests were anciently marks of honor, because they were worn only by heroes of valor and high rank that they might be the better distinguished in an engagement, and thereby rally their men if dispersed; or else they were of the nature of badges worn by all the followers of a chieftain and serving to identify them. They are at present considered as mere ornaments; and they may be assumed without authority; obviously they should not be used by women. Supporters are figures placed on each side of the shield and perhaps originated from the custom of pages in fantastic dresses guarding the achievements of arms of their masters while the latter were taking part in the exercises of the tournament. The scroll is an ornament usually placed below the shield and supporters, containing a motto or short sentence alluding to the crest, or to the bearing or to the bearer's name. The motto had its origin in the war cries of knights, though in some instances mottoes were borne differing from the war cry of the wearer. The badge is not subject to heraldic rule, though it may be a part of the heraldic achievement, used separately. The porcupine was the badge of Louis XII. of France, and the salamander was chosen by Francis I. when he came to the throne, but neither of these was included in the escutcheon or worn as a crest. The reader may consult Palliser, 'Historical Devices, Badges and War Cries' (London 1870). The most recent large and important book on heraldry in English is 'The Art of Heraldry,' by Arthur Charles Fox-Davies, which is based upon the Heraldischer Atlas of H. G. Ströhl. An excellent book for persons who are making a serious study of the matter is Berry's 'Encyclopædia Heraldica,' in three volumes, n. d. (about 1820). The treatise on Heraldry by Woodward and Burnett, two volumes, 1892, is a very full and up-to-date manual. Smaller books are numerous. To name English ones alone Cussan's 'Handbook of Heraldry,' Planche's 'The Pursuivant at Arms,' Worthy's 'Practical Heraldry,' and especially Charles Boutell's two books, 'English Heraldry,' second edition, 1871, and the very remarkable essay, 'Heraldry, Historical and Popular,' third edition, 1864, now scarce, but nevertheless the most suggestive book that can be found.

Revised by Russell Sturgis.

Herat, hĕr-ät', Afghanistan, a city in the northwest near the Heri-Rud River, about 370 miles west of Cabul. It is enclosed by a broad deep moat and an earthen mound surmounted by a lofty wall of unburned brick, and defended by a strong citadel. The caravansaries, public baths, and mosques are numerous. The trade, almost entirely in the hands of Hindus, is greatly favored by the situation of the town on the great thoroughfare from India westward. Herat was long the capital of the empire founded by Tamerlane, and was once much larger and more splendid than now. Its possession has been repeatedly contested among the peoples of central Asia, and, being regarded as a key to Afghanistan on the side next Persia and Russia it is of great importance politically. Its capture by Persia in 1856 led to a short war between Britain and Persia. Pop. about 45,000.

Hérault de Séchelles, sā'shĕl, **Marie Jean**, French revolutionist: b. Paris 1760; d. there 1794. He became imbued with the teachings of Diderot, but, after his election to the Legislative Assembly in 1791, being rather a philosopher than a revolutionist, he at first paid little attention to the radical element there. He soon, however, joined the extreme left, and later on supported Danton in the revolution of August and September 1792. He was a deputy from the department of Seine-et-Oise to the Convention of 1792 and voted for the king's death. He became a member of the Committee of Public Safety, and as such gained the enmity of Robespierre, who, claiming that he had betrayed certain secrets to the army of the Rhine, caused him to be arrested and executed. His best writings were published under the title 'Voyage à Montbard' (last ed. 1890).

Herb Paris, a poisonous plant of the lily family (*Paris quadrifolia*), resembling and related to white hellebore (q.v.), the toxic principle of which is a specific alkaloid called paradin.

Herbarium, a collection of dried plants, leaves, and fruit or seeds, arranged for preservation between sheets of bibulous paper; it is sometimes called *hortus siccus*, "dry garden," and is an indispensable adjunct to the apparatus of the systematic botanist, and microscopist. The most famous public herbariums are those of Kew, London; those of the British Museum and the London Linnæan Society. Those in Paris, Leyden, Berlin, and Vienna are also very full and complete.

In the United States there are three herbaria both copious and of the first order, namely, the Gray Herbarium of Harvard University, the Herbarium of the New York Botanical Garden, and the United States National Herbarium at Washington.

Herbart, Johann Friedrich, yō'hän frēd'rĭH hĕr'bärt, German philosopher: b. Oldenburg 4 May 1776; d. Göttingen 14 Aug. 1841. At 17 he became the pupil of Fichte at Jena, in 1805 was appointed extraordinary professor of Philosophy at Göttingen, and in 1809 went to Königsberg as Kant's successor; but in 1833 returned to Göttingen, where he remained till his death.

Herbart starts from the Kantian position by analyzing experience: logic, metaphysics, and æsthetics ranking as co-ordinate elements in his system. The first of these deals with the formal elements of thought, metaphysics and æsthetics with its content. Of these latter the former investigates those of our empirical conceptions arising from experience, and which cannot be alienated from our thought, whilst the latter are concerned with those conceptions which involve judgments of approval or disapproval. The most characteristic features of his thinking, however, are these: He posits a multiplicity of "reals," or things which possess in themselves absolute existence apart from apperception by the mind of man. He rejects the notion of separate mental faculties, substituting in their place the conception of primordial presentations or forces, from whose action and interaction all psychical phenomena result. From the conditions determining the equilibrium and movement of these presentations he deduces a statics and a dynamics of mind, both amenable to mathematical manipulation, and thus introduces psychology to a place among the exact sciences. Ethics he ranks as a branch of æsthetics; it investigates the agreement or disagreement between volition and the fundamental moral ideas.

Consult: works on Herbart by Thilo (1875), Zimmermann (1877), and Wagner (17th ed. 1894); De Garmo, 'Herbart and the Herbartians' (1895); Felkin's translation of Herbart's 'Science of Education' (1895); Ufer, 'Pedagogy of Herbart' (trans. 1896).

Herbelot, Barthélemy d', bär-tāl-mē dĕr-blō, French Orientalist: b. Paris 4 Dec. 1625; d. there 8 Dec. 1695. Having gone through a course of study in the university of his native city, he applied himself particularly to the eastern languages, with a view to the elucidation of the Hebrew Scriptures. He visited Italy, and while there commenced his great work, the 'Oriental Library.' Recalled to Paris by Colbert, a pension was given him, that he might be at liberty to proceed with his undertaking. It was his first design to have published his collection in Arabic, and types were cast for the purpose of printing it. But the death of Colbert having interrupted this plan, he recomposed his work in the French language, as likely to prove more generally useful. He was appointed to the royal professorship of Syriac in 1692. His book was published in 1697, under the title of 'La Bibliothèque Orientale.' The best edition of the 'Oriental Library' is that of The Hague (1777), with the supplements of Galland and Visdelou.

Herbert, Edward, Lord Herbert of Cherbury, English philosopher: b. Eyton-on-Severn, near Wroxeter, 1583; d. London 20 Aug. 1648. He was a famous soldier and diplomatist in his day, but at the present is remembered as an author and philosopher. At Paris, in 1624, he printed his famous book, 'De Veritate prout Distinguitur a Revelatione, a Verisimili, a Possibili et a Falso,' the object of which was to assert the sufficiency, universality, and perfection of natural religion, and thereby prove the uselessness of revelation. In 1624 he returned from France, and was created an Irish peer; and in 1629 became an English baron with the title of Lord Herbert of Cherbury. In the civil war he at first tried as far as possible to play a neutral part, but afterward sided with

the Parliamentary party chiefly with a view, it appears, to save his property. The character of Lord Herbert is strongly marked in his memoirs, which show him to be vain, punctilious, and fanciful, but open, generous, brave, and disinterested. The 'De Veritate' was followed by works entitled 'De Causis Errorum' (1645); and 'De Religione Gentilium' (1663; Eng. trans. 1709). In 1649 was published his 'Life and Reign of Henry VIII.' The English style of Lord Herbert is strong, manly, and free from the quaint pedantry of the age. He was one of the first to attempt a systematic proof of the sufficiency of natural religion. "Herbert's religious doctrine," says Sidney Lee, "starts with the assumption that religion, which is common to the human race, consists merely of the five innate ideas or axioms that there is a God, that He ought to be worshipped, that virtue and piety are essential to worship, that man ought to repent of his sins, and that there are rewards and punishments in a future life. He regards Christianity as on the whole the best religion, because its dogmas are least inconsistent with his five primary articles." His autobiography remained in manuscript till 1764, when it was published by Horace Walpole. There is a recent critical edition by Sidney Lee (1886).

Herbert, Lady **Elizabeth,** English writer, mother of Sir Michael Herbert, British ambassador at Washington 1902–3. She is well known as an authoress, and has written books of travel in Spain, Algeria, and many other countries, as well as novels and biographies. Among these may be noted: 'Rambles Round the World'; 'Wayside Tales'; 'Lives of Monsignor Dupanloup, Gascia Moreno, Alexis Clerc,' etc.

Herbert, George, English Anglican clergyman and poet; a brother of Lord Herbert (q.v.): b. Montgomery Castle, Wales, 3 April 1593; d. Bemerton, England, February 1632. He was educated at Westminster and Cambridge. After taking orders he was made prebendary of Leighton Bromswold, or Layton Ecclesia, in 1626. In 1630 Charles I., at the request of the earl of Pembroke, presented him with the living of Bemerton, near Salisbury, and here he remained till his death. As a pastor he was most exemplary and zealous, and he is generally known as "holy George Herbert." His verses are quaint and full of imagery, but with many beautiful thoughts and holy precepts. They are of the same school as those of Quarles and Donne. George Herbert was the intimate friend of Sir Henry Wotton, Dr. Donne, and Lord Bacon. Indeed the latter, whose acquaintance he made at Cambridge, is said to have had so high an opinion of his judgment as to have submitted his works to him before publishing them. Herbert's principal works are: 'The Temple; Sacred Poems and Private Ejaculations' (1631); 'Outlandish Proverbs, Sentences, etc.' (1640); 'Quadripartit Devotions' (1647); 'The Priest to the Temple, or the Character of a Country Parson' (1647); 'Remains,' prose writings (1652). His life was written by Izaak Walton (q.v.).

Herbert, Henry William, "Frank Forester," American author: b. London, England, 7 April 1807; d. New York 17 May 1858. He was graduated from Caius College, Cambridge, in 1828; removed to the United States in 1831; and until 1839 was instructor in the Greek and Latin languages in a private school of New York. In 1833 he established and until 1836 was editor of the 'American Monthly Magazine,' during a portion of that time with Charles Fenno Hoffmann (q.v.) as associate. From 1834 he became largely known as the first important American writer on sports and out-of-door subjects. He wrote also on French and English history, and made excellent translations from Dumas and Sue. His volumes include: 'Cromwell' (1837); 'Marmaduke Wyvil' (1843), 'The Cavaliers of England' (1852); 'The Chevaliers of France' (1853); 'The Puritans of New England' (1853); 'Field-Sports of the United States and the British Provinces' (1848); 'Sporting Scenes and Characters' (1857); 'Horses and Horsemanship of the United States and British Provinces' (1859).

Herbert, Hilary Abner, American lawyer and politician: b. Laurensville, S. C., 12 March 1834. He was educated at the universities of Alabama and Virginia, studied law and was admitted to the bar. He began practice at Greenville, Ala., but served in the Confederate army as captain and colonel of the 8th Alabama regiment; being disabled at the battle of the Wilderness (1864), he retired from the army, and continued the practice of his profession, first at Greenville, then at Montgomery (1872). He was elected to Congress in 1877, and seven times re-elected; in three Congresses he was chairman of the committee on naval affairs. In March 1895, he was appointed secretary of the navy by President Cleveland, an office which he held till 1897, when he began to practise law in Washington.

Herbert, Sir **Michael Henry,** English diplomatist: b. England 25 June 1857; d. Davos-Platz, Switzerland, 30 Sept. 1903. He went to Paris as attaché in 1879; was *chargé d'affaires* at Washington (1888–9); secretary to the British legation at Washington (1892–3); at The Hague (1893–4); and at Constantinople (1894–7). On 4 June 1902 he was appointed British ambassador to the United States at Washington, in succession to the late Lord Pauncefote, and the following year was compelled by ill health to return to Europe.

Herbert, Victor, American musical director and composer: b. Dublin, Ireland, 1 Feb. 1859. After studying music from his childhood in Germany, he was appointed principal 'cello player in the court orchestra, Stuttgart, from which time he appeared in concerts throughout Europe. In 1886 he took the position of solo 'cellist in the Metropolitan orchestra, New York, and has since been connected as soloist and conductor with the principal orchestras of the United States. As a composer he has written: 'The Captive,' an oratorio; and the comic operas, 'Prince Ananias'; 'The Wizard of the Nile'; 'The Serenade'; 'Cyrano de Bergerac.'

Herbiv'ora, a group of mammals characterized by their herbaceous diet; the grazers or ruminants. The term is no longer in scientific use.

Herbs, Culinary, fragrant or aromatic plants used to add flavor to food, especially stews, soups, dressings and salads. They usually owe these qualities to essential oils, which, being readily soluble or easily volatilized by heat,

quickly permeate the mass of food in which they are mixed. The seed of some, as caraway, anise (qq.v.) and dill, is employed; the foliage of others, as parsley, sage, thyme, is more frequently used. The former plants are cut and placed loosely upon sheets as soon as the seed reaches maturity; allowed to dry a few days; lightly thrashed and the seed cleaned; still further dried and stored in air-tight packages. The latter are gathered just before the first blossoms would open, because they are then richest in flavor. With parsley the leaves are gathered as soon as mature, several cuttings being made in a season. They are then dried upon trays at a temperature below 120 degrees and in freely circulating air until crisp, when they are rubbed to powder and stored as above. Paper or pasteboard packages are bad, because they allow the flavors to escape. Both seeds and leaves may be used in decoction, being covered with vinegar or alcohol in stoppered bottles. Fresh herbs, which are always preferable to dried or decocted, are especially useful in salads; dried and decocted in dressings, stews, etc., and at seasons when fresh ones cannot be obtained. In the United States the species most in demand are parsley, sage, thyme, savory, marjoram, spearmint, dill, fennel, tarragon, balm and basil (qq.v.) in nearly the order named. Parsley is beyond question the most popular because of its double use as a garnish and flavoring plant but sage is perhaps more frequently used in the latter capacity. It is most esteemed with pork, goose, duck, and similar rich meats. Spearmint is used mainly with roast lamb; tarragon with boiled fish; dill with pickles; and the other kinds mentioned with mild meats, such as turkey, chicken, veal, venison, etc. The kind, quantity and mixture used with each sort of food depends upon personal preference.

In general, herbs are of simplest cultivation. They usually prefer rather light, moderately rich, well drained soil, and sunny exposures. Since the seeds of many are small or slow to germinate they are frequently started in a greenhouse, hotbed or window, and transplanted to the garden when they are large enough and when conditions are favorable. Clean cultivation and the removal of weeds is essential. The perennial kinds, such as sage, are often propagated by stem cuttings, divisions or layers; tarragon always thus because it does not produce seed; spearmint usually by cuttings of the rootstock. The great majority are grown as annuals, being replaced each spring with fresh plants. Commercially they follow such crops as early cabbage, peas, etc., thus permitting a double use of the same soil annually. They are easily grown for winter use in the borders of benches in the greenhouse or in boxes placed in sunny windows.

Consult articles such as *Sweet Herbs* by Kains in Bailey's 'Cyclopedia of American Horticulture' (New York 1900–2).

Herculaneum, hĕr-kū-lā'nē-ŭm, or **Herculanum,** Italy, an ancient buried city, about five miles southeast of Naples. Strabo says it was first occupied by Oscans, afterward by Tyrrhenians and Pelasgians, and then by the Samnites. It took part in the social war against the Romans. In the time of Sulla it was a *municipium* and a fortified town. It was situated between Neapolis and Pompeii, on elevated ground between two rivers, and its port was one of the best on the coast. It suffered in 63 A.D. in the same earthquake that nearly destroyed Pompeii. In the greater irruption of 79 A.D. it was buried under a volcanic tuff formed of sand and ashes, partly consolidated by the agency of water. The site of Herculaneum, though well described, had been long sought in vain, when in 1713 three female statues (now in the Dresden Museum) were found in digging a well at Portici, a village situated on the ancient site. After this discovery further excavation was prohibited by the government, until in 1738 the well was dug deeper, and the theatre of Herculaneum was discovered. In 1750 a long, narrow passage, sloping down into the theatre, was opened, and is still the only way by which travelers descend to examine this structure. The excavations were continued more or less industriously for 50 years; but comparatively little progress was made, as the work was difficult and also dangerous to the houses in the populous villages of Resina and Portici, situated above. As soon as one part was excavated and explored it was filled up with the rubbish from a new digging. The theatre is the only building to be seen underground, and it is encumbered with the supports built to sustain the rock above it. It is a noble edifice, massively built of solid stone, and seated 8,000 persons. Bronze statues of Drusus and Antonia and of the Muses were found in various parts of the building. In a square on the south of the theatre a temple was found which was connected with another temple, to the east of it, by a wide street lined with porticoes. One of these temples, dedicated to the mother of the gods, had been restored by Vespasian after the earthquake of 63 A.D. On the north of the theatre was a basilica 228 feet long and 132 broad, surrounded by a portico of 42 columns, and adorned with paintings. Many beautiful paintings and works of art were removed from these buildings to the museum at Naples. A sumptuous private villa was disinterred, containing a number of statues, and in one of the rooms a quantity of papyrus manuscripts. Some of the statues are excellent as works of art, such as those of Agrippina, Aristides, the Sleeping Faun, and the Mercury. Other precious relics discovered here, and now in the museum, are busts of Plato, Demosthenes, Scipio Africanus, Augustus, Seneca, etc., beautiful mosaics, and articles of furniture. New excavations were carried out in 1828–37, and since 1868. The chief discoveries made were those of the forum, a small and elegant temple, a basilica, a dilapidated building supposed to have been an inn, dwelling-houses, tombs, etc. One of the houses discovered at Herculaneum contained a quantity of provisions, dates, chestnuts, large walnuts, dried figs, almonds, prunes, corn, oil, pease, lentils, pies, and hams, none of which had been disturbed for 18 centuries, for the doors remained fastened, in the same state as they were at the period of the catastrophe which buried the town. The internal arrangement of the house, and the manner in which it was ornamented, proved that it had belonged to a rich family, admirers of the arts; for it contained many pictures, vases, articles in glass, bronze, and terra-cotta. Few skeletons comparatively have been found either in Pompeii or Herculaneum, so that it is probable most of the

inhabitants saved themselves by flight. At the door of a villa in Herculaneum were found two, one of which held a key in one hand, and in the other a bag with coins and cameos. Near them were silver and bronze vessels.

Among the most interesting objects discovered here are the papyri above mentioned, over 1,750 of which are now in the Naples Museum. The rolls are of cylindrical form, and much charred. Hardly a third of them have been unrolled. The process presents great difficulties, from the tendency of the MSS. to crumble. One of the works is a treatise by Epicurus on Nature; there are some writings of Philodemus, a Syrian philosopher; but on the whole they are of little value. There have been published 11 volumes of the 'Volumina Herculanensia,' containing engraved transcripts of the unrolled papyri (folio, Naples, 1793–1855), and since 1861 several volumes of a continuation of the same.

Consult: Furcheim, 'Bibliografia di Pompei, Ercolano e Stabia'; Ruggiero, 'Storia degli Scavi di Ercolano.'

Her'cules, hér'kū-lēz, called by the Greeks HERAKLES, and also ALCIDES, al-sī'dēz, after his grandfather, Alcæus: a mythological hero of Greece, typified by poets, sculptors, and artists of later ages, as a model of human perfection, physical and mental. According to the traditions of the heroic age, he united the finest qualities of mind and heart, as understood at that period, with the highest development of bodily vigor, and under a ceaseless succession of labors and sacrifices, strove perpetually after divine excellence. His indomitable perseverance was crowned with victories which showed the triumph of the divine part of man's nature over the earthly, while his death secured him immortality, a seat among the gods, and the homage of divine honors.

The legends relate that he was the son of Zeus or Jupiter, king of the gods, and of Alcmena the Theban, daughter of Alcæus, son of Perseus. Knowing that the child born on a certain day would rule over the descendants of Perseus, Hera or Juno, wife of Jupiter, consumed with jealousy, contrived to prolong the travail of Alcmena, and hasten that of the wife of Sthenelus, another son of Perseus, who gave birth to Eurystheus, subsequently chief of the Persidæ. Hercules was brought up at Tirynthus, or according to Diodorus, at Thebes. Jupiter sought to protect his favorite son in every manner, and to make him worthy of immortality. On one occasion, while Juno was asleep, he laid the infant on her breast, that he might feed on the milk of the goddess. She awoke, and cast the hated babe from her, and the drops that then fell from her are said to have formed the Milky Way. Under the care of Amphitryon, Alcmena's husband, Hercules received the best instruction in all arts. Castor, the son of Tyndarus, taught him how to fight; Eurytus, archery; Autolycus, driving; Eumolpus, singing; Linus, to play the lyre; and under the centaur Chiron, he perfected his training, and became the most valiant and accomplished hero of the age.

In his eighteenth year he slew a huge lion in the neighborhood of Mount Cithæron which had preyed on the flocks of Amphitryon and of the king of Thespis. The king, desirous that his 50 daughters might have children by such a hero, entertained him at his court for 50 days, and Hercules became the father of their sons, the Thespiadæ. Hercules next freed his native city from the annual tribute of a hundred oxen, paid to Erginus, king of the Orchomenians. Creon, king of Thebes, rewarded Hercules by giving him his daughter Megara in marriage, and intrusting him with the government of his kingdom. Subjected to the power of Eurystheus owing to priority of birth, the latter acquainted with Hercules' successes and rising power, ordered him to appear at Mycenæ, and perform the labors which he was empowered to impose upon him. Hercules refused, and Juno to punish him, afflicted him with melancholic madness, during which he killed his own children by Megara, supposing them to be the offspring of Eurystheus. When he recovered he was so horrified by the misfortunes which had proceeded from his disobedience and insanity, that he consulted the oracle at Delphi; he was told that he must be subservient to the will of Eurystheus and perform ten labors imposed by the king, after which he would attain immortality. Hercules thereupon went to Mycenæ, where Eurystheus, apprehensive of so powerful an enemy, commanded Hercules to achieve a number of enterprises, the most difficult and arduous ever known. The favors of the gods, however, had completely equipped him for their performance; from Minerva he had received a coat of arms and helmet, a sword from Mercury, a horse from Neptune, a shield from Jupiter, a bow and arrows from Apollo, and from Vulcan a golden cuirass and brazen buskin with a celebrated brass club.

The first labor was to destroy the lion which infested the forests of Nemea and Cleonæ near Mycenæ, and was invulnerable to mortal arrows. Hercules attacked him with his club, chased him to his den, and after a sharp and fierce struggle choked him to death. He carried the dead beast on his shoulders to Mycenæ, and ever after clothed himself with the skin. The second labor was to destroy the Lernæan hydra, which he accomplished with the assistance of his friend Iolaus, who burnt with a hot iron the root of each head as Hercules crushed it to pieces with his club. The third labor was to catch the hind of Diana, famous for its swiftness, golden horns, and brazen feet. The fourth labor was to bring alive to Eurystheus a wild boar which ravaged the neighborhood of Erymanthus. In this expedition he destroyed the Centaurs, and caught the boar by closely pursuing it in the deep snow. In his fifth labor Hercules was commanded to clean the stables of Augeas, where 3,000 oxen had been kept for many years; this he accomplished in one day by turning the rivers Alpheus and Peneus through the stables, receiving as payment a tenth of the cattle, and concealing the fact that he had been commanded to perform the service. The sixth labor was to destroy the carnivorous birds, with brazen wings, beaks, and claws, which ravaged the country near Lake Stymphalis in Arcadia. In his seventh labor he brought alive into Peloponnesus the wild bull, a gift of Poseidon to Minos, king of Crete, which had laid waste the island. In his eighth labor he was commissioned to capture the mares of Diomedes, which fed upon human flesh. He killed Diomedes, and gave him to be eaten by his mares, which he brought to

Eurystheus. For his ninth labor he was commanded to obtain the girdle of the queen of the Amazons. In his tenth labor, he killed the monster Geryon, king of Gades, and brought to Argos his numerous flocks, which fed upon human flesh. Adjudging the second and fifth labors as unlawfully performed, Eurystheus imposed two others. These were: the eleventh, to obtain the golden apples from the garden of the Hesperides; and the twelfth, to bring from hell the three-headed dog Cerberus. Pluto promised him Cerberus on condition that he should use no weapons but force. Eurystheus, pale with fright when Hercules brought the monster to him, ordered its immediate removal. This ended what are generally known as the Twelve Labors of Hercules, and relieved the hero from bondage.

Besides these, Hercules achieved other labors equally great and celebrated, such as his war with Jupiter against the giants, his expedition with the Argonauts to Colchis, the pillage of Troy, the liberation of Prometheus and Theseus, etc. During three years' slavery, imposed by the Delphian oracle for plundering the temple to avenge supposed neglect, Hercules' mistress, Omphale, queen of Lydia, married him. Hercules afterwards married Dejanira, daughter of Œneus, king of Ætolia, and when Iole, daughter of the king of Œchalia, a princess formerly refused to Hercules, became his captive, Dejanira sent Hercules the tunic given her by the dying centaur Nessus, as having the power to recall a husband from unlawful love. The tunic had been infected by the poisoned arrow shot by Hercules at the centaur, when he offered violence to Dejanira, after carrying her across the river Evenus. When Hercules put the tunic on, the poison penetrated his system and he suffered untold torments; in remorse Dejanira killed herself. In his agony Hercules had himself conveyed to Mount Œta and laid on a funeral pyre which at his commands was set on fire. In the midst of a dark cloud, accompanied by lightning and thunder, his immortal spirit was transported to Heaven, where he took his place among the gods, became reconciled to Juno and married her daughter Hebe.

While the myth of Hercules is of Greek origin, counterparts of the legend appear among many nations. Some scholars regard Hercules as a solar hero, and the twelve labors to represent the 12 zodiacal signs. Artists represent him under a variety of forms, as a child, a youth, and man, in his numerous adventures and exploits. The principal ancient statue is the Farnese Hercules at Naples, by the Athenian Glycon. In the Vatican, the Torso di Michelangelo, so called because that artist studied it during several years, is a remarkable fragment of an ancient statue of Hercules.

Hercules, in astronomy, one of Ptolemy's northern constellations. It is within this constellation that the point toward which the sun, with its accompanying system of planets, is traveling at present is situated. The constellation contains the finest globular cluster of stars in the northern heavens, and the bright double and variable star Ras Algethi.

Hercules-beetle, a very large South American lamellicorn beetle (*Dynastes hercules*). An enormous horn projects from the prothorax of the male, and a smaller one from the head; they act together like a pair of forceps. The length of the male is about six inches, but the female is smaller and lacks the horns. Numerous related species are known, of which *D. tityrus,* found in the southern United States, is 2½ inches long.

Hercules' Club, a North American shrub or tree growing to height of 12 feet and sometimes to 40 feet. See ARALIA.

Hercules, Pillars of, name of the Straits of Gibraltar among the ancients. Hercules is said to have erected a pillar on each side of the strait between Europe and Africa, upon the mountains Calpe and Abyla, as the limits of his wanderings toward the west. The earliest Greek writer by whom the Pillars of Hercules are mentioned is Pindar. On the other hand the Phœnicians called the strait the Pillars of Melkant (q.v.), whom the Greeks knew as Melicertes.

Herder, Johann Gottfried von, yō hän gŏt'frēd fŏn hĕr'dĕr, German critic and poet: b. Mohrungen, Prussia, 25 Aug. 1744; d. Weimar 18 Dec. 1803. He was the son of a poor schoolmaster, but friends procured him an appointment in Frederick's College, where he was at first tutor, and at a later period instructor. During this period he became known to Kant, who permitted him to hear all his lectures gratis. His unrelaxing zeal and diligence enabled him to become acquainted with science, theology, philosophy, philology, natural and civil history, and politics. In 1764 he was appointed an assistant teacher at the cathedral school of Riga, with which office that of a preacher was connected. In 1769 he went to Paris; he became traveling tutor to the Prince of Holstein-Oldenburg, but in Strasburg he was prevented from proceeding by a disease of the eyes; and here he became acquainted with Goethe, on whom he had a very decided influence. Herder had already published his 'Fragments on the More Modern German Literature,' his 'Critical Woods' (Kritische Wälder), etc., which had gained him a considerable reputation, though he had not published anything of importance in theology; yet, while in Strasburg, he was invited to become court preacher, superintendent, and consistorial counsellor at Bückeburg, whither he proceeded in 1771. He soon made himself known as a distinguished theologian, and in 1776 received an invitation to become court preacher, general superintendent, and consistorial counsellor at Weimar. This appointment was through the influence of Goethe. In 1801 he was made president of the high consistory, a place never before given to a person not a nobleman and was subsequently made a noble by the Elector of Bavaria. As a theologian Herder contributed to a better understanding of the historical and antiquarian part of the Old Testament. His 'Geist der hebräischen Poesie' is highly valued. He did much for the better appreciation of the classical authors, and his philosophical views of human character are full of instruction. His greatest work is his 'Ideen zur Philosophie der Geschichte der Menschheit' (1785 *et seq.*). In poetry Herder effected more by his various accomplishments, his vast knowledge, and fine taste, than by creative power; yet he has produced some charming songs; and

his 'Cid,' a collection of Spanish romances into a kind of epic, is one of the most popular poems of Germany.

Heredia, José Maria, Spanish-American poet: b. Santiago de Cuba 31 Dec. 1803; d. Toluca, Mexico, 7 May 1839. He was graduated from the law department of the University of Havana in 1819; for taking part in the attempted revolution of 1823 was banished from Cuba, lived for two years in the United States, and in 1825 removed to Mexico, where he held various civil, judicial, and journalistic positions. His poetic works have been to some extent rendered into other languages. The 'Ode to Niagara' is well known. Heredia has been considered by many the greatest of Spanish-American poets. One of the best editions is that of Ponce de Leon, 'Obras Poeticas de Don José Maria de Heredia' (1875).

Heredity, the transmission of parental characteristics to the offspring. The child possesses the mean between the character of each parent, that is, the father and mother share equally in transmitting their peculiarities. Yet it should be borne in mind that no two individuals are exactly alike, and besides the resemblances to the parents, every child differs in certain respects from the parent. We speak of the force of heredity, and this, whatever be its nature, is very wonderful. Thus the Egyptian of to-day inherits the features and mental characteristics of his ancestors who lived 10,000 years ago. One cause of this is the fact that the physical features and climate of Egypt have remained unchanged for that period. Did heredity act rigidly we should have no modification of type from one geological age to another. The inheritance of one set of characters may, owing probably to profound changes in the environment, lapse, and the original peculiarities be replaced by others. Thus civilized man has thrown off certain habits and tendencies of his savage ancestors, and acquired new and higher culture — modes of action and feeling. Heredity has its limits, and in certain highly specialized types of animals has lapsed or ceased to act as at first. Hurst remarks: "Heredity is merely a likeness of effects due to the likeness of the causes producing them."

There are four types or forms of inheritance: (1) Continuous or normal inheritance, that is, where the children resemble the father and mother. (2) Interrupted inheritance, where the offspring resemble the grandparents. (3) Collateral inheritance, where the offspring inherit the qualities of their uncle or aunt. (4) Atavism or reversion, which is inheritance from a remote ancestor. Thus when individuals of two domesticated races are crossed, the offspring may resemble neither parent, but are like the supposed ancestral or wild species. This is called "throwing back" by breeders. Galton speaks of alternative heredity, and illustrates it by the color of the human eye. "If one parent," he says, "has a light eye-color and the other a dark eye-color, some of the children will, as a rule, be light and the rest dark, they will seldom be medium eye-colored, like the children of medium eye-colored parents." What is called particulate inheritance is common in the color of the hair of horses, dogs, mice, and other mammals, and in the hairs on the leaves of certain plants.

Galton's Law.— We do not know why certain characters are transmitted and others are not, and we cannot foretell, says Bateson, which individual parent will transmit characters to the offspring, and which will not, yet this problem may at some time become solved. From his studies on human stature, and on the transmission of colors in Bassett hounds, Galton has shown that the expectation of inheritance is such that a simple arithmetical rule is approximately followed. He deduced the rule that of the whole heritage of the offspring the two parents together on an average contribute one half, the four grandparents one quarter, the eight great-grandparents one eighth, and so on, the remainder being contributed by the more remote ancestors.

This rule does not in many cases apply, and Galton points out that it takes no account of individual prepotencies. Moreover, says Bateson, there are numerous cases in which on crossing two varieties the character of one variety almost always appears in each member of the first cross-bred generation. For example, the offspring of the polled Angus cow and the shorthorn bull is almost always polled or with very small loose "scurs." Seedlings raised by crossing *Atropa belladonna* with the yellow-fruited variety have without exception the blackish-purple fruits of the type. These are now recognized as instances of Mendel's principle of dominance.

Mendel's Law.— As far back as 1865 an Austrian monk, Mendel, made prolonged experiments in crossing varieties of the pea (*Pisum sativum*). His paper was overlooked until attention to his remarkable results was called by De Vries in 1900; he and also Correns and Tschermak at the same time independently rediscovered Mendel's law. Mendel selected seven pairs of characters, such as the shape of the ripe seed, of the cotyledons, of the seed-pod, color of the seed-skin, length of stem, etc. Large numbers of crosses were made between peas differing in respect of one of each of these pairs of characters. It was found, says Bateson, that in each case the offspring of the cross exhibited the character of one of the parents in almost undiminished intensity, and intermediates which could not be at once referred to one or other of the parental forms were not found. "In the case of each pair of characters there is thus one which in the first cross prevails to the exclusion of the other." This prevailing character Mendel called the dominant character, and to the other he gave the name of recessive character.

This law of dominance has been found by Bateson and by Castle to apply to animals as well as plants, and thus is a most important biological law. Thus when mating occurs between two organisms, whether vegetable or animal, differing in some character, the offspring frequently all exhibit the character of one parent only, in which case that character is said to be "dominant." For example, on crossing white mice with gray mice, Castle found that the offspring are gray, that color-character being dominant. The character which is not seen in the immediate offspring is called recessive, for though unseen it is still present in the young. white in the experiment being the recessive color.

The law of dominance has its exceptions; the hybrid often possesses a character of its

own, instead of the pure character of one parent, as is true in cases of complete dominance. The hybrid form often resembles a supposed ancestral condition, when it is usually regarded as a reversion. Examples are the gray hybrid mice, which are indistinguishable in appearance from the house mouse; also slate-colored pigeons resulting from crossing white with buff pigeons.

One result of Mendel's discovery is the purity of the germ-cells. As stated by Castle: "The hybrid, whatever its own character, produces ripe germ-cells which bear only the pure character of one parent or the other." To breeders Mendel's law is of great importance because, as remarked by Castle, it reduces to an exact science the art of breeding in the case most carefully studied by him, that of entire dominance. "No animal or plant is 'pure' simply because it is descended from a long line of ancestors possessing a desired combination of characters, but any animal is pure if it produces gametes (germ-cells) of only one sort, even though its grandparents may among themselves have possessed opposite characters."

The bearings of Mendel's discovery, confirmed by De Vries' experiments, on the origin of species is of great interest and moment. The problem is whether aberrations, sports, or discontinuous variations may not sometimes result in the formation of new species and types, or whether species are all the result of slow, continuous variations. As stated by Castle, "A sport having once arisen affecting some one character of a species, may by crossing with the parent form be the cause of no end of disintegration on the part of any or all of the characters of the species, and the disintegrated characters may, indeed must, form a great variety of new combinations of characters, some of which will prove stable and self-perpetuating.

Mendel's discoveries also explain the principle that new types of organisms are extremely variable, whereas old types are subject to little variation. A new type which has arisen as a sport will cross with the parent form. The offspring, says Castle, will then inherit some dominant character, others latent, and this will result in polymorphism of the race. Thus the suggestion of Galton that species may arise from sports is confirmed, while added cases are afforded by the recent remarkable experiments of De Vries, resulting in the origination of seven new species of primrose by sudden variations, or what he calls "mutations."

Homochronous Heredity.— This is a form of heredity called by Darwin "inheritance at corresponding periods of life." It is exemplified in animals with a metamorphosis, whose larvæ lead a different life and differ greatly in structure and form from the parent. Thus the butterfly inherits in its infancy the caterpillar stage, then the pupa, finally the features of the imago; one character or set of characters appear by heredity, are cast aside, and new features arise, those of the pupa stage, and so on. Each butterfly, beetle, or bee, as well as the fluke-worms, tapeworms, etc., inherit at different periods of their lives stages which have become fixed by homochronous heredity.

The Physical Basis of Heredity.— A number of biologists from Spencer to Jaeger and Weismann have supposed that heredity is due to the transmission from parent to offspring of particles developed in the reproductive cells of the parent, whence arose the theory now generally held that the nucleus of the spermatozoon and of the egg is the bearer of heredity. Even in the protozoa, if one be divided into nucleate and enucleate halves, the portion without a nucleus degenerates, while the part containing the nucleus lives and regenerates the lost parts. The nucleus contains a portion which stains readily with reagents, and is called the "chromatin," which consists of particles called "chromosomes." Now the nucleus of the egg and that of the spermatozoon contain the same number and quantity of chromosomes, to what are called the cleavage-spindles, hence the chromatin, that is, the chromosomes, are regarded as the bearers of heredity, some of these passing down from one generation to another.

Consult: Weismann, 'The Germ-Plasm' (New York 1893); Bateson, 'Mendel's Principles of Heredity' (Cambridge, England, 1902); Castle, 'Mendel's Law of Heredity' (Cambridge, Mass., 1903); with the earlier works of Darwin, Brooks, Galton, Hertwig, and others.

ALPHEUS S. PACKARD,
Late Professor of Zoology, Brown University.

Hereford, hĕr'ĕ-fōrd, England, a city and parliamentary borough, capital of Herefordshire on the Wye, 120 miles northwest of London. The chief building is the cathedral, built in 1012–56, rebuilt in 1072, and restored in 1863. It is of early Norman architecture, 335 feet long and 174 feet wide, contains many fine monuments, some as ancient as the cathedral, and its accessory features include a lady chapel, charterhouse, cloisters, an episcopal palace and a library containing valuable MSS., Wyclif's Bible, and a 13th century map of the world. A musical festival of the united choirs of Gloucester, Worcester, and Hereford is given in the cathedral triennially. The see dates from 673; the city was incorporated in the reign of King John. Pop. (1901) 21,382.

Her'esy (Gr. *hæresis*) primitively means a choice or election, and in its application to religious belief is used to designate as well the act of choosing for one's self, and maintaining opinions contrary to the authorized teaching, as also the heterodox opinions thus adopted. In the Acts of the Apostles the word seems to be used of a sect or party, apart from the consideration of its character, whether good or bad; but in the Epistles and in the early Christian writers it is almost invariably used in a bad sense, which is the sense uniformly accepted in all subsequent theological literature.

Even in the apostolic times heresies had arisen in the Church, and before the Council of Nice the catalogue of sects had already swelled to considerable dimensions.

From the very date of the establishment of Christianity in the Roman empire heresy appears to have been regarded as a crime cognizable by the civil law; and Constantine enacted several severe laws for its repression, which were continued and extended by his successors, and were collected into a single title, 'De Hæreticis,' in the Justinian code. The penalties of heresy ordained by these enactments are very severe, extending to corporal punishment, and even to death; and they all proceed on the distinct assumption that a crime against religion

is a crime against the state. These enactments of the Roman law were embodied in the various codes of the European kingdoms; in English law heresy consisted in holding opinions contrary to the faith of Holy Church. By common law the offender was to be tried in the provincial synod by the archbishop and his council, and, after conviction, was to be given up to the king to be dealt with at his pleasure. But the statute 2 Hen. IV. chap. 15 (*De hæretico comburendo*) empowered the diocesan to take cognizance of heresy, and, on conviction, to hand over the criminal directly, and without waiting for the king's writ, to the sheriff or other competent officer. This statute continued practically in force, with certain modifications, till the 29 Charles II. chap. 9, since which time heresy is left entirely to the control of ecclesiastical legislation.

The doctrines considered heretical by the Christian Church may be found in the 'Dictionnaire des Heresies,' by the Abbé Pluquet, with the history, progress, nature, and also the refutations of their errors.

Her'etic, in ecclesiastical terminology, one who embraces a heresy. It is evident that the word heretic can have only the relative meaning of heterodox. The early Christian Church always made a distinction between heretics who obstinately persisted in their heresy, and heretics merely through error, or who had been born in heresy. The fathers of the Church declare themselves ignorant of the final condition of the latter. Again, peaceable heretics are distinguished from those whose doctrines produce public confusion and disorder. However, the general view is that all heresies lead, sooner or later, to disturbances and bloodshed.

Hereward, hĕr'ĕ-wȧrd, a Saxon yeoman who flourished about 1070. He was practically the last to withstand the Normans, holding the Isle of Ely against William the Conqueror 1070–1. After William had succeeded in reaching the refuge of the Saxon patriots, Hereward, scorning to yield, fled to the fastness of the swampy fens to the northward. He was commonly styled HEREWARD the WAKE, and his character and adventures form the theme of Charles Kingsley's popular historical romance, 'Hereward.'

Her'ford, Oliver, American humorous author and illustrator: b. England. He is at present on the staff of the 'Criterion.' Among his works are: 'Artful Antics'; 'The Bashful Earthquake and Other Fables and Verses' (1898); 'Alphabet of Celebrities' (1899); 'A Child's Primer of Natural History' (1899); 'Wagner for Infants' (1899); 'Overheard in a Garden' (1900).

Hering, Ewald, German psychologist: b. Altgersdorf, Saxony, 5 Aug. 1834. He studied medicine, and settled at Leipsic as physician in 1860; in 1862 he was lecturer in physiology at the Leipsic University, and in 1865 was professor of physiology and medico-physics in a medical school at Vienna, and in 1870 held the same chair at Prague. Hering is best known for his work in the field of psychophysics, especially for his investigations of visual space perception and for the color theory which he originated. This theory is opposed to the empiristic theory of Helmholtz and is most generally accepted by psychologists at the present time. His writings include: 'Die Lehre vom Binocularen Sehen' (1860); 'Zur Lehre vom Lichtsinne' (1872–4); 'Der Raumsinn und die Bewegung des Auges'; 'Das Gedächtniss als eine allgemeine Funktion der organisierten Materie' (1870).

Her'ing, Rudolph, American hydraulic and sanitary engineer: b. Philadelphia, Pa., 26 Feb. 1847. He was graduated at the Dresden (Germany) Polytechnic School, 1867, and became assistant engineer of Prospect Park, Brooklyn, N. Y., the following year. He was assistant engineer of Fairmount Park, at Philadelphia, 1869–71, and astronomer at Yellowstone National Park in 1872. After serving as assistant city engineer 1873–80 he opened an office for private practice in engineering and has furnished designs for sewerage and water supply for numerous towns and cities in the United States, Canada and South America. He is member of many professional societies both in Europe and America, and has written many published reports on sewerage and water supply of cities.

Heriot, hĕr'ĭ-ŏt, George, Scottish philanthropist: b. Edinburgh 1563; d. London 12 Feb. 1624. His father was a goldsmith in Edinburgh, and the son followed his father's profession, and was admitted a member of the Incorporation of Goldsmiths in May 1588. In 1597 he was appointed goldsmith to the queen by a charter from James VI., and on the accession of the latter to the English crown followed the court to England. From the period of Heriot's settlement in London little is known of his history. He died on 12 Feb. 1624, and was buried at St. Martin's-in-the-Fields. By his will he left nearly the whole of his fortune toward the founding and erecting of a school for poor boys in Edinburgh, styled in the bequest a "hospital." The foundation of the present structure, known as Heriot's Hospital, was laid in July 1628; and the expense of the erection exceeded £30,000 sterling. From the rise in value of property the yearly revenue of the hospital has very greatly increased; and the governors were empowered in the reign of William IV. to establish elementary schools within the city for the gratuitous education of poor children, 16 day schools being ultimately established, besides evening schools. In 1885, however, an entirely new scheme was introduced and a great part of the funds are now devoted to the support of Heriot's Hospital School and the Heriot-Watt College. The former is a day school for boys of 10 and upward, and the Heriot-Watt College is a college giving a thorough technical, commercial, and literary education chiefly by evening classes, though there are also day classes. The annual revenue is now about $150,000.

Her'kimer, Nicholas, American military officer: b. about 1715; d. Danube, N. Y., 17 Aug. 1777. He became a lieutenant of militia, served in the French and Indian war, and defended Fort Herkimer in 1758. Promoted brigadier-general of militia in 1776, he directed operations against Sir John Johnson, and when Fort Stanwix was threatened by a combined force of Indians, Tories, and regulars, advanced to its relief. He was ambushed by Col. Saint Leger at Oriskany, and one of the most closely-fought battles of the Revolutionary War followed.

Herkimer having lost a third of his force, was unable to continue, and Saint Leger's army was rendered thoroughly ineffective. Herkimer himself was wounded, and died as the result of an unskilful operation. The town and county of Herkimer, N. Y., were named in his honor.

Herkimer, N. Y., village, county-seat of Herkimer County; on the Mohawk River, the Erie Canal, and on the New York C. & H. R. railroad; about 25 miles east of Utica and 68 miles northwest of Albany. The chief manufactures are flour, furniture, mattresses, knit goods, beds, paper, creamery products, and cigars. The city owns and operates the electric plant and the waterworks. It is the seat of Folts Mission Institute. Pop. (1900) 5,555.

Her'komer, Hubert, English painter: b. Waal, Bavaria, 26 May 1849. His father, a wood carver, went to America in 1851, but returned to Europe and settled in Southampton in 1857. Hubert studied at the School of Art in that city, where he assisted in founding a life school for drawing. In 1867 he exhibited in the Dudley Gallery. From this time he gradually gained recognition as a painter in water colors, and in 1871 was elected a member of the Institute of Water Color Painters. His first picture exhibited at the Royal Academy, 'After the Toil of the Day' (1873), a German subject, attracted attention; and two years later he gained a great reputation by his famous picture representing 'The Last Master — Sunday at the Royal Hospital, Chelsea,' to which a grand medal of honor was awarded at Paris in 1878. Later pictures are: 'Eventide: a Scene in Westminster Union' (1878), "a worthy companion of the other realistic yet more heroic study of old age, which the artist made in his Chelsea Pensioners"; 'Missing: a Scene at the Portsmouth Dockyard Gates' (1881), "a masterpiece in its way"; 'On Strike' (1891), his diploma work; 'Back to Life: a District Nurse Taking out a Child for the First Walk after a Long Illness' (1896); and 'The Guards' Cheer' (1898), representing a scene in the Diamond Jubilee procession. Among many portraits painted by him the best known are those of Wagner, Ruskin, and Tennyson. His best water-color pictures are: 'Im Walde'; 'The Woodcutter's Rest'; 'The Poacher's Fate'; and 'At the Well.' Mr. Herkomer was elected associate of the Royal Academy in 1879, and full member in 1890, and from 1885 till 1895 held the Slade professorship of fine art at Oxford in succession to Mr. Ruskin. He holds a life professorship at Munich, superintends an art school founded by himself at Bushey in Hertfordshire, and for the theatre connected with it has written several plays. Herkomer also occupies a high place as an etcher and mezzotint engraver. He has published: 'Lectures on Etching and Mezzotint Engraving' (1892). See Courtney, 'Life' (1892).

Hermandad, ĕr-män-däth', a confederation of the cities of Aragon, formed to defend themselves against the usurpations and the rapacity of the feudal nobility. This object was most clearly apparent in the brotherhood (Hermandad) formed about the middle of the 13th century in Aragon, and that formed about 1282 in Castile. In 1295, 35 cities of Castile and Leon formed a joint confederacy for the same object. These fraternities were the model of the later Hermandad of the municipal communities, which was formed in Castile under the reign of Ferdinand and Isabella. It was established in 1486 with the approbation of the king. The city authorities raised a military force, and appointed judges in different parts of the kingdom. Neither rank nor station protected the offender against the tranquillity of the country, nor could he find safety even in the churches. The Santa Hermandad (holy brotherhood) which readers of Don Quixote will be acquainted with, had, like the earlier institution, of which it was a continuation, the object of securing internal safety, and seizing disturbers of the peace and highway robbers, but did not act except in case of offenses actually committed. It consisted of a company of armed police officers, who were distributed in the different provinces of the kingdom of Castile, and whose duty it was to provide for the security of the roads outside of the cities. One of their strictest regulations was not to use their power within the cities. They were subject to the Council of Castile. The principal divisions of the company had stations at Toledo, at Ciudad Rodrigo, and at Talavera.

Hermann, hĕr'mạn, **Alexander,** American conjurer: b. Paris, France, 10 Feb. 1844; d. near Great Valley, N. Y., 17 Dec. 1896. From his brother Carl, Alexander took his earliest lessons in sleight-of-hand and the brothers then traveled in Europe and became widely known as skilled conjurers. Coming to the United States in 1867 they met with great success. The elder presently returned to Europe, but Alexander became a citizen of the United States, made a tour of the world and had few equals in his profession.

Hermann (hĕr'män) **und Dorothea,** dŏr-ō-tā'ä, a pastoral poem by Goethe, published in 1797. It contains about 2,000 hexameter lines. The scene is the broad Rhine plain, and the time the poet's own. The standard English translation is that by Miss Ellen Frothingham (1870).

Hermann, Mo., a town in Roark Township, the capital of Gasconade County, on the south bank of the Missouri River, here crossed by a bridge, 81 miles west of St. Louis, and on the Missouri Pacific railroad. It is in a grape-vine-growing region and manufactures wine, beer, flour, tools and cigars. Pop. (1900) 1,575.

Hermannstadt, or **Nagy-Szeben,** Austria, the capital of a county in Transylvania. See Szeben, Nagy.

Hermaph'roditism, the occurence of both kinds of sexual glands in one and the same animal. The differentiation of the sexes begins with the polyps, when for the first time in the animal kingdom we meet with individuals which are male and female. The lower plants and in the animal kingdom the sponges and Hydra (q.v.) are monœcious, that is, sexual cells occur in the same individual. In the more highly specialized animals, the sexual glands exist in different individuals, and the form is said to be bisexual, or diœcious, as opposed to hermaphroditic forms.

True or Natural Hermaphroditism.— This is found in many flowering plants, in sponges, most cœlenterates, many worms, including the earthworm, many mollusks, and in most barna-

cles, and this appears to be in relation with their more or less fixed mode of life. As a rule testes and ovaries occur in the same animal, but situated in different regions of the body, while in land snails there is a hermaphroditic gland which produces spermatozoa and eggs in the same follicle. Certain animals, or frogs, which are bisexual as adults, pass through an embryonic hermaphroditism. Normal hermaphroditism is very rare in insects and vertebrates; in the latter only two cases are known, that is, a sea-perch (*Serranus scriba*) and the hagfish (*Myxine*).

Abnormal Hermaphroditism.— What in man is called hermaphroditism is a misnomer, as it arises from malformation of the external reproductive organs. In insects occurs lateral hermaphroditism in which one half of the moth or butterfly, for example, is male and the other female. In some of these cases dissection has shown that only male or female sexual glands alone occur in an undeveloped condition. This is called *gynandromorphism.* Abnormal hermaphroditism sometimes occurs in fishes and batrachians where an ovary is found on one side and a testis on the other. It is curious that in a threadworm (*Angiostomum*) and in certain isopod crustacea (*Cymothoidæ*) the reproductive glands are first male, the same gland afterward producing eggs.

Hermes, Georg, gā-ōrg' hĕr'mĕs, German theologian: b. Dreyerwalde, Westphalia, 22 April 1775; d. Bonn 26 May 1831. He studied theology at the University of Münster, became a teacher in the gymnasium of that city, and in 1807 professor of dogmatic theology in the university. When the Prussian government established the University of Bonn, Hermes was appointed to the chair of Catholic theology (1819). Here he began to distinguish himself by his attempts to found a speculative, philosophic, and dogmatic school in the church itself, delivering a series of lectures which caused great sensation by aiming at an alliance between Protestants and Catholics. This attempt to base the positive theology of the church (a doctrine known as Hermesianism) drew around him great numbers of followers. Many of these in time filled chairs of theology and set forth their views in conjunction with their master in a magazine, the 'Zeitschrift für Philosophie und katholische Theologie,' published at Cologne from 1832. The method which Hermes advocated insisted that the truth of revelation and of the Catholic Church should first be tested by reason, and that revelation should then be followed. He did not go so far as to declare that all the dogmas in themselves could be proved *a priori,* but endeavored to found the right of the church to teach them on the ground of reason. Hermesianism was in fact an ingenious effort to base the doctrines of the church on Kant's system of philosophy. It aroused powerful opposition, being condemned as heretical by a papal letter of 26 Sept. 1835. Hermes' scholars stoutly defended their orthodoxy, many of them repeatedly appealing to the pope, but without success.

Hermes, hĕr'mēz (called by the Romans *Mercurius,* and identified with their own god of that name), in Greek mythology the son of Zeus and Maia. According to legend his birthplace was in the mountains of Cyllene, Arcadia. Four hours after his birth he invented the lyre, which he made by killing a tortoise, and stringing the shell with three or seven strings. He then sang to it the loves of Zeus and his mother Maia. Having concealed the lyre in his cradle, he was seized with hunger, went in the dark evening to Pieria, and stole 50 oxen from the sacred herd of Apollo which he drove backward and forward to confound their tracks; then walking backward himself, he drove them backward also; and after having killed two of them near the river Alpheus roasted and sacrificed a part to the gods. He concealed the remainder in a cavern. He also carefully destroyed all traces of them. The next morning Apollo missed his oxen, and went in search of them, but he could discover no traces of them until an old man of Pylos told him that he had seen a boy driving a herd of oxen in a very strange manner. Apollo now discovered that Hermes was the thief. He hastened to Maia, and accused the infant, who pretended to be asleep, and, not terrified by the threat of the god that he would hurl him into Tartarus, steadily maintained his innocence. Apollo, not deceived by the crafty child, carried his complaint to Zeus. Hermes lied even to him. But Zeus perceived him to be the offender; but was not angry with him, and smiling at his cunning, ordered him to show the place where the oxen were concealed. To secure him Apollo bound his hands, but his chains fell off, and the cattle appeared bound together by twos. Hermes then began to play upon his newly-invented lyre, at which Apollo begged the instrument of the inventor, learned of him how to play on it, and gave him a whip to drive the herd, thenceforth belonging to both in common.

They then concluded a contract with each other: Hermes promised never to steal Apollo's lyre or bow; the latter gave him the *caduceus.* The ancients represent Hermes as the herald and messenger of the gods. He conducts the souls of the departed to the lower world, and is therefore the herald of Pluto, and the executor of his commands. His magic wand had the power to close the eyes of mortals, to cause dreams, and wake the slumbering. The qualities requisite for a herald he possessed in the highest perfection, and bestowed them on others — grace, dignity, and insinuating manners. He was also the symbol of prudence, cunning, and fraud, and even of perjury, and was the god of theft and robbery. In the wars of the giants he wore the helmet of Pluto, which rendered him invisible, and slew Hippolytus. When Typhon compelled the gods to fly before him and conceal themselves in Egypt, he metamorphosed himself into an ibis. He is also mentioned by Homer as the patron of eloquence, and still more particularly by Hesiod. Of his inventions Homer makes no mention. Later writers ascribe to him the invention of dice, music, geometry, the interpretation of dreams, measures and weights, the arts of the palæstra, letters, etc. He was also regarded as the patron of public treaties, as the guardian of roads, and as the protector of travelers. He was represented in art as a boy in the prime of youth, sometimes with the caduceus, and sometimes with a winged cap, standing, sitting, or walking. The artists of later times placed him among the youthful and beardless gods. The most prominent traits of his character are vigor and dexterity. In the

representation of Hermes of a later date the relations of corporeal beauty and mental dexterity are wonderfully preserved. Artists made the cock his symbol, on account of its vigilance or love of fighting (in allusion to gymnastics); the tortoise, on account of his invention of the lyre; the purse, because he was the god of traffic; a ram and a goblet, because he was the director of religious ceremonies and sacrifices; the trunk of a palm-tree, upon which his statues lean, because he was the inventor of arithmetic and writing (upon palm-leaves); the *harpe* or sickle-shaped knife, because he was the slayer of Argus.

Hermes Trismegistus, trĭs-mĕ-jĭs'tŭs, the Greek title of the Egyptian moon god, Thoth, one of the most interesting figures in Egyptian mythology. He is represented as Ibis or with the ibis head, and is fully illustrated in the monuments and papyrus rolls from time to time brought to light. He is the god of time and of its divisions; he is the measurer and the god of measurements. He is the conductor of the dead. He is also the god of human intelligence, to whom are attributed all the productions of human art. All the literature of Egypt is attributed to him — all the writings that relate to the different sciences, mathematics, astronomy, medicine, music. These were called by the Greeks the Hermetic Books. Thoth is also credited with the invention of alchemy and magic. The Hermetic art is used to mean alchemy. The secrets of this art were handed on from teacher to pupil orally and in secret and this transmission was termed the Hermetic chain. For these reasons the Greeks identified him with their Hermes, and besides called him Trismegistus, "thrice great." By later writers, Euhemerists, Neoplatonists (q.v.), and Christians, Thoth was considered a great Egyptian king, a teacher of mankind, who had left books of magic and mystery behind him. Numerous books of such a sort once existed in Egypt. Clement of Alexandria knew of 42, and so-called Hermetic fragments are still extant in the works of Stobæus, Cyrillus, Suidas and Lactantius. The Hermetic books as we know them belong probably to no earlier date than the 3d or 4th century of our era, and are in Greek and Latin.

Her'mit (Gr. *eremitēs*), a solitary ascetic, who, with a view to more complete freedom from the cares, temptations, and business of the world, took up his abode in a natural cavern or a rudely formed hut in a desert, forest, mountain, or other solitary place. Hermits began to appear in the Christian church in the 3d century. The advocates of asceticism (q.v.) were the first to set the example of retiring from cities to rural districts and villages. But the hermits sought to withdraw altogether from mankind, that they might give themselves up to holy contemplation. The earliest hermit is said to have been Paul of the Thebaid (Egypt), who during the Decian persecution fled to the desert (250); there he lived for the rest of his life, dying, 113 years old, about 342. The fame of his sanctity quickly incited others to imitate his mode of life. The most famous amongst these successors was St. Anthony (q.v.). At the time of his death (365) hermit cells existed in considerable numbers in the deserts of Egypt, Syria, and Palestine. The fame of their sanctity drew many to visit these hermits partly out of curiosity, to get religious advice from them, partly also in the belief that diseases were cured by their blessing. Sometimes they returned for a short time to the midst of their fellow-men to deliver warnings, instruction, or encouragement, and were received as if they had been inspired prophets or angels from heaven. But the number of hermits gradually diminished as the cenobite life of convents grew into fashion. Indeed the institution at no time secured the same footing in the Western Church that it did in the Eastern; and perhaps the reason may in part be found in the difference of climate, which renders a manner of life impossible in most parts of Europe that could be pursued for many years in Egypt or Syria. Partial revivals of the practice continued to be made, however, during some centuries, St. Cuthbert (q.v.) being a case in point. See Monachism, and Charles Kingsley's 'Hermits' (1869).

Hermit-crabs, crabs that shelter themselves in spiral sea-shells, for the protection of the soft-skinned and unsymmetrical abdomen. They are members of the *Macrura* (see Decapoda), and have very large and generally unequal claws, one being used to close the entrance of the shell into which the hermit can wholly retract himself. The abdominal appendages are practically aborted, with the exception of those at the tip of the tail, which hold firmly to the spire of the inhabited shell. The hermit-crabs belong to three families, namely: *Paguridæ,* or common marine hermit-crabs; *Parapaguridæ,* or deep-sea hermit-crabs; and *Cenobitidæ,* or terrestrial hermit-crabs. Two species are numerous on the American Atlantic coast running actively about in rock pools and shallows. The little hermit-crab (*Eupagurus longicarpus*) generally inhabits the shells of dog-whelks (*Ilyanassa*), while the larger species (*E. pollicaris*) occupies those of *Lunatia* or sometimes of the winkles and conchs. As they grow they must move to larger and larger shells, and the search for new tenements and dangerous change of abodes in the presence of enemies makes the life of one of these animals more than ordinarily exciting. The habits of these and other hermit-crabs are of great interest, generally, and especially on account of the various hydroids, anemones and mollusca which associate with them as commensals. The palm or robber-crab (q.v.) of the East Indies, and the land-crabs of the West Indies, are good examples of terrestrial hermit-crabs. Consult J. R. Henderson, 'Challenger Report on Anomura'; Verrill, 'Invertebrates of Vineyard Sound' (1875); Arnold, 'Sea Beach at Ebb-tide' (1901). See Commensalism, Crab, Crustacea.

Hermit Thrush. See Thrush.

Her'mitage, The, Andrew Jackson's home at Nashville, Tenn., from about 1804, when he removed there from Hunter's Hill. In 1819 the house was built in which he lived till his death in 1845. The Hermitage is now the property of the State of Tennessee.

Hermite, Charles, shärl ār-mēt, French mathematician: b. Dieuze, Meurthe, German Lorraine, 24 Dec. 1822; d. Paris 14 Jan. 1901. He entered the Ecole Polytechnique in 1842, but left it to devote his attention wholly to mathematics. From 1876 to his death he held the chair of higher algebra in the University of

Paris. His principal claim to be considered a great and original mathematician rests on his investigations in the line of functions, and his first important work on this theory won for him election to the Academy of Sciences. He proceeded to make discoveries in the theory of algebraic forms and in the theory of numbers. He finally settled the question of the solubility of the quintic equation, and really led the way to Lindemann's further investigations. For a list of his writings see 'Catalogue of Scientific Papers of the Royal Society of London,' Vols. III. and VII.

Hermosillo, hār-mō-sēl'yō, Mexico, capital of the state of Sonora, on the river Sonora, about 60 miles from the Gulf of California, and 78 by rail north from the port of Guaymas, with which it has a large traffic, being the principal entrepôt for the trade with the interior. Large quantities of fruit are grown in the vicinity, especially grapes, from which much brandy is made. Pop. (1903) 17,800.

Hern'don, William Henry, American lawyer: b. Greensburg, Ky., 28 Dec. 1818; d. near Springfield, Ill., 18 March 1891. He studied at Illinois College, was admitted to the bar in 1844, and in the same year formed a law partnership with Abraham Lincoln, which continued formally till the latter's death. He was mayor of Springfield, Ill., in 1855. With J. W. Weik, he wrote the well-known 'Herndon's Lincoln: The True Story of a Great Life' (in a new ed. 1891), which is particularly valuable for the study of Lincoln's personality and the details of his early career.

Herne, James A. (JAMES AHERNE), American actor and playwright: b. Troy, N. Y., 1 Feb. 1840; d. New York 2 June 1901. He first appeared in a traveling company, and later in various roles and organizations throughout the United States. Later he was actor-manager at San Francisco, and in 1878 presented his first play, 'Hearts of Oak,' which won immediate success. 'Drifting Apart' (1885), 'The Minute-Men' (1886) and 'Margaret Fleming' (1890) were less favorably received, although the last was highly ranked by the critics. In 1883–4 Herne wrote his most successful work, 'Shore Acres,' which was first performed as 'The Hawthornes' at Chicago in 1892, and in 1892–3 in Boston under its present title. He himself appeared as 'Uncle Nat' Berry. 'Shore Acres' was followed by 'The Rev. Griffith Davenport' (1899), a dramatization of Helen Gardner's 'An Unofficial Patriot,' and 'Sag Harbor' (1900). As both actor and dramatist Herne was a skilful delineator of types of everyday life.

Her'nia (Latin, a rupture, a burst, a descent), a swelling formed by the displacement of a soft part, which protrudes by a natural or accidental opening from the cavity in which it is contained. The three great cavities of the body are subject to these displacements. The brain, the heart, the lungs, and most of the abdominal viscera may become totally or partially displaced, and thus give rise to the formation of hernial swellings. Displacements of the brain and of the organs of the chest are, however, extremely rare, and are in general the result or symptom of some accident or disease. Many parts of the abdominal wall may become the seat of hernias, but they most commonly appear in the front lower regions, which, being destitute in great measure of muscular fibres, and being the site of many of the openings leading from the abdomen to the limbs, offer less resistance to the displacement of the viscera. Hernias are most common in the groin, at the navel, more rarely in the vagina, at the interior and upper part of the thigh, and at its lower and posterior part. They have received different names from their positions. All the abdominal viscera, with the exception of the duodenum, the pancreas, and the kidneys, may form a hernia, but they are not all displaced with the same facility. The omentum and intestinal canal escape easily; the stomach, liver, and spleen rarely form hernias. Most of the viscera, when displaced, push the peritoneum forward before them; this membrane thus forms a covering to the hernia, which is called the hernial sac. If the hernia, with its sac, can be entirely replaced, it is said to be reducible; if, from its size or other cause, it cannot be restored to its former place, it is irreducible.

Among the predisposing causes of hernia may be ranked any circumstance which diminishes the resistance of the abdominal walls, whether natural or accidental; such as muscular weakening of those walls by a forced distention, as in pregnancy, by accidents, by lifting heavy weights, or by excessive standing. Any prolongation of the viscera which tends to bring them in contact with points at which they may protrude, and articles of dress which push the organs toward the weaker parts of the abdominal wall (as corsets), may also produce hernia. The efficient causes of hernia are all circumstances which may break the equilibrium existing between the abdominal walls and the viscera, which react and mutually press upon each other. The simultaneous contraction of the abdominal muscles and of the diaphragm, which takes place on every violent effort, is one of the chief of these cases. Hence sneezing, coughing, leaping, playing on wind-instruments, etc., may be the direct cause of a hernia.

The symptoms of a hernia are the existence of a tumor or swelling at any point of the abdomen, but more particularly in the region of the groin. A reducible hernia is not a very troublesome disease, but may become so by acquiring an increase of size, and by strangulation. A hernia is said to be strangulated when it is not only irreducible, but also subjected to a continual constriction; this constriction may be produced by different causes, but it is generally a constriction at the opening through which the hernia protrudes. As soon as a patient perceives that he is affected with a hernia he should have recourse to medical advice, for the disease is then in its most favorable state for treatment. The hernia is immediately reduced, and must then be subjected to a constant compression. This is done by means of a truss (q.v.). An irreducible hernia must be supported with great care. All violent exercises and excess in diet must be avoided. Strangulated hernia, presenting greater danger, requires more prompt relief. The object of treatment is to relieve the constriction. If the reduction cannot be effected by other means, an operation will be necessary. This consists in dividing the parts which produce the constriction. The longer this opera-

tion is delayed, the more dangerous it will become. After the parts are healed, the opening must be subject to compression, as in the case of a simple hernia. Radical operation for hernia is the most advisable form of treatment. It is safe in the hands of a competent surgeon.

Hero, a priestess of Aphrodite at Sestos. The loves of Hero and Leander, a youth of Abydos, on the other side of the Hellespont, are related in a poem by Musæus. No difficulties could discourage Leander. He swam every night across the Hellespont, guided by a torch which shone across the strait from the tower of Hero, and even continued his visits during the winter. On one occasion, however, the guiding light was extinguished, and his strength failed him, and the waves carried his body to the foot of the tower, where Hero anxiously awaited him. Overcome with anguish at the sight, she threw herself from the tower and perished.

Hero of Alexandria (Gr. *Herōn*), Greek mathematician and natural philosopher; fl. perhaps in the 1st century A. D. He seems to have invented a number of machines, among which are "Hero's fountain," and a steam-engine on a principle similar to that of Barker's mill (q.v.). He also made some contributions to pure mathematics. Hultsch edited the remaining fragments of his geometrical works in 1864, and Schmidt began in 1899 an edition of his complete extant writings. See HERO'S FOUNTAIN.

Herod, called THE GREAT, king of the Jews: b. about 62 B.C.; d. 4 B.C. He reigned from 37 B.C. until his death. He was the second son of Antipater the Idumean, who, being made procurator of Judea by Julius Cæsar, appointed him to the government of Galilee. He at first embraced the party of Brutus and Cassius, but after their death reconciled himself to Antony, by whose interest he was first named tetrarch, and afterward king of Judea. After the battle of Actium Augustus confirmed him in his kingdom. As a politician and commander, his abilities were conspicuous. He rebuilt the temple at Jerusalem with great magnificence, and erected a stately theatre and amphitheatre in that city, in which he celebrated games in honor of Augustus, to the great displeasure of the more zealous of the Jews. He also rebuilt Samaria, which he called Sebaste, and adorned it with very sumptuous edifices. He likewise, for his security, constructed many strong fortresses throughout Judea, the principal of which he termed Cæsarea, after the emperor. On his palace, near the temple of Jerusalem, he lavished the most costly materials, and his residence of Herodium, at some distance from the capital, by the beauty of its situation, drew around it the population of a great city. Such, indeed, was his magnificence, that Augustus said his soul was too great for his kingdom. Herod was the first who shook the foundation of the Jewish government, by dissolving the national council, and appointing the high-priests, and removing them at pleasure, without regard to the laws of succession. His policy, ability, and influence with Augustus, however, gave a great temporary splendor to the Jewish nation.

Herod Agrip'pa I., king of Judea: d. Cæsarea 44 A.D. He reigned from 37 A.D. until his death. He was son of Aristobulus. At Rome with Drusus, son of Tiberius, on whose death he left Rome for Idumæa; but returned some years after. On the accession of Caligula 37 A.D. he was honored with the title of king, and received the tetrarchies of Philip and Lysanias, and later that of Antipas. Upon the accession of Claudius his rule was extended to include all the dominions of Herod the Great. It was this Herod who, to please the Jews, caused St. James to be put to death, and St. Peter to be imprisoned. His power and opulence acquired him a great reputation, and he really did much for the benefit of the Jews. His death is described in Acts xii. 20–3.

Herod Agrippa II., king of Judea: d. 100 A.D. He reigned from 53 A.D. until his death. He was son of Herod Agrippa I. He resided much at Jerusalem, and here, together with his sister, Berenice, heard the defense of Paul, addressed to the Roman governor Festus (Acts xxv. 13–xxvi. 32). A great builder, he improved his capital city of Cæsarea Philippi; renamed by him Neronias. It was in his reign that the Temple was completed. Being driven from Jerusalem in the revolt which proved so fatal to the Jews, he joined Cestius, the Roman commander, and, when Vespasian was sent into the province, met him with a considerable reinforcement. During the siege of Jerusalem he was very serviceable to Titus.

Herod An'tipas, tetrarch of Galilee. He reigned from 4 B.C. to 37 A.D. He was son of Herod the Great. This was the Herod who put to death St. John the Baptist (Mark vi. 14–29), in compliment to his wife Herodias, and it is he who is the familiar 'Herod' of the New Testament narrative. Accused of having been concerned in the conspiracy of Sejanus, and of being in secret league with the king of Parthia, he was stripped of his dominions, and sent (39 A.D.) with his wife into exile at Lugunum (Lyons), or, as some say, to Spain, where he died.

Herodes, Atticus. See ATTICUS HERODES.

Hero'dias, a granddaughter of Herod the Great and Mariamne, daughter of Aristobulus and sister of Herod Agrippa I. She was first married to her half-uncle Herod Philip, whom she abandoned to connect herself with his half-brother Herod Antipas. It was by her artifice that Antipas was persuaded to order the death of John the Baptist (Matt. xiv. 3–12; Mark vi. 17–29).

Herod'otus, Greek historian, called the "father of history": b. at Halicarnassus in Asia Minor about 484 B.C. Before writing his history he traveled extensively, visiting the shores of the Hellespont and the Euxine, Scythia, Syria, Palestine, Babylon and Ecbatana, Egypt as far as Elephantine and other parts of northern Africa, everywhere investigating the manners, customs, and religion of the people, the history of the country, productions of the soil, etc. On returning home he found that Lygdamis had usurped the supreme authority in Halicarnassus, and put to death the noblest citizens, and Herodotus was forced to seek an asylum in the island of Samos. Having formed a conspiracy with several exiles he returned to Halicarnassus and drove out the usurper, but the nobles who had acted with him immediately formed an

aristocracy more oppressive than the government of the banished tyrant, and Herodotus withdrew to the recently founded colony of Thurii, in Italy, where he seems to have spent most of his remaining life. Here, at an advanced age, we are told by Pliny, he wrote his immortal work, a statement strengthened by the fact that events are noticed in the body of the book which occurred so late as 409 B.C., while its abrupt ending proves almost beyond question that he was prevented by death from completing it. The history is divided into nine books, each bearing the name of a Muse, and is written in the Ionic dialect. The object of the historian is to narrate the conflict between the Greeks and Persians, and he traces the enmity of the two races back to mythical times. Passing rapidly over the mythical period he comes to Crœsus, king of Lydia, of whom and of his kingdom he gives a comparatively full history. The conquest of Lydia by Cyrus induces him to relate the rise of the Persian monarchy and the subjugation of Asia Minor and Babylon. The history of Cambyses and his Egyptian expedition leads him to introduce the valuable details of the history, geography, and manners and customs of Egypt, occupying the second book. The Scythian expedition of Darius causes the historian to treat of the Scythians and the north of Europe; and the subsequent extension of the Persian kingdom affords him opportunity for an account of Cyrene and Libya. In the meantime the revolt of the Ionians breaks out, which eventually brings on the conflict between Greece and Persia. An account of this outbreak and of the rise of Athens after the expulsion of the Pisistratidæ, is followed by what properly constitutes the principal part of the work, and the history of the Persian war now runs on in an uninterrupted stream until the taking of Sestos. There are English translations of his history by Macaulay (1890); Beloe, Cary, and Rawlinson, the last with important notes and dissertations. The 'Life of Homer,' attributed to Herodotus, and printed at the end of several editions of his works, is now universally believed to be a production of a later date. The best editions of the history of Herodotus are by Wesseling (1763); Schweighäuser (1806); Bähr (1855-61); Stein (1871).

Heroin, hĕr'ō-ĭn, $C_{17}H_{17}NO_3.(CH_3CO)_2$, the diacetic ester of morphine. It occurs as a faintly bitter, colorless, odorless, crystalline powder, which is nearly insoluble in water. It is soluble in dilute acids, however, and is precipitated by alkalies. Its hydrochloric dissolves freely in water and in alcohol, but is insoluble in ether. Heroin was first prominently introduced to the medical world in 1898.

Herold, Louis Joseph Ferdinand, loo-ē zhō-zĕf fĕr-dē-năñ ā-rōld, French musical composer: b. Paris 28 Jan. 1791; d. Thernes, near Paris, 19 Jan. 1833. A pupil of the Conservatoire, he also studied composition under Catel, Méhul, and Cherubini, and in 1812 won the Prix de Rome with the cantata 'Mlle. de la Vallière.' His first opera, 'La Gioventú di Enrico Quinto' (1815) was received by the Neapolitan public with applause. His first serious début as composer for the French stage was with his comic opera 'Les Rosières' (1817). This very successful work was followed in quick succession by numerous others of varying fortune. At last in 1831 appeared his 'Zampa,' and in 1832 his 'Le Pré aux Clercs,' the operas on which his fame chiefly rests, and which have gained a permanent place, the former especially being still produced with acceptance in the principal cities of the Continent. Consult: Jouvin, 'Herold sa Vie et ses Œuvres' (1868).

Her'on, Matilda, American actress: b. Draperstown, near Londonderry, Ireland, 1 Dec. 1830: d. New York 7 March 1877. She was brought to the United States as a child, and appeared on the stage for the first time in Philadelphia as Bianca in 'Fazio.' Her chief parts, in which she met with great success throughout the United States, were Camille in 'La Dame aux Camélias'; and Ulah in 'De Soto.'

Herondas, or **Herodas,** Greek poet, probably flourishing about the latter half of the 3rd century B.C. Little positive information is obtainable concerning the place of his birth, but it was probably in the island of Cos. Prior to 1891 only a few fragments of his verses had been found, but in that year an Egyptian papyrus was found containing several poems (mimes or mimianibi) and these were published by F. G. Kenyon, thus bringing to light a phase of Greek life and times of which the history has been meagre. Seven of the poems are in comparatively complete form, and, besides giving an insight into Heronda's life and work, they picture the every day life of the times in extremely realistic terms, though the satirical portions of them are not personal in their nature. In composition the mimes are in choliambic verse or iambic trimeter and are written in the Ionic dialect. The latest edition containing additions by O. Crusius was published in 1898, entitled 'Untersuchungen zu den Mimiamben des Herondas.' See MIME.

Herons, wading birds of the order *Herodii*, forming, with egrets and bitterns, the family *Ardeidæ*. The family is characterized by a thin, compressed body; a long, thin neck; a straight, narrow, pointed beak; fully feathered head; longish, slender legs; three toes in front, the two outer united by a membrane, the middle claw pectinate; large, blunt wings; extensive development of powder-down tracts; and often by elongated feathers of the top of the head and other parts. Upward of 70 species of herons and their immediate allies are known, of which 14 inhabit North America. The bitterns (q.v.), with 10 tail-quills, form the sub-family *Botaurinæ*, the herons and egrets (q.v.), with 12 tail quills, the *Ardeinæ*. Egrets are simply white herons. The great blue heron (*Ardea herodias*) to which *A. cinerea* of Europe is closely related, inhabits all parts of North America and northern South America. It is a large bird with a length of about four and a spread of nearly six feet, and of beautiful slate-blue color, with the long flowing plumes black. It is to be found by the side of streams, lakes and the seashore, usually alone. Fish form the bulk of its food, but it also devours frogs, small reptiles, insects, and almost any kind of animal which it can capture. It roams in search of food mostly in the morning and evening. The heronry, or breeding-place, is usually found among high trees, and the same breeding-place is used by successive generations if they are unmolested: frequently several species of herons consort together at a favorite breeding-place. The large

nest is made of twigs and sticks, and is lined with rushes, grass, and various similar materials. The eggs, usually three or four in a nest, are of a fairly uniform greenish blue color. Many nests are usually found in one heronry, and sometimes the nests are built on the ground or on a cliff. The cry is a sort of "crank, crank," uttered in a hoarse voice. In the North the blue heron is migratory, elsewhere it is resident. The little blue heron (*A. cærulea*) is found in the eastern United States from the Middle States southward and in the West Indies and Central America. It is scarcely more than one half the size of *A. herodias* and exists in two color phases, the one dark slate-blue with purplish reflections on the head and neck, the other white with traces of blue, especially constant on the unfeathered parts. This species formerly bred with other southern species in great heronries, most of which have been decimated by plume-hunters.

The little green heron or fly-up-the-creek (*Butorides virescens*) ranges throughout temperate North America and somewhat beyond southward, breeding nearly everywhere. Northward it is migratory and is the familiar heron about the streams and ponds of the Middle and New England States, where it usually nests in pairs or small communities and mostly in thick bushes or cedar trees; in other localities it sometimes breeds with larger species in heronries. The pale greenish elliptical eggs are from three to six in number. Its foods consist chiefly of small frogs, minnows and snakes, for which it searches by day as well as by night along the shallows of streams, where its harsh cry of alarm is often the first intimation of its presence. The name refers to the beautiful deep bronze green color of the upper parts.

The night-herons (*Nycticorax nævius*, and *N. violaceus*), which are closely related to the *N. grisea* of Europe, are easily distinguished from other herons by the thick, stout beak. The former, known as the black-crowned night-heron or squawk, is common throughout the United States and Canada in summer, and in the winter migrates far into South America, while the latter, or yellow-crowned species, is much less frequent and chiefly confined to the sea-coast of the warm parts of America. The squawk is about two feet long, the young brownish, the adults deep green and blue-gray above with two or three very long filamentous white occipital plumes. The night-herons are more active after dark than any other species, and are seldom seen abroad, except in the dusk or on cloudy days.

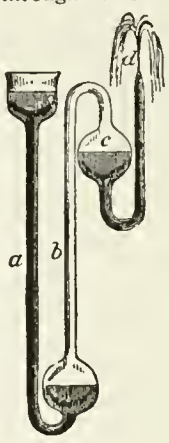
Many species of herons reside in the warm parts of Africa and Asia, among them being the largest of all, the *A. goliath*.

Consult Baird, Brewer and Ridgway, 'Water-birds of North America' (1884); Reichenow, 'Journal of Ornithology' (1877); Job, 'Among the Waterfowl' (1902). See BITTERN; EGRET.

Heroöpolis, an ancient Egyptian city found by excavation in the eastern Delta region. Maps made prior to 1880 generally located the city near the present city of Suez, but the excavations of Naville in 1883 under the auspices of the Egypt Exploration Fund tend to show that the city was farther north. Heroöpolis is given in the Septuagint version of the Old Testament as the meeting place of Joseph and Jacob. The Coptic translation is Pethom, very similar to the Hebrew Pithom, or "House of Tum," and for some time it has been known from Egyptian geographical lists that Pithom was situated in the land of Theku-t. This name has been identified with Succoth, the second resting place of the Children of Israel in their flight from Egypt. The Naville excavations brought to light the old site of Pithom and Succoth, the excavations being made at Tell el-Mashhutah, twelve miles west of Ismailah. A mile-stone which was recovered then showed the distance between Heroöpolis and Clysma to have been nine miles. This would confirm the view taken by Strabo that the city was at the head of the Red Sea navigation and was situated on what he called "Heroöpolitan Gulf," but if his view be correct, then it can only be inferred that the Red Sea extended at that ancient date further north than it now does and that the place where the Israelites crossed was not where it is generally supposed to be, but considerably further north.

Herostratus. See EROSTRATUS.

Hero's Fountain, a pneumatic apparatus, through which a jet of water is supported by condensed air. A simple mode of constructing it by means of glass tubes and a glass-blower's lamp is shown in the annexed figure. The column of water in the tube *a* compresses the air in *b;* this presses on the surface of the water in *c,* and causes it to gush out at *d*.



Hero's Fountain.

Herpes, an acute, non-contagious, inflammatory disease of the skin, characterized by an eruption of one or more clusters of vesicles upon a reddened base. Several forms of the disease are recognized by dermatologists, of which the commonest are facial herpes, and herpes zoster. Facial herpes constitutes the common fever blister, or cold sore, and is usually seen about the mouth, though it also occurs on other parts of the face. There is often some slight constitutional disturbance preceding the eruption, which first makes its advent known by a sensation of burning or itching in the part, followed by reddish discoloration of the skin and after a few hours by a number of pin-head to pea-sized blisters filled with clear or turbid fluid. After a few days these dry up and form a yellowish crust, which then falls off, leaving a red spot that soon disappears. The usual duration of the disease is about a week and it shows a strong tendency to recur. Herpes often accompanies febrile conditions such as pneumonia and malaria, and a similar lesion is not rare about the genitals. Herpes occurs mostly in those whose skin is irritable or delicate, and is usually the result of some derangement of the mucous membrane of the respiratory, digestive or genito-urinary tract. It sometimes is the unfailing harbinger of the menstrual period. Cold, mental depression, and injury or irritation of the skin are other causes. The disease belongs to the class of the neuroses, and in some instances its presence

can be explained only on the basis of nerve disturbance. In most cases no treatment is required, as the lesions promptly heal of their own accord, but soothing ointments or lotions tend to relieve the irritation. Herpes zoster, or shingles, is a special form remarkable for the fact that the eruption follows the course of certain nerves, and is usually disposed around one side of the body like a half belt. In rare cases it encircles the body. Its onset is preceded by stinging neuralgic pains, and by languor, lassitude, loss of appetite, shiverings, headache, nausea, quickened pulse, etc., after which the eruption appears in irregular patches. The vesicles become enlarged to the size of small peas in twenty-four to thirty-six hours, and fresh clusters occur for three or four days, completing the belt-like appearance. As the eruption recedes, by the fifth or sixth day, the vesicles become white and opaque, and the red margins grow livid or purple. Sometimes the vesicles burst, and several of the patches run together, forming irritable sores, discharging a thin serous fluid, which concretes and forms a crust that falls off as the parts beneath heal. The disease occasionally follows injuries to the nerves, and it is common in damp, cold weather of spring or autumn, when it sometimes occurs in epidemics. It is sometimes produced by sudden exposure to cold after violent exercise, and sometimes follows acute affections of the respiratory organs. The treatment consists in attention to any systematic derangement present and in the local use of soothing applications, and protective dressings to prevent rupture of the vesicles. The duration of shingles is usually from ten days to three weeks. Most cases run a favorable course and second attacks are rare.

Herpestis, a genus of dicotyledonous gamopetalous plants, of the natural order *Scrophularineæ*, of the tribe *Gratioleæ*, native to the tropical sections of both hemispheres. It may be distinguished by its calyx, as the upper segment is large and ovate, and covers the rest, the other lobes narrow or linear, its cylindrical corolla, four stamens, and two or four-valved capsule. The genus comprises about fifty species of small, creeping herbs, having opposite, or toothed leaves, and generally flowering solitary or in axillary clusters of yellow, blue or white flowers. *H. Monniera* is the common water hyssop, and the natives of India find the juice of this plant, when mixed with petroleum, of great benefit to parts of the body affected with rheumatism. *H. colubrina*, a native to Peru, is used, under the name of *yerba de colubra*, as a remedy for the bites of poisonous animals.

Herpetology, hĕr-pĕ-tŏl'ō-jĭ, the study of reptiles. In its earlier days it included under the term "reptile" not only those now properly so named, but the amphibia (q.v.) and some other "creeping things" not in either group. Cuvier's classification, the first approach to a scientific one, put both the true reptiles and the amphibians as co-related groups under *Reptilia;* but their formal distinction was soon perceived. Huxley showed that in their descent, embryology and structural relations, the amphibians were more closely related to fishes than to the reptiles (lizards, serpents and turtles). He therefore united the two in a superior group *Ichthyopsida*, while he joined the birds to the reptiles in a group of similar rank called *Sauropsida*. Thus the limits of herpetology have been restricted to truly scientific limits,— the chordate class *Reptilia*, a definite group distinguished by the following characters:

Reptiles are cold-blooded, the temperature of the body not greatly exceeding that of the surrounding medium; the heart is three-chambered, except in crocodilians, where four chambers first occur; mostly venous blood goes from the heart to the anterior viscera, and mixed blood to the posterior region, only the head and anterior regions receiving purely arterial blood; the body is covered with scales, with which subjacent bony plates or scutes are sometimes associated; the vertebræ are absolutely gastrocentrous (biconcave); the skull articulates by a single condyle with the backbone, and the lower jaw works against the quadrate bone; the great majority are oviparous, while in some the eggs are hatched within the mother.

This characterization unites into the one class, many orders of wholly extinct types, one order represented by a single living example (the tuatara "lizard"), and the existing tortoises and turtles, lizards, snakes, and crocodiles; and none other is a reptile, properly speaking. The group occupies a central position in the vertebrate series. Above it on the scale of organization are the birds and mammals; beneath it the amphibians and fishes. Similarly reptiles stand in a middle position in geological history, as the Mesozoic, or Secondary Period, was that in which the group flourished, and of which the existing forms are, on the whole, the diminished and degraded remnants. In respect to their phylogeny: "On the one hand, there is not the slightest doubt," declares Gadow, "that they are evolved from some branch of the Stegocephali (q.v.), whilst on the other hand the reptiles, probably through some branch of the Theromorpha, have given rise to the mammals; some other reptilian branch, at present unknown, blossomed out into birds."

Classification.—The most recent classification of the reptiles, perfected since about 1875 by the enormous amount of information collected in all parts of the world, and especially in the western United States, in regard to fossil forms (see PALÆONTOLOGY), is that formulated by H. Gadow ('Amphibia and Reptiles,' 1901), expressing substantially the consensus of all specialists, and is as follows:

CLASS REPTILIA.

SUBCLASS I. *Proreptilia.*—Permian reptiles in which the components of the vertebra remain separate; well developed limbs and girdles fitted for a terrestrial life. The fragmentary remains of these animals are hard to separate definitely from the Stegocephali.

SUBCLASS II. *Prosauria.*—Chiefly extinct reptiles with deeply amphicœlous vertebræ whose parts are still unfused; movable chevron bones occur in the tail and frequently, with intercentra, in the trunk.

Order I.—*Microsauri.*—Small Carboniferous and Permian reptiles with dermal armor on the dorsal and ventral side of the trunk and tail; and ribs with head and tubercle. The armor of the skull, and the flat ischia and pubes of the pelvis resemble the condition in Stegocephali.

Order 2.— Prosauri.— Permian to recent, terrestrial, unarmored, generalized reptiles, of which one species (*Sphenodon,* or *Hatteria, Punctatum*) still persists in New Zealand (see TUATARA). This animal is distinguished from the lizards with which it was formerly placed by many skeletal characters, such as the fixed quadrate bone and the broad bony roof of the mouth.

SUBCLASS III. *Theromorpha.*— Fossil reptiles with fixed quadrate bone, only one temporal arch, and having pubes and ischia united ventrally in one broad symphysis. This group has an especial interest because it is probably the one from which mammals sprang, and flourished between the Permian and Triassic ages. See THEROMORPHA.

SUBCLASS IV. *Chelonia.*— Reptiles with an upper and lower bony shield, four feet, and toothless jaws — the turtles. There are two orders, *Athecæ* and *Thecophora.* See CHELONIA.

SUBCLASS V. *Dinosauria.*— Mesozoic reptiles, having a long tail, powerful hind legs, fixed quadrate bones, and bifurcated ribs. It is divisible into several orders. See DINOSAURIA.

SUBCLASS VI. *Crocodilia.*—Four-footed, long-tailed reptiles, with fixed quadrate bone, teeth in alveolæ and confined to jaws; ischia not united by a symphysis. The group had its origin in the Dinosauria, from which it is difficult sharply to separate it, arose in the Mesozoic era, and the early forms were marine. The strict *Crocodilia* first appeared in the lower Jura, and have evolved along two parallel lines of advance, one of which ends in the recent long, sharp-snouted gavials, and the other in the broad, short-snouted crocodiles and alligators (qq.v.). The skin is covered with horny scales or scutes which, in some fossil species formed an osseous armor. The front nasal openings lie on the dorsum of the snout near its apex, and their hinder ends are carried by the broad and deep palate far back into the throat. By this means the alligator can lie submerged with its mouth open so as to bring the nostrils to the surface and thus breath without carrying water into the windpipe. The lungs are large and of complicated structure. The heart has practically four chambers as in mammals. There are three orders: *Pscudosuchia,* early generalized forms, expiring in the Jurassic age; *Parasuchia,* extinct forms of the Jurassic and Triassic periods (See CROCODILE, FOSSIL; BELODON); *Eusuchia,* modern crocodilians. See CROCODILE.

SUBCLASS VII. *Plesiosauria.*—Mesozoic reptiles, with pentadactyle appendages adapted to life in water; fixed quadrate bones, numerous alveolar teeth, and ribs without tubercles. They apparently filled the place of the dolphins of to-day, except that the neck is in most species extremely long. See PLESIOSAURIA.

SUBCLASS VIII. *Ichthyosauria.*— Mesozoic, marine, whale-like, viviparous reptiles, with appendages transformed into paddles. The teeth are conical, lie in a groove and are very numerous. See ICHTHYOSAURIA.

SUBCLASS IX. *Pterosauria.*— Mesozoic aërial reptiles with fixed quadrate and anterior appendages forming wings — the pterodactyls. See PTEROSAURIA.

SUBCLASS X. *Pythonomorpha.*—Elongate marine cretaceous reptiles with movable quadrate bones; appendages shaped like paddles, teeth fused with jaws. Two orders, *Dolichosauri* and *Mosasauri.* See MOSASAURS.

SUBCLASS XI. *Sauria.*— Reptiles with movable quadrate bones and transverse cloacal opening; the most recent of the reptiles, probably originating in the *Prosauria.* It contains two orders: *Lacertilia* (geckos, lizards, and chameleons); and *Ophidia* (snakes).

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Herrera, Francesco de, frän-thēs'kō dā ār-rā'rä, called EL VIEJO (the Elder), Spanish painter: b. Seville 1576; d. Madrid 1656. He broke with the Italian traditions of Spanish painting and became the founder of the Spanish national school. He also worked in bronze, and it was this probably which gave rise to the charge that he was connected with counterfeiters. He had a disposition so very detestable that his pupils, of whom Velasquez was one, all left him. The Louvre contains some of his works, among others 'The Israelites Gathering the Quail in the Wilderness.' But the best are at Seville, including the 'Last Judgment,' in the Church of San Bernardo; 'Saint Peter,' in the Cathedral; and 'Moses Smiting Water from the Rock,' one of four large canvases in the archiepiscopal palace. His frescoes at both Madrid and Seville have quite disappeared.

Herrera, Francesco de, called EL MOZO (the Younger), Spanish painter: b. Seville 1622; d. Madrid 1685. He studied art under his father, Francesco, called El Viejo (q.v.) (to whom he was very far inferior as a painter), and remained some years at Rome. He was a founder of the Seville Academy (1660), and became its vice-director. Subsequently he was appointed court-painter to Philip IV. In the Seville Museum is his 'Four Doctors of the Church Adoring the Host'; in the Prado Museum, 'Saint Hermenegild.' During his residence in Italy he painted fish with such success that he was known there as 'Lo Spagnuolo dei Pesci.'

Herrera, José Joaquin de, hō-sā' hō-ā-kēn, Mexican military officer: b. Jalapa 1792; d. Tacubaya 10 Feb. 1854. He joined the Mexican army in 1809, and in 1821 was promoted brigadier-general. He aided in overthrowing Iturbide, when the latter became emperor, and was successively minister of war and president of the supreme court. President for a brief period in 1845, he again held office in 1848–51. During the war with the United States, he was aide to General Santa Anna.

Herreshoff, hĕr'rĕs-hŏf, **John B.,** American shipbuilder: b. Bristol, R. I., 1841. Under his management the Herreshoff Manufacturing Company succeeded Edward Burgess in designing and building the fastest yachts in the world. Although he has been blind since the age of 15, he has always been active in business.

Herreshoff, Nathaniel Greene, American shipbuilder: b. Bristol, R. I., 1848. He was

educated at the Massachusetts Institute of Technology, and was graduated Sc. M., at Brown University. He is superintendent of the Herreshoff Manufacturing Company, and has designed many torpedo-boats and yachts, notably those sloops which have engaged in the international races of recent years.

Her'rick, Christine Terhune, American writer on domestic economy: b. Newark, N. J., 1859. She is a daughter of M. V. Terhune (q.v.) and has published: 'Housekeeping Made Easy' (1888); 'The Little Dinner'; 'Liberal Living Upon Narrow Means'; 'First Aid to the Young Housekeeper' (1900); etc.

Herrick, Clarence Luther, American college president: b. Minneapolis, Minn., 21 June 1858. He was graduated from the University of Minnesota in 1880, and after holding professorships at Denison University, Ohio, and the University of Chicago, became president of the University of New Mexico at Albuquerque.

Herrick, Myron T., American capitalist and politician: b. Huntington, Lorain County, Ohio, 1854. He studied at Oberlin College and Ohio Wesleyan University, went to Cleveland in 1875, and taking up the study of law was admitted to the bar in 1878. He soon gave up the profession of law, however, and organized the Euclid Avenue National Bank, from this time onward being prominent in financial circles. At first secretary of the Society for Savings Bank in Cleveland, he became its president in 1894, and has been connected with various railroad and other large financial enterprises. He has taken a keen interest in national and local politics from a Republican standpoint, in 1903 was elected governor of Ohio, but in 1905 was defeated by John M. Pattison.

Herrick, Robert, English lyric poet: b. London 20 Aug. 1591; d. Dean Prior, Devonshire, October 1674. He was educated at Cambridge, at one time studied law, but entered the Church, and in 1629 received the living of Dean Prior, Devonshire. Previous to this he had written much poetry, and had also indulged in the gayeties of London, where he had become a friend of Ben Jonson and other kindred spirits. In common with many others of the Episcopal clergy, he was ejected from his living in 1647, whereupon he returned to London, and lived there on scanty means till he was restored in 1662. The first collected edition of his poems was published in 1648, under the title of 'Hesperides, or the Works, both Humane and Divine, of Robert Herrick.' Herrick sank for a considerable time into unmerited neglect. From this he was rescued by Nott, who, in 1810, published a selection of poems from his 'Hesperides.' There are complete editions by W. C. Hazlitt (1869) and Grosart (1876). Notwithstanding his frequent coarseness in his secular pieces, his sacred poems appear to be the outcome of sincere piety. He has been pronounced by Campbell a writer of delightful Anacreontic spirit, and by many critics he is ranked as the best of English lyric poets. Some of his songs, as 'Cherry Ripe,' 'Gather the Rosebuds while ye May,' etc., are still popular favorites.

Herrick, Robert Welch, American novelist: b. Cambridge, Mass., 26 April 1868. He was graduated at Harvard in 1890, and in 1895 became assistant professor of rhetoric at the University of Chicago. His literary style displays much finish, while his studies of character are both keen and discriminating. He has published: 'The Man Who Wins' (1895); 'Literary Love Letters and Other Stories' (1896); 'Love's Dilemmas' (1898); 'Composition and Rhetoric' (1899); 'The Web of Life' (1900); etc.

Herrick, Sophie McIlvaine Bledsoe, American microscopist, daughter of Albert T. Bledsoe (q.v.): b. Gambier, Ohio, 26 March 1837. She was editor of the 'Southern Review' 1875–8, and has since been connected with the editorial staff of 'Scribner's Magazine' and its successor, 'The Century.' She has published 'Wonders of Plant Life under the Microscope' (1883); 'The Earth in Past Ages'; 'Chapters in Plant Life.'

Herring. The typical fishes of the family *Clupeidæ* (q.v.), to which also belong the shad, alewife, sardine (qq.v.), and other food-fishes, the numbers of which consumed makes this the most important economically of all families of fishes. The true or sea-herrings belong to the genus *Clupea*. The common herring (*C. harengus*) of both sides of the North Atlantic swims in enormous schools containing countless numbers of individuals packed as closely as possible over areas of often 6 to 20 square miles. The herring is a migratory fish, but its movements are so complicated that much mystery still clings to them. The most satisfactory conclusions have been arrived at by a German commission appointed to study the natural history of the Baltic, etc., which concluded that the herrings live in the deep water off the coasts which they approach periodically chiefly for the purpose of spawning; that there exist a large number of distinct races, differing in size, form, times of spawning, and various other peculiarities, and that each of these races swims in separate schools, which move independently and have different seasons and grounds for spawning. Spawning takes place at various seasons, according to locality, some schools spawning in the late winter, others in the spring, and still others during the autumn months. The eggs are small and adhere in masses to seaweeds, stones, etc., on the bottom. Vast numbers are thus deposited in certain favored localities to which haddock and other fishes are attracted for the purpose of devouring them. The number of eggs produced by each fish is not especially large, being from 10,000 to 50,000, but nevertheless the natural productiveness of the herring has been sufficient to overcome inroads caused by the fisheries and the much greater destruction due to the hordes of bluefish, sharks, porpoises, gulls, and other enemies which accompany the schools in order to prey upon them. Having only few and small teeth, the herrings cannot capture active living creatures, but, as they swim with quick, nervous movements, water is being continually taken into the mouth and strained through the gill-rakers. By this means great numbers of copepods and other minute forms of life, especially larval crustaceans, annelids, and mollusks, are retained within the mouth and swallowed.

The herring fishery is of stupendous importance to the countries of northern Europe, whose prosperity is as much dependent upon this industry as ours is upon the wheat crop.

This is especially true of the Scandinavian countries, whose hardy fishermen take from the sea annually not less than 1,500,000,000 pounds. Scotland takes from 150,000,000 to 200,000,000 pounds, and the other maritime nations usually smaller quantities. On this side of the Atlantic the fishery is much less extensive, but is growing, and is no doubt destined to reach a great magnitude, especially in the waters of British America, which furnish each year about 250,000,000 pounds. Although found as far south as North Carolina, the herring has a commercial importance only north of Cape Cod, the New England fisheries, which are chiefly confined to Maine, yielding in 1898 64,589,000 pounds, worth $600,000. Most of these were sold fresh, either for food, or, early in the season, for cod bait; of the remainder, about 7,000,000 were salted and nearly 4,000,000 smoked. A favorite preparation is the partly smoked form of "bloaters." Large quantities of young herrings are packed and sold as sardines. In the prosecution of the American fisheries use is made chiefly of several forms of drift or gill nets and seines; under favorable conditions of great tidal movements, as in the Bay of Fundy, great numbers are captured in weirs.

A closely similar species (*C. pallasii*) is found on the Pacific coast of America, and is the object of a rapidly extending fishery. Of the anadromous river-herrings or alewives (*Pomolobus*), two species are of great commercial importance on the Atlantic coast of the United States, particularly southward, though the fisheries extend from Maine to Florida. They enter the rivers to spawn about the same time as the shad, with which they are caught chiefly in pound nets and seines. In 1896, 2,500 persons were employed in the fishery, the product of which was about 50,000,000 pounds, valued at $460,000. The greater number are smoked.

To the extensive literature of the herring, the following references will serve as an introduction: Goode, 'Fishery Industries of the United States' (1884); Smith, 'Alewife Fisheries of the United States,' in Report of United States Fish Commission for 1898; Cunningham, 'Marketable Marine Fishes'; 'Report of the Commission for the Scientific Investigation of the German Seas' (a very important contribution in German); 'Annual Reports' of the United States Commissioner of Fisheries.

Herring Gull, the most numerous and widely spread of gulls, common in the breeding season throughout all the northerly parts of the world, and migrating southward in winter. The silvery sheen of white and pearl-blue plumage are indicated in its technical name (*Larus argentatus*); and its habit of following schools of fishes and picking them up gives it the name of herring-gull. The same name is often given, however, to several others of the smaller gulls. See GULLS.

Herrnhut, hĕrn'hoot, a small town or village in the kingdom of Saxony, in the circle and 18 miles southeast of Bautzen. It is situated at the foot of Hutberg Mountain, 1,054 feet above the level of the sea. It was founded by Count Zinzendorf 1722, for the use of the Moravian Brethren, and it afterward became the metropolis and centre of that sect of Christians, who, from this town, are often called Herrnhuters. (See UNITED BRETHREN.) The town is built with great regularity, and distinguished by the order, cleanliness, and stillness which prevail in it. It has a great variety of manufactures, principally of linen, calico, tobacco, and of articles in gold, tin, leather, etc. The objects of curiosity are the observatory and the burial-ground on a neighboring hill, resembling a garden, and called by the brethren "Garden of Peace." Pop. 1,200.

Her'ron, Francis Jay, American soldier: b. Pittsburg, Pa., 17 Feb. 1837; d. New York 8 Jan. 1902. He was graduated at the Western University of Pennsylvania in 1854, and on the breaking out of the Civil War commanded the Governor's Grays in the First Iowa regiment. In 1861 he was made lieutenant-colonel of the Ninth Iowa regiment. In 1862 he received the commission of brigadier-general of volunteers. Early in 1863 he joined Gen. Grant at Vicksburg and commanded the left wing of the besieging forces as major-general (1862), until the capture of the city. He subsequently captured Yazoo City, with its boats and supplies; commanded the Thirteenth army corps, and broke up the traffic along the Rio Grande, assisted President Juarez against Maximilian's forces, and in June 1865 received the surrender of the Confederate forces west of the Mississippi. In 1873 he took up his residence in New York, where he practised law until his death.

Herron, George Davis, American clergyman and social reformer: b. Montezuma, Ind., 21 Jan. 1862. He was educated at Ripon College, Wisconsin, and also studied in Europe. He became pastor of the Congregational Church in Lake City, Minn., and while there made an address ("The Message of Jesus to Men of Wealth") before a Minneapolis club, which attracted much attention; he subsequently received a number of calls from important churches, and went as pastor to Burlington, Ia. Here he organized a club for the discussion of social questions, which was largely attended, especially by workingmen. In 1893 he accepted the chair of applied Christianity at Iowa College, resigning in 1900 on account of the objection to his teachings; he then organized a religious and socialist movement known as the "social crusade." In 1901 he divorced his wife, and married a second time, an action which aroused much criticism. He has written: 'The Larger Christ' (1891); 'The Call of the Cross' (1892); 'A Plea for the Gospel' (1892); 'The New Redemption' (1893); 'The Christian Society' (1894); 'The Christian State' (1895); 'Social Meaning of Religious Experiences' (1897); 'Between Cæsar and Jesus' (1899).

Herschel, hĕr'shĕl, **Caroline Lucretia,** sister of Sir William Herschel (q.v.), German astronomer: b. Hanover, Germany, 16 March 1750; d. there 9 Jan. 1848. In her 22d year she went to England to reside with her brother, then organist in Bath. When William abandoned his former profession in favor of astronomy she became his helpmate, and when he was appointed private astronomer to George III. she discharged efficiently all the duties of an assistant astronomer, for which she was allowed a small salary. Although these duties were very arduous, she yet found time to conduct a series of observations of her own with a small Newtonian telescope her brother had made for

HERRING GULL (*Larus Argentatus*).

her. She devoted special energy to the discovery of comets, and was so successful as to be entitled to claim the priority of discovery of at least five. Several remarkable nebulæ and clusters of stars included in her brother's catalogue were described from her original observations. In 1798 her valuable work, 'A Catalogue of Stars taken from Mr. Flamsteed's Observations, with Introductory Remarks by W. Herschel,' was published by the Royal Society. On her brother's death in 1822 she returned to her native country, where she died after an unusually protracted life, distinguished by useful scientific labors. The Royal Society recognized the value of her labors by bestowing upon her in 1828 their gold medal, and some time afterward by conferring upon her the privileges of honorary membership.

Herschel, Sir John Frederick William, English astronomer; only son of Sir William Herschel (q.v.): b. Slough, near Windsor, 7 March 1792; d. Collingwood, Kent, 11 May 1871. He was educated at Eton and Cambridge. His first publication was 'A Collection of Examples of the Application of the Calculus to Finite Differences' (1820), but it was not until the death of his father that he devoted his special attention to those astronomical researches which have made the name of Herschel so famous. He limited his first exertions to a re-examination of the nebulæ and clusters of stars discovered by his father, and in 1824, with James South, reported to the Royal Society the position and apparent distances of 380 double and triple stars, obtained by more than 10,000 measurements. This memoir attracted the notice of the French Academy, and they voted it their astronomical prize; and two years later the gold medal of the Royal Society was awarded to each of the astronomers. The results of the re-examination were given in 1833 to the Royal Society in the form of a catalogue of stars in order of their right ascension. The catalogue contained observations on 525 nebulæ and clusters of stars not noticed by his father, and on a great number of double stars, between 3,000 and 4,000 in all. His 'Treatise on Sound' appeared in the 'Encyclopædia Metropolitana' in 1830, as did his 'Treatise on the Theory of Light' in 1831, in which year also appeared his well-known 'Preliminary Discourse on the Study of Natural Philosophy,' one of the most charmingly written books on science. In 1831 he was created a knight of the Royal Hanoverian Order. In 1833 Herschel published in Lardner's 'Cabinet Cyclopædia' a 'Treatise on Astronomy,' subsequently enlarged into 'The Outlines of Astronomy,' of which several editions have been published. Before this, however, he had undertaken a private expedition to the Cape of Good Hope for the purpose of carrying out in the southern hemisphere observations similar to those he had made in the northern. Four years were spent near Cape Town (1834–7). His great object was to discover whether the distribution of the stars in the southern hemisphere corresponded with the results of his father's labors, prosecuted mainly on the opposite side of the Galactic Circle. That the observations might be strictly comparable they were made by the same method as Sir W. Herschel, and with a telescope of the same optical power. The whole number of stars counted in the telescope amounted to 68,948, included within 2,299 fields of view. By a computation based on the star-gauges in both hemispheres relative to the Milky Way, Sir John found that the stars visible in a reflecting telescope of 18 inches aperture amounted to 5,331,-572; and, more than this, the number really visible in the telescope was vastly greater, for in some parts of the Milky Way the stars were found to be so crowded in space as to defy all attempts to count them. The results of this vast labor were published in 1847, expense being borne by the Duke of Northumberland. On Herschel's return to England in 1838 he was received with every public honor, and on the queen's coronation was created a baronet. In 1848 he was president of the Royal Astronomical Society. He was buried in Westminster Abbey.

Herschel, Sir William, Anglo-German astronomer: b. Hanover, Germany, 15 Nov. 1738; d. Slough, near Windsor, England, 25 Aug. 1822. He went to England in 1757, and at first was employed in the formation of a military band. Although enthusiastically fond of music, he devoted his leisure hours to mathematics and astronomy; and being dissatisfied with the only telescopes within his reach, he set about constructing one for himself, in which undertaking he succeeded, having in 1774 finished a reflecting instrument of 5½ feet. Encouraged by his success he proceeded to complete larger telescopes, and from this period gradually withdrew from his musical engagements. Late in 1779 he began a regular survey of the heavens, star by star, with a 7-foot reflector, and after 18 months labor discovered, 13 March 1781, a new primary planet, named by him the *Georgium Sidus*, but now known as *Uranus*. George III. gave him a pension, enabling him to devote the rest of his life to astronomy. At Slough, he commenced the erection of a telescope of the dimensions of 40 feet, and completed it in 1787. Its diameter was 4½ feet, and it weighed 2,118 lbs. With this powerful instrument he continued to prosecute his discoveries, regularly communicating the results to the Royal Society till 1818. In 1783 he thought he had discovered a volcanic mountain in the moon, and from further observations made with his large instrument in 1787 found he was the victim of an optical illusion. He discovered two of the satellites of Saturn, and the fact that his system of rings revolved, and he measured his rotation and that of Venus, announced to the world that there were binary stars in the heavens, etc. Herschel received much assistance in making and recording observations from his sister Caroline (q.v.); and latterly his brother, a skilful optical instrument-maker, lent him valuable aid. In 1802 he laid before the Royal Society a catalogue of 5,000 new nebulæ, nebulous stars, planetary nebulæ, and clusters of stars he had discovered. See 'Herschel, his Life and Works,' by Holden (1881).

Her'schell, Farrer, Lord, English lawyer and statesman: b. London, England, 2 Nov. 1837; d. Washington, D. C., 1 March 1899. He was educated at University College, London, and the University of Bonn. He became a barrister of Lincoln's Inn in 1860; was recorder of Carlisle 1873–80; solicitor-general 1880–5; and lord high chancellor in 1886, and again 1892–5. He was a member of the Venezuela and British Guiana boundary arbitration tribunal in 1897,

and was subsequently appointed one of the high joint commissioners from Great Britain, on the Anglo-American Commission, designed to settle existing differences between the United States and Canada, of which he became president. During the sitting of the commission in Washington, D. C., in February 1899, he had a severe fall, from the effects of which he died shortly after.

Hertel, hĕr'tĕl, **Albert,** German painter: b. Berlin 19 April 1843; studied at the Berlin Academy, where he became professor in 1875, and was made a member in 1901. Among his landscapes are 'Olive Harvest in Capri' (1872); 'After the Storm on the Coast of Genoa' (1878); 'Road Between Rapalla and Santa Margherita' (1892); and 'View in the Roman Campagna' (1896).

Hertel de Rouville, ār-tĕl dė roo-vēl', **Francis,** Canadian soldier: b. Three Rivers, Maurice County, Quebec, 1643; d. 1722. He was captured in 1681 and tortured by the Iroquois who were so struck by his fortitude that they adopted him into their tribe, from which he escaped and as one of Frontenac's lieutenants performed some remarkable exploits against the English from whom he captured Falmouth, now Portland. Louis XIV. tardily rewarded him with a patent of nobility.

Herter, Albert, American artist: b. New York 2 March 1871. He studied painting at Paris in the studio of Jean Paul Laurens. He has twice visited Japan and the years spent there have strongly influenced the character of his work. He is member of the Society of American Artists, of the Water Color Club, and of the Water Color Society.

Hertz, Heinrich, hīn'rĭH hĕrts, German physicist: b. Hamburg 22 Feb. 1857; d. Bonn 1 Jan. 1894. He studied at the University of Berlin, and in 1880 became assistant to Helmholtz there. In 1883 he was lecturer on theoretical physics at the University of Kiel; in 1885 was professor of physics at a technical school in Karlsruhe; and in 1889 succeeded Clausius as professor of physics at the University of Bonn. His most important work was his experiments with electricity, by which he proved that electricity can be transmitted in electromagnetic waves with the same rapidity as light, these waves showing the same phenomena of refraction, polarization, etc., as light waves. He thus further developed and attested the truth of Faraday's electro-magnetic theory of light. It is by means of the Hertzian waves also that wireless telegraphy (q.v.) is made possible.

Heruli, hĕr'ū-lī, a Teutonic tribe first heard of in history about the middle of the 3d century, who passed south from the coast of the Baltic and swept with the Goths into the eastern provinces of Rome and founded an empire on the Danube. They appear as reinforcements of Odoacer in his invasion of the western provinces of Rome in 476. Their king Rudolph formed an alliance with Theodoric the Great, but they were afterward conquered by the Longobardi. A part of them were driven toward Scandinavia, a part lingered on the borders of the Roman empire. They did good service to the Byzantine empire, but after encountering the Vandals in Africa, and the Ostrogoths in Italy, they vanished from history.

Herzel, Theodor, Jewish leader of political Zionism: b. Budapest 2 May 1860; d. 3 July 1904. He was educated in Vienna for the law, but devoted himself almost exclusively to journalism and literature. He was at first Paris correspondent and later literary editor of the *Neue Freie Presse,* and wrote comedies and dramas. In 1896 he published his 'Judenstaat,' the English translation of which ('A Jewish State') made him the political leader of the Zionist movement; and his efforts were at once centred in this propaganda. 'Die Welt' of Vienna was established by him in 1897, and in that year he planned and was elected president of the first Zionist Congress held at Basel. At every subsequent congress (the sixth having been held in August 1903) he was unanimously re-elected. In 1898 he inaugurated a series of diplomatic interviews with various sovereigns and statesmen. At the Hague Peace Conference he was received by many of the delegates. In the Zionist movement he was officially the chairman of the Grosses Actions Comité, and of the Vienna executive committee, and a member of the council of administration. Among his further works are: 'Das Neue Ghetto' (1903), directed against the Jewish element that combated his views; 'Altneuland' (1903), a fictional presentation of Zionistic ideas.

Herzegovina, hĕrt-sĕ-gō-vē'nä, Austria-Hungary, a province of the Balkan peninsula nominally belonging to European Turkey, but since 1878 administered along with Bosnia (q.v.) by Austria. It is bounded on the north by Croatia and Bosnia, on the east by Bosnia, on the southeast by Montenegro, and on the south and west by Dalmatia; length, northwest to southeast, 140 miles; breadth, 50 miles; area, 700 square miles. The surface is generally mountainous, covered by ranges belonging to the Dinaric Alps, sloping gradually to the Adriatic, which receives all its drainage chiefly by the Narenta. It contains many fertile valleys, and raises excellent tobacco. The exports consist chiefly of hides, tallow, cattle, wool, wax, and fruit. Mostar is the chief town. The province was conquered by the Turks in 1465. An insurrection, caused by Turkish misgovernment, broke out in July 1875, and was the cause subsequently of war between Russia and Turkey. In accordance with the Treaty of Berlin (1878) the province was occupied by Austrian troops, and is now ruled by an Austrian military governor. Pop. about 250,000.

Hesiod, hē'sĭ-ŏd, Greek poet: b. Ascra, a village of Bœotia, at the foot of Mount Helicon, whence it is called the *Ascræan.* But little is known of Hesiod with certainty. Even the age in which he lived cannot be precisely determined. A very common tradition relates that, in a poetical contest with Homer at Chalcis, he came off victorious. Herodotus calls him a contemporary of Homer, and says they lived 400 years before himself (about 900 B.C.). In his 'Works and Days' (172) Hesiod says that he belonged to the period immediately following the Trojan war; but there are many reasons for supposing that he lived at a later period. Of the numerous works attributed to him three only remain. These are the 'Theogony,' a collection of the oldest fables concerning the birth and achievements of the gods, arranged so as to form a connected whole. It is the most

important and difficult of all his works. With it was probably connected the lost 'Catalogues of Women' (or the *Eoiai megalai*), to the fourth book of which the second fragment (the 'Shield of Heracles') must have belonged. This is evidently composed of three distinct parts, only one of which is occupied with the real description of the shield. The third fragment is a didactic poem, 'Works and Days' (*Erga*, or *Erga kai Hemerai*). It treats of agriculture, the choice of days, etc., with prudential precepts concerning education, domestic economy, navigation, etc. The Hesiodic poems are inferior to the Homeric in almost every respect. Hesiod's complete works have been translated into English verse by Elton, and Bohn's Classical Library contains a prose version.

Hesperides, hĕs-pĕr'ĭ-dēz (daughters of Hesperis), the guardians of the gold apples which Ge (the Earth) had given to Hera on her marriage. They were the daughters of Atlas and Hesperis, but their parentage is differently represented by other writers. They were four in number and their names were Agle, Arethusa, Erytheia, Hesperia, or Hesperarethusa. They were assisted in the charge of their garden by the sleepless dragon, Ladon. It was the twelfth labor of Heracles to bring the golden apples of the Hesperides to Eurystheus.

Hesperornis, hĕs-pē-rôr'nĭs, a remarkable extinct form of bird, the remains of which are met with in the cretaceous deposits of Kansas. As described by Prof. Marsh, it possessed small pointed reptilian teeth, which were implanted in a deep continuous groove, somewhat like those of Ichthyosaurus. Its brain was small and more reptilian in type than that of any adult bird as yet examined. It appears to have been a large diving-bird, measuring over five feet from the point of the bill to the end of the toes. Its wings were rudimentary, its legs powerful, and its feet well adapted for rapid progression in water. The tail was broad, could move up and down, and was probably used as a rudder or swimming-paddle. The long slender jaws were united in front only by cartilage, as in serpents, and had on each side a joint which admitted of some motion, so that "the power of swallowing was doubtless equal to almost any emergency." Consult: Lucas, 'Animals of the Past' (1901).

Hesperus, hĕs'pē-rŭs, among the Greeks the planet Venus, when it appeared as evening star, personified as the divinity that at weddings leads the bride to the arms of her husband. He is called Phosphorus or Lucifer as a morning star, and is styled the son of Eos (Aurora) and Cephalus. He was also known as son or brother of Atlas, and brother of the Hesperidæ.

Hesperus Peak, an elevation of the La Plata Mountains, in the southwestern part of Colorado. Gold and silver have been mined in the vicinity. This peak is one of a group of high peaks in this part of the State; the height is about 13,135 feet.

Hesse, hĕs, or **Hessia** (German, HESSEN, hĕs'sĕn), Germany, an ancient territory inhabited in the time of the Romans by the Catti or Chatti, an old Germanic tribe. Under the Frankish kings Hesse was governed by counts, the principal of whom were the Counts of Gudensberg of the name of Giso. Philip I. the Generous, who succeeded to the sovereignty of the whole country in 1509, and who was the earnest and zealous friend of the Reformation, divided his dominions among his four sons. The eldest, William IV., obtained one half, including the capital, Cassel; Louis IV. one fourth, comprising Marburg; Philip II. one eighth, with Rheinfels; and George I. also an eighth, with Darmstadt. But Philip dying in 1583, and Louis in 1604, without children, there remained only the main branches of Hesse-Cassel and Hesse-Darmstadt (qq.v.).

Hesse, Grand Duchy of, formerly HESSEN-DARMSTADT, Germany, a state consisting of 13 divisions. Eleven of these are small, six surrounded by Prussian territory, and five on the borders of Baden and Würtemberg. The other two portions, forming about nine tenths of the whole, are separated by a belt of land stretching east to west, and including part of the Prussian dominions. The more southerly of these portions forms the two provinces of Rheinhessen and Starkenburg. The northern portion, forming the province of Oberhessen, is surrounded by the Prussian province of Hesse-Nassau; area of whole grand duchy, 2,964 square miles. Oberhessen is generally mountainous; Starkenburg and Rheinhessen are also mountainous; in the southwest the Donnersberg, a northern ramification of the Vosges, rapidly subsides to the extensive plains belonging to the valleys of the Main and the Rhine. To the latter river the whole surface of the grand duchy belongs, with exception of a small portion in the north, drained by the Eder and Fulda, affluents of the Weser. The climate is greatly diversified, varying with the altitude. The soil, particularly in the provinces of Starkenburg and Rheinhessen, is fertile, and grain of all kinds is raised in large quantities. Hemp, flax, potatoes, and rape-seed also are extensively grown, and in particular districts tobacco and hops. The vine forms an important object of culture, and fruit is abundant. Horses, cattle, sheep, and swine are numerous. The minerals include iron, coal, lignite, and salt; and there are good quarries of sandstone, limestone, whetstones, basalt, and roofing-slate. The most important manufacturing industry is linen. The principal towns are Darmstadt, the capital; Mainz, Giessen, Bingen, and Worms. The grand duchy is an hereditary monarchy. The constitution dates from 1820, but was somewhat modified in 1856 and 1872. The legislative power is vested partly in two chambers — an upper, composed chiefly of nobility and citizens, appointed for life by the grand-duke; and a lower, composed chiefly of deputies from the towns, villages, and rural districts. About two thirds of the inhabitants are Protestants. Pop. (1900) 1,119,893. The grand-ducal line was founded in 1567 by George I., son of Philip the Generous. By the death of the landgrave of Hesse-Homburg, in 1866, Louis III., grand-duke of Hessen-Darmstadt, succeeded to his dominions. In the German war of that year Hessen-Darmstadt joined Austria. Its army was nearly annihilated at Friedberg, and it was deprived of the newly-acquired landgraviate and other districts. In 1870 the grand duchy of Hesse entered the German empire. Louis IV., who succeeded Louis III., died in 1892. He was the husband of Princess

Alice of Great Britain, and their son, Ernest Louis, is now the reigning sovereign.

Hesse-Cassel, hĕs-kăs'ĕl, or **Electoral Hesse,** Germany, a former electorate and independent member of the Germanic Confederacy, between Rhenish Prussia and Bavaria, containing 4,430 square miles, with about 850,000 inhabitants, mostly Protestants. It was founded by the eldest son of Philip the Generous, the Landgrave William IV., surnamed the Wise (1567–92). For a long period the history of Hesse-Cassel was a narrative of conflicts between the people for political freedom and the elector for absolute rule. The demands of the people were on several occasions strengthened by appeals to the elector from the Prussian government. On the outbreak of the German war of 1866, the elector joined Austria, and his territory was occupied by Prussian troops. On the conclusion of the war Hesse-Cassel was annexed to the Prussian territories, and now forms part of Hesse-Nassau (q.v.).

Hesse-Nassau, hĕs'năs'â, or **Hessen-Nassau,** hĕs'sĕn-năs'sow, Germany, a province of Prussia, which includes the former principality of Hesse-Cassel (except some small districts), the greater part of the former duchy of Nassau, that portion of the former landgraviate of Hesse-Homburg which lies on the right bank of the Rhine, the territory and town of Frankfort, and some small districts ceded by Hessen-Darmstadt and Bavaria. The province is bounded by the Prussian provinces of Westphalia, Hanover, Saxony, and the Rhineland, the principality of Waldeck, the grand duchy of Saxe-Weimar, and the kingdom of Bavaria; area, 6,018 English square miles, divided into the two governments (Regierungsbezirke) of Cassel and Wiesbaden. The greater part of this province has a rugged surface, partly covered by branches of the Harz Mountains. The principal rivers are the Werra, Lahn, Ohm, Rhine, and Main. Arable land is limited, and cultivation is chiefly confined to the narrow valleys and lower hill slopes, amounting to about two fifths of the whole surface. The principal crops are rye, barley, and oats. Potatoes also are extensively grown. Fruit is tolerably abundant, and a great part of the loftier districts is covered with extensive forests, which employ a considerable number of the inhabitants, and furnish one of the most valuable sources of revenue. There are various minerals, and valuable mineral waters at Homburg, Wiesbaden, etc. The manufactures consist chiefly of woolens, cottons, and linens. The principal towns are Cassel, the capital, Wiesbaden, and Frankfort. Pop. (1900) 1,897,310.

Hessen-Darmstadt, hĕs'sĕn-därm'stät. See HESSE, GRAND DUCHY OF.

Hessian Fly. See WHEAT INSECT PESTS.

Hessians in the Revolution, The. In the 18th century Germany was divided into nearly 300 sovereignties, each maintaining a court and a military force. The possible revenue was often very limited, the burdens were almost intolerable, and the princelings were often profligate and cruel; they did not need their forces for home defense, and were glad to make money for themselves by letting out their regiments for hire, though except in one case they remitted no taxes on the people from the receipts. There was also a lingering tradition that soldiering was an honest trade like any other, and that it was useful for helping sovereigns to keep order; especially to put down insurrections, which were wicked. This, however, did not apply to rulers hiring out their troops and pocketing the money; and not only the liberal school of writers and public men, but enlightened despots like Frederick the Great, denounced it. But England had not sufficient army for the American War, and wished drilled troops rather than raw recruits, and after vainly endeavoring to hire 20,000 Russian soldiers, turned to the German princes, with some of whom she had dynastic relations, and all of whom were so eager to sell their wares that two of them offered soldiers for hire immediately after Bunker Hill, without waiting to be asked. Only those which could furnish considerable numbers were worth treating with, and all the German auxiliaries were finally hired from six states; about half being from two Hessian states, and by far the largest (more than three times greater than any other) from one. All were indiscriminately termed "Hessians," as all German immigrants were formerly called "Palatines." The first treaty was made with the Duke of Brunswick, 9 Jan. 1776, for 4,300 troops; reinforcements or replacements were sent year by year, till the total had amounted to 5,723, only 2,708 of whom ever returned. The second was with the Landgrave of Hesse-Cassel, 15 Jan. 1776, for 12,805; finally increased to 16,992, of whom 10,492 returned. The contingents from the others, under various treaties, amounted to — Hesse-Hanau, 2,038; Anspach-Baireuth, 2,353; Waldeck, 1,225; Anhalt-Zerbst, 1,152. Total sent to America, 29,867, of whom 17,313 returned; the rest either died or remained as citizens. There were about 20,000 in America at any one time after 1776. These forces cost Great Britain in subsidies and incidentals about £1,770,000; besides the lump sum, it was obliged to replace the dead, and at least in one case count three wounded men as one dead one.

About 18,000 were shipped in 1776; the commander-in-chief was Lieut-Gen. Philipp von Heister, a veteran of the Seven Years' War. The first division of some 8,000 landed at Staten Island, 15 August; they included a body of chasseurs and grenadiers under Lieut. E. W. F. von Donop, an able and daring officer. They took a leading part in the battles of Long Island and White Plains, and all the operations for capturing New York; and stormed Fort Washington with a loss of 56 killed and 276 wounded. During this time the second division of about 4,000, under Lieut-Gen. Wilhelm von Knyphausen, joined them. Washington's surprise at Trenton fell on Col. Rall's brigade of Germans. Rall was a regular officer whose contempt for the ragged Americans surpassed that of the most arrogant Briton, and he refused to take the most elementary precautions; he was mortally wounded. Early in 1777 Heister was superseded by Knyphausen; Howe finding the former intractable, and the Landgrave of Hesse laying the blame of Trenton upon him. Meantime the Brunswickers and a Hanau regiment under Baron von Riedesel had made a clearance of Canada; and in 1777 they were

joined to the expedition of Burgoyne, in whom Riedesel had no faith. It was from this division that Baum's detachment was sent off to raid Vermont, and to meet its fate at Bennington, with Breymann's sent to support it; 365 of Baum's 374 Germans did not return, and 231 of Breymann's were killed, wounded, or captured. Riedesel and his remaining men shared in Burgoyne's surrender. Around Philadelphia, at Brandywine and Germantown, Knyphausen's command was of the first importance; and at Red Bank Donop tried to storm the American fort and was mortally wounded, his command losing 82 killed and 229 wounded, besides 60 prisoners. In the three years' occupation of Rhode Island, from the fall of 1776 to that of 1779, about half of the British corps was Hessians; and they liked, and were liked by the inhabitants,— when they departed, all persons, but especially women, were prohibited from appearing at the Newport windows, in fear that the soldiers might not wish to go. In the South, at Savannah, Charleston, Pensacola, Baton Rouge, etc., they left many dead; and shared in the bloody drawn battle of Guilford Court House. Finally, at Yorktown, they bore the brunt of the actual fighting, losing 53 killed and 131 wounded.

The Germans did their duty bravely and faithfully, with loyalty to a service they had been sold into to no profit of theirs. Very few deserted, in spite of constant inducements held out to them; a policy which Washington strongly deprecated. Probably one reason was, that they were at once recognizable from their speech. Nor were they in the least inhumane or rapacious: the charge that they were cruel barbarians was a mere political weapon of the time. In a strange country, they would have run the risk of being murdered in reprisal had they been such: but in fact they appear to have been well-meaning men. Of the 29,867 who came over, only 17,313 returned to Germany. Of the 12,554 remaining, 548 were killed; some of the total 1,652 wounded died; some disappeared; but a great number are known to have remained and settled in the country. Grants were given them in Nova Scotia, but many scattered as chance directed. See Lowell, 'The Hessians in the Revolution' (1884).

Hestia. See VESTA.

Hesychius, hĕ-sĭk'ĭ-ŭs, the author of a Greek lexicon, which has probably come to us in an abridged form, and which he partly collected from former dictionaries, and partly enlarged by many new words and examples from Homer, the dramatic and lyric poets, the orators, physicians, and historians, was a native of Alexandria, and according to the best authorities flourished about the end of the 4th century after Christ. Of the circumstances of his life nothing is known. His lexicon possesses great value, especially of an antiquarian kind, and is the most useful for the study of the Greek language of all the ancient critical writings that are extant. The best editions of his lexicon are Alberti and Ruhnken's (Leyden 1746–66, two vols. folio), and that prepared by Schmidt (Jena, five vols. 1867–68; in a smaller form, two parts, 1864; second edition, 1867).

Hetæra, hĕ-tē'ra (Greek *hetaira,* a female companion), the name given by the Greeks to a mistress, as opposed to a lawful wife. But the word had various shades of meaning, from a mistress, who might be a wife in all but the legal qualification of citizenship, down to a harlot. The beauty and accomplishments of many of the hetæræ occasioned their society to be sought by men of the highest eminence, even Plato and Socrates. No shame was attached to associating with them. Aspasia, the mistress of Pericles, is the most renowned of these hetæræ. (See ASPASIA.) Hetæræ, less intellectually famous, were Lais, whom Aristippus the philosopher loved, Phryne, and others. They also became famous for their connection with the works of art. Praxiteles made a marble and gold statue of the latter, and she was also the model for his statues of Aphrodite.

Heterog'amy. See METAGENESIS.

Heterogenesis, hĕt"ĕ-rō-jĕn'ĕ-sĭs, or **Heterogeny.** See METAGENESIS.

Heteropoda, hĕt-ĕ-rop'ō-da, a group of small, pelagic, pectinibranch mollusks, which dwell together in the open sea, have the foot modified into a swimming organ, and are provided with a ventral sucker. The shells are spiral or shaped like that of an argonaut and seem as if composed of thin glass; indeed, the whole animal is beautifully transparent. Heteropods occur in enormous abundance at the surface of the sea in all the warmer parts of the world, and their dead shells sinking to the bottom form a large constituent of the abyssal ooze. They are highly organized, have well developed eyes and other organs of sense, are bisexual, and produce eggs in long cylindrical cords. The young in their development pass through a trochosphere and then a veliger stage. All are predatory, seizing and feeding on the numerous minute forms of life about them. They are most active in the early evening, darting about with twisting motions like worms, usually on their backs. They use the ventral sucking-disk for attaching themselves to any object they may encounter. Three families, containing many species, are known, and their closest affinities are with the pteropods. Consult Kingsley, 'Standard Natural History,' Vol. I. (1885).

Heterop'tera. See HEMIPTERA.

Het'man (Russian, Ataman), chief of the Cossacks, formerly elected by that people. He had the power of life and death, and was head of the army in time of war. Mazeppa in 1708 revolted against Russia, taking the side of Charles XII. of Sweden, and Peter the Great abolished in consequence the power and authority of the hetman. Catharine II. suppressed the office and title in the province of Ukraine; it still exists among the Cossacks of the Don. In Poland the commander-in-chief of the army was styled hetman, and was appointed by the sovereign. The last elective hetman of the Cossacks in Russia was Platorf 1812–14. On his death the grand duke, heir to the throne, was made hetman.

Hetty Sorrel, in George Eliot's 'Adam Bede' (1859), a dairymaid whose unfortunate career, condemnation to death, and final reprieve form an important part of the story.

Hevelius, Johannes, yō-hän'nĕs hā-fā'lē-oos, or hĕ-vē'lī-ŭs, known also as JOHANNES HEVEL, Polish astronomer: b. Dantzic 28 Jan. 1611; d. there 28 Jan. 1687. After visiting the principal countries of Europe he settled in his native city, and from 1639 till his death applied himself almost exclusively to the study of astronomy. His 'Selenographia,' or description of the moon, published in 1647, was the first of numerous astronomical works of great value and authority on his favorite science. Halley, who visited Hevelius at Dantzic at the request of the Royal Society of London, of which Hevelius had been elected a member in 1664, reported favorably of the correctness of his observations. In 1661 he observed a transit of Mercury, a triumph confined to Gassendi alone of all preceding astronomers. Hevelius ranks next to Flamsteed among the men of his day as a diligent and accurate observer of the heavens.

Hewes, hūz, **Joseph,** American patriot; a signer of the Declaration of Independence: b. Kingston, N. J., 1730; d. Philadelphia, 10 Nov. 1779. He was educated at Princeton College, and about 1760 he removed to Edenton, North Carolina. He soon became a member of the colonial legislature, and was a delegate to the General Congress at Philadelphia 1774–7 and again in 1779. After taking his seat he was appointed on a committee to "state the rights of the colonies in general, the several instances in which those rights are violated or infringed, and the means most proper to be pursued for obtaining a restoration of them," and aided in the preparation of its report.

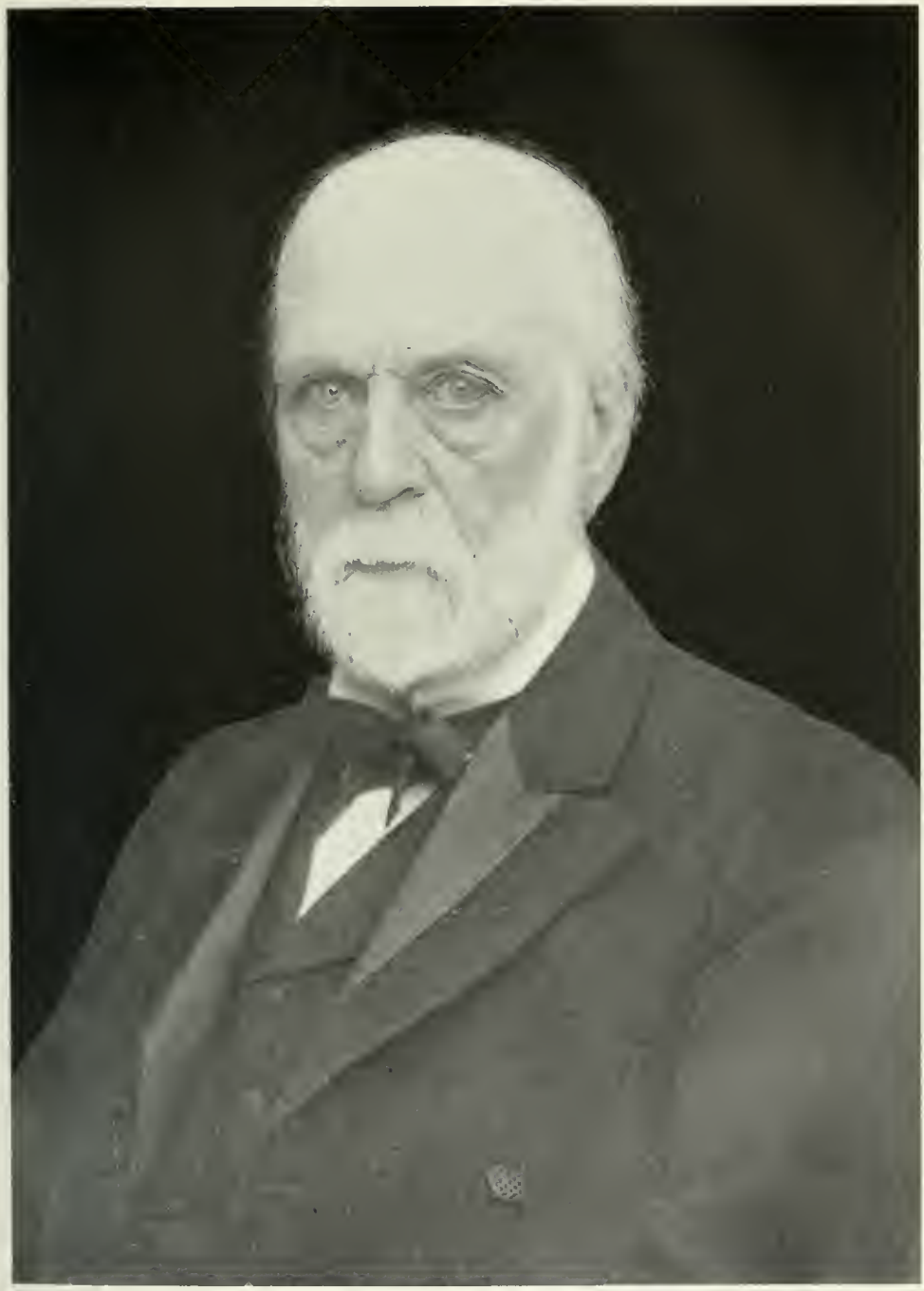
Hewett, hū'ĕt, **Waterman Thomas,** American Germanic scholar: b. Miami, Mo., 10 Jan. 1846. He was graduated from Amherst College in 1869 and has been professor of German language and literature at Cornell University from 1870. He has been general editor of Macmillan's 'German Classics' since 1895, and beside frequent contributions to periodicals has published among other works 'The Friesian Language and Literature' (1879); 'History of Cornell University' (1894).

Hewit, hū'ĭt, **Nathaniel Augustus,** American Roman Catholic clergyman: b. Fairfield, Conn., 27 Nov. 1820; d. New York 3 July 1897. He was graduated from Amherst College in 1839 and was for several years in the Episcopal ministry. He became a Roman Catholic in 1846 and joined the Order of Redemptorists. He was later one of the founders of the Congregation of Saint Paul (Paulists) taking the religious name of "AUGUSTINE FRANCIS," and subsequently becoming professor and superior in the Paulist Seminary, New York. He wrote 'Life of Princess Borghese' (1856); 'Problems of the Age' (1868); 'Light in Darkness' (1871); etc.

Hewitt, hū'ĭt, **Abram Stevens,** American manufacturer and politician: b. Haverstraw, Rockland County, N. Y., 31 July 1822; d. New York 18 Jan. 1903. He was graduated from Columbia in 1842 at the head of his class, and in 1843 he was made acting professor of mathematics there; he also began the study of law, and was admitted to the bar in 1845. He did not practise, however, but shortly after went into the iron and steel business with his father-in-law, Edward Cooper. By careful and skilful management he built up the financial success of his firm (Cooper & Hewitt); which was the first to manufacture iron girders and supports for fire-proof buildings and bridges, and also furnished the government with large quantity of material during the Civil War. In dealing with his employees, he was particularly successful, never having any serious trouble; it was his policy to keep the works running and the men employed, at least part of the time during dull seasons, though the business was sometimes carried on at a loss. At the time of his death he was recognized as one of the foremost iron masters in the country, his firm controlling the Trenton Iron Co. and the New Jersey Iron and Steel Co. He organized the Cooper Union Institute (q.v.), and as the secretary of the board of trustees largely shaped and controlled its policy for a number of years. He also gave largely to the institution. He was first active in politics at the time of the reorganization of Tammany Hall after the overthrow of the Tweed Ring. He served in Congress 1874–8, and again 1880–6 and was always especially prominent in all matters pertaining to finance, advocating a low tariff and the gold standard. In 1876 he was chairman of the Democratic National Committee, and immediately after the election issued a proclamation to his party stating that Tilden had been elected; later he supported the policy of Tilden which resulted in the appointment of the Electoral Commission (q.v.). In 1886 he was nominated for mayor of New York by Tammany and other Democratic organizations and after a hard campaign won the election over Henry George and Theodore Roosevelt. As mayor he gave the city a most efficient administration, but his independent policy often antagonized the Tammany leaders, especially his strict enforcement of the excise law. He was not renominated by his party, and was defeated as a candidate on an independent ticket in 1888. While mayor he urged in one of his annual messages the need of improvement of the city's rapid transit, and advocated municipal ownership; though his suggestions were not heeded at the time, he continued his interest in the subject, and it was largely due to his efforts that recent improvements in that direction were undertaken; in recognition of his services the Chamber of Commerce presented him with a gold medal in 1901. In February 1903 a number of prominent citizens of New York set on foot a movement to raise a memorial fund of $500,000 to be presented to Cooper Union as the "Abram S. Hewitt Endowment of the Cooper Union."

Hewitt, John Napoleon Brinton, American ethnologist and linguist: b. on the Tuscarora reserve, Niagara County, N. Y., 16 Dec. 1859. For several years he assisted Mrs. Erminnie Smith (q.v.) in the linguistic researches she was making for the Bureau of Ethnology on the Tuscarora reserve, and he is now employed in linguistic work at the Smithsonian Institution.

Hewitt, Peter Cooper, American capitalist and inventor: b. New York 1861. He is the son of Abram S. Hewitt (q.v.), was educated at Stevens Institute, Hoboken, and Columbia College. He entered business with his father and invented improvements in the processes of the Peter Cooper glue factory, which the Hewitt firm controls. Turning his attention to electricity



ABRAM STEVENS HEWITT

he invented the Cooper Hewitt lamp and static converter. The lamp in its present form consists of a glass tube of any desired shape with a bulb at one end which contains a small quantity of mercury. All air is exhausted from the tube, which thereupon fills with vapor from the mercury in the bulb. Electrodes are provided at each end of the lamp, the negative electrode in the bulb of mercury and the positive electrode at the opposite end. On passing a direct current through the lamp the vapor which fills the tube is rendered incandescent and gives off a steady, blue-white light. Owing to the great resistance at the negative electrode to the initial flow of current, it is necessary to use a high voltage to start the lamp. This is commonly done by passing a spark from a "choking" coil through the negative electrode, which when once penetrated offers but slight resistance to the flow of current. If for any reason the current is interrupted, the high resistance is immediately resumed and must be broken down again before permitting further flow of current.

The light given off by this lamp is entirely lacking in red rays, and consequently does not reveal the real color of the objects it falls upon. It is, however, of great value as a photographic illuminator being rich in actinic rays, which most affect the photographic plate. Mr. Hewitt is investigating with a view to discover means to turn some of the rays of the incandescent vapor into red rays. This discovery will be a means of great economy, because the Cooper Hewitt lamp is probably the cheapest artificial light in the world. The mercury vapor lamp consumes one half watt per candle-power, as against 3½ watts in the incandescent lamp.

Hewlett, hū'lĕt, **Maurice Henry,** English author: b. London 22 Jan. 1861. He was the son of Henry Gay Hewlett, a writer of some little note, and was educated at the London International College, Isleworth. He was admitted to the bar in 1891, and in 1896–1900 was keeper of the land revenue records and enrolments. His reputation was made as an interpreter of the more recondite phases of the life and thought of the Middle Ages, especially in Italy. His style is a skilful medium for his purpose, but frequently so archaized as to be somewhat difficult. His books are: 'Earthwork out of Tuscany' (1895), a collection of Italian studies; 'The Masque of Dead Florentines' (1895); 'Songs and Meditations' (1897); 'Pan and the Young Shepherd' (1898); 'The Forest Lovers' (1898), his first popular success; 'Little Novels of Italy' (1899); 'Richard Yea-and-Nay' (1900); 'New Canterbury Tales' (1901); 'Fond Adventures' (1904).

Hexam'eter (from the Greek ἕξ, six, and μέτρον, a measure), a verse of six feet. It is the heroic or epic measure of the Greeks and Romans, the finest examples of which are the two poems ascribed to Homer, the Iliad and the Odyssey, and the Æneid of Virgil. The sixth foot is always a spondee (two long syllables) or a trochee (a long and a short). The five first may be all dactyls (one long syllable and two short), or all spondees, or a mixture of both. The scheme of this verse then is —

—◡◡, —◡◡, —◡◡, —◡◡, —◡◡, — —
— —, — —, — —, — —, — —, — ◡

with all the varieties which the mingling of the two kinds of feet, as mentioned, affords; as,

—◡◡, — —, — —, —◡◡, —◡◡, — —
Forte sub arguto consederat ilice Daphnis;
or, —◡◡, — —, —◡◡, —◡◡, —◡◡, — —
Qui Bavium non odit amet tua carmina, Mævi;

and so on. The variety of which the hexameter is susceptible, its great simplicity, its harmony, and its numerous pauses, constitute the charm of this verse, and adapt it to the most various subjects. A spondee is rarely used in the fifth foot, and then in Latin the word with which the verse ends is generally composed of four syllables, and the fourth foot at least must be a dactyl; as,

Cara deûm soboles, magnum Jovis incrementum.

The prevalence of the dactyl or spondee in the hexameter depends much upon the genius of the language; thus the dactyl is more frequent in Greek than in Latin, and in German than in Greek. It is evident that the hexameter cannot be formed in such languages as Italian, French, Spanish and English, whose prosody is regulated by the accent and not by the *quantity* of the words.

The French and Italian writers, however, early attempted the hexameter, as well as Sidney and Southey in English; but without success. More recent English poets have also tried it, as Clough and Kingsley. Longfellow has made use of the hexameter in his 'Evangeline.' But in no modern European language have hexameters become naturalized, except in German, to which this measure seems as well adapted as to the Greek. Fischart attempted the German hexameter in the 16th century. In the middle of the 18th century it was used by Klopstock, Uz, and Kleist. Goethe's hexameters are very often as poor as their sense is beautiful. John Henry Voss improved the German hexameter by the excellent translation of Homer and his valuable 'Zeitmessung der deutschen Sprache' (Königsberg 1802).

Hexapoda, hĕk-săp'ō-dạ, a group name for the six-footed arthropods, or true insects (*Insecta*), excluding spiders, myriapods and other forms often popularly included in the term "insects."

Hexoic Acid, an organic acid having the formula $C_6H_{12}O_2$, or $C_5H_{11}.COOH$, and occurring in fats, in cheese, among the products of the butyric fermentation of sugar, and in the fruit of *Heracleum sphondylium* and in the flowers of *Satyrium hircinum*. It is best prepared by the fractional distillation of crude fermentation butyric acid. It is an oily substance, very clear and mobile, solidifying at about 29° F., and boiling at 400° F. It has a specific gravity of 0.95, and is oxidized by nitric acid to acetic and succinic acids. It is also known as "caproic acid," and its salts are sometimes called caproates, and sometimes hexoates.

Heyse, Paul, powl hī'zĕ, German poet and novelist: b. Berlin 15 March 1830. He studied classics in his native city, in 1852 traveled in Switzerland and Italy, and two years later he settled in Munich on the invitation of King Maximilian II. of Bavaria, who granted him a pension. He has lived mainly in Munich ever since, devoted almost exclusively to literature. His first work was 'Jungbrunnen, Märchen

eines fahrenden Schülers' (Tales of a Traveling Scholar) (1850); and to the same year belongs his tragedy 'Francesca da Rimini.' 'Die Brüder' (1852) and 'Urica' (1852), were narrative poems, and formed part of the volume entitled 'Hermen' (1854), later 'Novellen in Versen,' which did much to establish his reputation. Heyse's genius has found its most perfect expression in his tales or novelettes (Novellen), and in this department of literature he holds almost a unique place among German writers. His work is almost throughout highly finished and artistic, and shows a rich imagination and great fertility in invention. His tales have been published in more than 20 collections, and a selection appeared in 1890 under the title 'Auswahl fürs Haus.' His early successes in narrative verse were followed by such works as: 'Die Braut von Cypern' (1856); 'Thekla' (1858); 'Rafael' (1863); 'Syritha' (1867); 'Der Salamander' (1879); 'Die Madonna im Ölwald' (1879); 'Liebeszauber' (1889). His best plays are those of his third period, and some of them, especially 'Hans Lange' and 'Kolberg,' have been acted with great success. 'Mary of Magdala' was well received in America. Among them are: 'Die Hochzeit auf dem Aventin' (1886); 'Gott schütze mich vor meinen Freunden' (1888); 'Hans Lange' (1866); 'Kolberg' (1868); 'Die Weisheit Salomos' (1887); 'Weltuntergang' (1889); 'Die schlimmen Brüder' (1891); 'Wahrheit?' (1892); and 'Jungfer Justine' (1893). His larger novels, 'Kinder der Welt' (1873); 'Im Paradiese' (1875); 'Merlin' (1892); and 'Über allen Gipfeln' (1895), have met with great success. Among other works are: 'Skizzenbuch' (1877); 'Verse aus Italien' (1880); 'Spruchbüchlein' (1885); 'Gedichte' (Poems, 5th ed. 1895); and 'Neue Gedichte und Jugendlieder' (1897).

Heyward, hā'ward, **Thomas, Jr.,** American patriot: b. St. Luke's Parish, S. C., 1746; d. there 6 March 1809. He was of much prominence in North Carolina during the Revolution, was a delegate to the Continental Congress 1775–8 and one of the signers of the Declaration of Independence. In later years he was a judge in his native State.

Heywood, John, English dramatist of the first half of the 16th century. He was a paid musician at the court of Henry VIII., with whom he became a favorite on account of his skill in music. Heywood's dramatic works may be classed as interludes, standing between the miracle-plays and the drama proper. The earliest of them, 'A Merry Play between the Pardoner and the Frere, the Curate and Neybour Pratte,' was written before 1521. Another famous piece is 'The Four P's, an interlude in which figure a Palmer, a Pardoner, a Potycary, and a Pedlar.' His allegory of the 'Spider and the Fly' (1556) fully reveals Heywood's religious proclivities. By spiders, the Protestants are meant; by flies, the Catholics.

Heywood, Thomas, English dramatist: b. Lincolnshire. He was educated at Cambridge and appears to have been writing plays as early as 1596. Of all the old dramatists he was the most prolific. We learn from the preface to 'The English Traveller' that down to 1633 he had "had either an entire hand, or at the least a main finger," in the composition of 220 plays; and he continued for some years after that date to write for the stage.

Twenty-four of Heywood's plays have been preserved. The best is 'A Woman kilde with Kindnesse' (1607). His work is usually distinguished by naturalness and simplicity; but he wrote at the beginning of his career one absurdly grandiose play, 'The Foure Prentises of London' (1615), which was parodied in Beaumont and Fletcher's 'Knight of the Burning Pestle.' 'The Rape of Lucreece' (1608) is chiefly noticeable for its songs; 'Love's Maistresse' (1636), dealing with the story of Cupid and Psyche, is fanciful and ingenious; and there is much tenderness in 'A Challenge for Beautie' (1636). 'The Captives, or the Lost Recovered' an interesting play acted in 1624, was first published in 1885.

Hezekiah, hĕz-ę-kī'a (*Hizkiyah,* generally *Hizkiyahu,* strength of Jehovah), the 12th king of Judah. At 25 he succeeded Ahaz about 726 B.C., d. about 698 B.C. He had no sooner mounted the throne than he initiated a system of reform, on the injunctions of Isaiah, and broke up the idolatrous customs into which the people had fallen during the life of his father. He also endeavored to repair the injury done by national defeats and losses. He purged, repaired, and reopened the temple with magnificent sacrifices and a splendid ceremonial. So extreme was his indignation against idolatry that he destroyed the brazen serpent which was said to be the one used by Moses in his miraculous healing of the Israelites. With patriotic zeal he assumed the aggressive against the Philistines, and not only rewon the cities lost by his father, but dispossessed them of most of their own. In the 14th year of Hezekiah's reign he had a dangerous illness, which threatened serious complications, and the kingdom was in a difficult crisis, for the king had no heir, Manasseh not being born till long afterward. The greater part of the Scripture records bearing on the reign of Hezekiah is occupied by the two invasions of Sennacherib. Several of the Psalms are supposed to allude to the discomfiture of Sennacherib, for example, xlvi.-xlviii., lxxvi. Hezekiah did not long survive this deliverance, dying after a reign of nearly 29 years. Among the many highly useful works executed by him, the aqueducts of Jerusalem are of especial importance.

Hiawatha, hī-ą-wâ'tą or -thą, the hero of an American Indian legend known by this name among the Iroquois and among the other tribes. He is mentioned in various works on the aborigines, and in 1855 was immortalized in the poem, 'Hiawatha,' by Longfellow.

Hiawatha, Kan., city, county-seat of Brown County; on the Saint Joseph & G. I. and the Missouri P. R.R.'s; about 70 miles northwest of Kansas City and 55 miles north of Topeka. It is situated in a rich agricultural region. Its chief manufactures are flour, foundry products and agricultural implements. Its trade is principally in wheat, corn, fruit, livestock, flour, and lumber. It has the Morrill Public Library and an academy. The city owns and operates the waterworks and an electric-light plant. Another electric-light plant is

owned by a private corporation. Pop. (1900) 2,829.

Hib'bard, George Abiah, American writer of short stories: b. Buffalo, N. Y., 1858. He has written 'Iduna, and Other Stories'; 'Nowadays'; 'The Governor'; etc. His work is marked by finished style and much insight into character.

Hib'ben, John Grier, American logician: b. Peoria, Ill., 19 April 1861. He was graduated from Princeton 1887 and is now professor of logic there. He is author of 'Inductive Logic' (1896); 'The Problems of Philosophy' (1898).

Hiberna'tion, the winter sleep of warm-blooded animals. Under this term is also included the torpidity of frogs, toads, reptiles, certain fishes, insects, the horseshoe crab and snails, which is mainly due to prolonged cold. Among the mammals which hibernate are the bear, dormouse, badger, bat and hamster; a number are incomplete hibernators, as the prairie dog, while squirrels fall into a winter sleep during the coldest weather, but may be seen in warm spells in winter. The males of the black and white bear are more or less active during the winter months, while the females are hibernating. The same species, like the skunk, may in the southern portion of its range not hibernate at all. Neither do the hibernators all retire to their holes or dens or under fallen trees at the same date, but the time varies with the temperature, and different degrees of torpidity are exhibited. It also appears that continuous hibernators do not lay in a supply of food, as do intermittent ones like squirrels; yet the Arctic fox is said to store up a supply of dead lemmings, ermines, geese, etc.

Hibernation is like sleep, and has been compared with trance. During this period the animal functions are nearly suspended, the excretions are greatly diminished and in the bears the rectum is closed by a resinous plug, called by the Swedes "tappen," and by American hunters "seal." The animal heat is lowered to that or nearly that of the air, the action of the heart being slight; there is an increased muscular irritability, and the animal loses from 30 to 40 per cent of weight.

Snakes, lizards, the toad, frog, salamanders, and certain fishes hibernate, burying themselves in the earth below the reach of frost, the aquatic forms digging into the mud at the bottom of streams. The few fishes which are known to lie dormant and take no food sink into the mud of streams or of the sea. The horseshoe crab burrows in the mud beyond the reach of oyster dredges in November, remaining in deep water until the middle of spring. Most insects hibernate in the larva or pupa state, a few as moths or butterflies. Caterpillars hide under moss, the bark of trees, etc., but they freeze solid and may be broken into two pieces like an icicle. They gradually thaw out in spring; when the changes are sudden, great numbers die. Spiders and snails hibernate under stones, moss, etc., while slugs bury themselves in the mud, and those mussels and other mollusks living in streams and lakes descend into the mud.

Estivation.— In the tropics there is a corresponding period of torpor during the hot, dry season, when food is scarce, and vegetation is taking a rest. Alligators, snakes, certain mammals, as the tanrec, insects and land snails become dormant, the latter closing the mouth of their shells with a membrane-like substance (epiphragm), leaving a small opening in it for the admission of air in breathing, yet after a prolonged shower they become active. Thus it is seen that heat, dryness and the lack of food operate in causing estivation, while cold and famine appear to be the cause of hibernation; though all species are by no means affected alike. Among the lowest organisms the dormant vitality of resting spores, seeds of plants, winter eggs of sponges, of polyzoa, the dormancy of certain adult forms, are connected with a lowered temperature, and a resting period is necessary both in plants and animals. The simultaneous shedding of the leaves of deciduous trees is certainly connected with if not caused by cold, and it is undoubtedly true that changes of temperature as well as lack of food, and the need of rest, cause hibernation and summer dormancy.

Hibernia, the ancient name applied to Ireland (q.v.).

Hiber'nians of American, Ancient Order of, an Irish-American secret society founded in 1836. It has one general or national board, with 2,002 subordinate divisions. There were 139,453 members in 1902. The benefits disbursed the same year amounted to $429,000. National president (1902), J. T. Keating, Chicago, Ill.

Hibiscus, hī-bĭs'kŭs, a genus of plants of the mallow family (q.v.), distinguished by a double calyx and fruit of three or more many-seeded carpels united into a many-seeded capsule. The species are numerous, natives of warm climates, some trees or shrubs, but most of them large herbaceous plants. Many bear very beautiful flowers, much used in the South Sea Islands in wreaths, etc., for personal adornment. The rose-of-Sharon (*Hibiscus syriacus*), a native of Syria and Carniola, has long been in cultivation as an ornamental shrub. Several other species have become favorite hothouse plants. The scarlet hibiscus (*H. coccineus*) and the rose-mallow (*H. moschcutos*) are among the most striking and beautiful of North American wild flowers, glowing among the reeds of marshes in late summer in flame-color and pink. The characteristic mucilaginous and fibrous properties of the Malvaceæ are very strongly developed in this tribe. The fruit of *H. esculentus,* called gumbo, okra, etc., is in general use for food in the East and West Indies and the United States. It is an annual plant, with a soft herbaceous stem, three to five feet high, crenate leaves, axillary sulphur-colored flowers, and pyramidal, somewhat podlike capsules. The fruit is used in an unripe state, and is generally much esteemed, but is disliked by some on account of its viscidity. It enters as an important ingredient into the pepper-pot of the West Indies, or is used in soups. It also produces a coarse fibre. The bark of *H. tiliaceus,* a tree 20 feet high, with a very thick bole, abounds in mucilage. This tree is one of the most abundant trees of the South Sea Islands; and the wood, being light, tough, and durable, is much used for many purposes. From its fibre the Tahitians manufacture matting. Many other species yield fibres, some coarse, some fine and beautiful, which are used in dif-

ferent countries; but the most important in this respect is *H. cannabinus*, the Deccan hemp of western India (see HEMP). *H. sabdariffa* is very generally cultivated in warm countries, on account of its calyx, which, as the fruit ripens, becomes fleshy, and acquires a very pleasant acidity. It is much used for making tarts and jelly, and a decoction of it, sweetened and fermented, affords a refreshing beverage, well known in the West Indies as sorrel cool drink, the plant being called red sorrel; and in Madras it is used for similar purposes, and is named rozelle or rouselle. Musk-seed (*H. abelmoschus*) is cultivated for its seeds, which have a fragrance between that of musk and that of amber. They are much used by perfumers, and are called *graines d'ambrette*. In Egypt and Arabia they are mixed with coffee, and stimulant and stomachic qualities are ascribed to them. The petals of *H. rosa-sinensis* possess astringent properties, and they are also used by the Chinese to stain their eyebrows and their shoes black.

Hic'cup, or **Hiccough**, is a spasmodic affection of the diaphragm caused sympathetically by the irritation of structures supplied by nerves communicating with the phrenic nerve. Though generally a slight and passing inconvenience, its occurrence in the last stages of acute disease is a grave symptom, indicating general collapse of the nervous system. It may last only a few minutes or may continue for weeks without being capable of being subdued by any kind of treatment. Fasting or a stimulant suddenly swallowed is one of the commonest causes of hiccup, which generally passes off of its own accord. Nothing removes it more effectually than some active emotion of the mind suddenly excited. Hiccup is a common attendant of dyspepsia, and is often observed in abdominal diseases when terminating fatally, and is especially a symptom in some forms of hernia. Many remedies have been suggested for it, such as holding the breath as long as possible, tying a belt tightly round the waist, and the frequent swallowing of small rounded pieces of ice.

Hich'born, Philip, American naval officer: b. Charlestown, Mass., 1839. In 1869 he entered the United States navy as assistant constructor, in 1875 was made constructor, and in 1881 a member of the naval advisory board. From 1893 until his retirement 4 March 1901, he was chief constructor, and as such was identified with the reorganization and enlargement of the new United States navy. He attained rear-admiral's rank, and published a valuable report on foreign dockyards.

Hich'ens, Robert Smythe, English journalist and novelist: b. Speldhurst, Kent, 14 Nov. 1864. He was educated at Clifton College and the Royal College of Music, and after a short career as a musician turned to journalism. In 1893 he visited Egypt for his health, and there conceived the idea which materialized in the 'Imaginative Man' (1895) 'The Green Carnation' (1894), however, epigrammatic and keenly satirical in tone, first brought him into public notice. Later works of his are: 'After To-Morrow' (1895); 'New Love' (1895); 'The Folly of Eustace and Other Stories' (1896); 'The Londoners' (1897); 'Byeways' (1897); 'The Prophet of Berkeley Square' (1901); etc.

Hick'ey, Emily, English poet: b. Macine Castle, County Wexford, Ireland, about 1845. She was co-founder in 1881 of the Browning Society with F. J. Furnivall (q.v.) and has lectured on English literature. She has published among other volumes 'A Sculptor and Other Poems' (1881); 'Verse Tales, Lyrics, and Translations' (1889); 'Our Lady of May and Other Poems' (1902). Her verse has been highly praised by critics.

Hickey Plot (1776), a conspiracy of the British officials and Loyalists of New York to end the Revolutionary war by the murder or capture of its leaders and the seizure or destruction of its supplies. The heads and probable devisers of it were Governor Tryon, who had fled from the city but remained on a man-of-war in the harbor, and sent supplies of money for bribery, etc.; and Mayor Mathews. The scheme was to kill or seize the patriot generals, and at all events to deliver Washington alive to Sir William Howe, blow up the magazine and secure the passes to the city. Several hundred New York Loyalists were involved. Two of Washington's guard were bought, but a third pretended to accede and revealed the plot. Mathews, a gunsmith named Forbes, and a dozen others were arrested and sent to Connecticut, Mathews carrying the mayoralty flag with him. Thomas Hickey, one of the treacherous guards, was hanged in New York 27 June 1776, the first military execution in the American army.

Hick'man, Ky., town, county-seat of Fulton County; on the Mississippi River, and on the Nashville, C. & St. L. railroad; about 35 miles below Cairo, Ill. It has steamboat connections with the river ports. It is the seat of Hickman College. Its chief industrial establishments are a flour-mill, wagon-factory, two spoke-factories, saw- and planing-mills. Its trade, in addition to its own manufactured articles, is principally in grain and tobacco. Pop. (1900) 1,589.

Hick'ok, Laurens Perseus, American metaphysician: b. Danbury, Conn., 29 Dec. 1798; d. Amherst, Mass., 6 May 1888. He was graduated at Union College in 1820, was licensed as a preacher in 1822, and was pastor successively at Newton and Litchfield, Conn., till in 1836 he was elected professor of theology in the Western Reserve College, Ohio, where he remained eight years. He was professor in the Auburn Theological Seminary 1844–52, and then became professor of mental and moral science, and vice-president in Union College. In 1866 he was formally made president of that institution of which, however, he had been in sole charge for eight years previous. His publications include among other works 'Rational Psychology' (1848); 'Moral Science' (1853); 'Empirical Psychology, or the Human Mind as Given in Consciousness' (1854); 'Rational Cosmology,' (New York 1858), in which he attempts to demonstrate *a priori* the laws of the universe; 'Creator and Creation' (1872); 'Humanity Immortal' (1872); 'Logic of Reason' (1875).

Hick'ory (formerly HICKORY TAVERN), N. C., town in Catawba County; on the Southern railway; near the headwaters of the Catawba

River; about 43 miles northwest of Charlotte and 50 miles west of Salisbury. The chief manufactures are flour, foundry products, wagons, lumber, leather, boots and shoes. It has several private educational institutions: Claremont Female College, opened in 1880; Saint Paul's Lutheran Seminary; Lenoir College, opened in 1891, under the auspices of the Lutheran Church. Pop. (1900) 2,535.

Hickory, a group of trees of the walnut, forming the genus *Hicoria,* and exclusively North American. They are large strong trees, 60 to 80 feet high, with close shaggy bark and large pinnately divided leaves, pistillate flowers on a terminal peduncle and staminate flowers in long, drooping aments. The fruit is a thick-shelled nut in a tough green husk. There are about 10 species, all natives of the eastern United States and Canada except a Mexican species. The best known of these are the following: Shag-bark, shell-bark or white hickory (*H. ovata*), leaflets 5 to 7, whose bark scales off in great plates curving outward at both ends, and whose nuts are sweeter and better than those of any other species; the northerly "big shag-bark" or king-nut (*H. laciniosa*), leaflets 7 to 9, with narrower "shags," darker wood and big nuts in husks often three inches long; white-heart, or fragrant hickory, or mocker-nut (*H. alba*), noted for the hardness and toughness of its wood; the pignut or broom hickory (*H. glabra*), leaflets 3 to 7, which represents a group of moisture-loving species whose nuts are thin-husked, elongated and bitter and astringent to the taste. Associated with these is the pecan (*H. pecan*), of the Southern States, whose oblong, thin-shelled nut is one of the most delicious of all nuts, and is now being cultivated in a few places in order to supply the increasing demand. The water hickory (*H. aquatica*) is sometimes called the bitter pecan.

Uses of Hickory-wood.—As timber this wood is of great value for articles requiring great strength with lightness and elasticity; but it is liable to quick decay when exposed to the atmosphere, and for this reason is little used in building, and should be painted. It was the most serviceable of all woods to the aboriginal Americans; and the axe, pick, and tool handles made from it are exported to all parts of the world. It enters into the manufacture of rakes, cradles, and many forms of farm-implements; is largely used in carriage-making, especially for thills, shafts, and the parts of racing-sulkies, the lighter American vehicles owing their acknowledged pre-eminence largely to the availability of this wood. The wood of the various species differs in quality, however; that of the pecan is hard and brittle, and the water hickory soft and comparatively light. The wood of the others is exceedingly strong and tenacious, and weighs about 50 pounds to the cubic foot.

Insect Pests.—A. S. Packard recorded in 1890 170 species of insects attacking the hickories; and Chittenden declared in 1903 that this number could be easily doubled. Hickory appears to be an especial favorite of borers. Prominent among them are the painted hickory-borer, one of the long-horned beetles (*Cyllene picta*); the hickory twig-girdler (*Oncideres cingulata*), twig-pruner (*Elaphidion villosum*), and hickory-bark beetle (*Scolytus quadrispinosus*). This bark-borer is the most important economic species, and during recent years has been the cause of considerable injury in hickory forests in the State of New York. Consult Packard, 'Insects Injurious to Forest and Shade Trees,' published in 1888 as the fifth report of the United States Entomological Commission.

Hickory Shad. See GIZZARD SHAD.

Hicks, Elias, American preacher of the Society of Friends: b. Hempstead, L. I., 19 March 1748; d. Jericho, L. I., 27 Feb. 1830. While a youth he manifested a talent for public speaking, and at 27 was a well known preacher. For many years he labored zealously in advancing the generally accepted doctrines of the Friends; but having as he believed discovered errors in these tenets, put forth views of his own which he defended with energy and ability. To advance these views he traveled extensively in the United States and in the British provinces, attracting large congregations by his oratory. The result was a schism in the body of Friends; those adhering to the old doctrines being specially termed orthodox, while the followers of Hicks were called after him Hicksites. (See FRIENDS.) He was an active abolitionist and with others was instrumental in inducing the State of New York to pass an act which, on 4 July 1827, liberated all slaves within its borders. He was the author of 'Sermons' (1828); 'Observations on Slavery' (1811); 'The Letters of Elias Hicks' (1834); etc. See 'Elias Hicks, Journal of his Life and Labors' (1828).

Hicks, Thomas, American painter: b. Newton, Pa., 18 Oct. 1823; d. 1890. He studied at the Philadelphia Academy, at the National Academy, New York, and afterward in Paris under Couture. Settling in New York he became one of the favorite portrait painters of his day. His pictures in the rooms of the New York Historical Society form an interesting gallery of historic figures, executed with more than ordinary artistic skill.

Hicks, Thomas Holliday, American politician: b. Dorchester County, Md., 2 Sept. 1798; d. Washington, D. C., 13 Feb. 1865. After successively occupying the positions of sheriff, member of the State legislature, member of the State electoral college, and member of the Governor's council, he was in 1858 elected governor of the State. When war was threatened between North and South, although sympathizing with the South and condemning the North's attitude on the slavery question, he sided with the party of neutrality in Maryland and opposed the secession of that State. When there were rumors of a plot formed by 6,000 men of his State to prevent Lincoln's inauguration and seize the city of Washington he suspended the writ of habeas corpus, and planned the arrest of suspected persons. He was the only prominent State official who stood by the Federal government, and at the expiration of his term as governor the new Legislature passed resolutions thanking him for having saved the State from joining the Confederates. In 1862 he was appointed to the senate of the United States and served in it till his death.

Hicks-Beach, SIR Michael Edward, English politician: b. London 1837. He was educated at Eton and Oxford, entered parliament

in 1864, and was made chief secretary for Ireland in 1874, and secretary of state for the colonies in 1898. In 1885 he was appointed chancellor of the exchequer and leader of the Conservative party in the House of Commons. He was president of the board of trade from 1888 to 1892. On the fall of the Gladstone ministry in 1895 he again became chancellor of the exchequer. In October, 1902, he caused a sensation by charging the Balfour government with wasteful expenditure of war appropriations, and in 1903 ably defended the British policy of free trade.

Hick'son, Sydney John, English zoologist: b. London 25 June 1859. He was educated at Cambridge and has been professor of zoology at Owens College, Manchester, England, from 1894. He has published 'A Naturalist in North Celebes'; 'The Fauna of the Deep Seas'; 'The Story of Life in the Seas' (1898).

Hidalgo y Costilla, Miguel, mē-gĕl' ē-dăl'-gō ē kōs-tēl'yä, Mexican revolutionist, first leader in the Mexican war of independence: b. State of Guanajuato 8 May 1753; shot in Chihuahua, Mexico, 27 July 1811. He was a priest, and in earlier life was simply a man of great acquirements, anxious to promote industry in Mexico, and noted for conscientious fulfilment of his ecclesiastical functions. He is said to have introduced the silkworm into Mexico, and did much to promote the culture of the vine. This conflicted with the policy of the Spanish government, which was to discourage all manufactures or agriculture which could interfere with the revenue, and the vines Hidalgo had planted were destroyed. This drove him to rebellion. Possessing much influence among the Indians, he formed the plan of a general insurrection, which was to take place 1 Nov. 1810; but the plot having been disclosed by one of the conspirators, some of his party were arrested, and he was obliged to precipitate his movements. On 10 September having been joined by three officers of the garrison of Guanajuato, he raised the standard of revolt. His eloquence had a remarkable effect on the multitude who heard him, and when after his oration he unfurled a rude copy of the picture of Our Lady of Guadalupe, the patroness of Mexico, the war assumed the character of a crusade. On 29 September with an army of 20,000 men, mostly Indians, he captured Guanajuato. He took Valladolid and several small places, and soon after was proclaimed generalissimo of the Mexican army, and advanced against Mexico; but finding himself almost without ammunition, was obliged to retreat. During this war the government party declared that the ordinary rules of warfare need not be observed as regarded the insurgents, while the latter retaliated with the most horrible atrocities. On one occasion Hidalgo is said to have massacred 700 prisoners because they were Europeans. After several defeats the insurgents were left at Saltillo under charge of Rayon, while Hidalgo and others went to the United States to obtain arms and military aid. On their way they were captured by a former friend, and finally shot in Chihuahua. He was after his death regarded as a saint by the people, and within a few years the place of his execution was shown to travelers as a holy spot. The town of Goliad, Texas, was named in his honor, the H, as silent in pronunciation, being omitted and the other letters rearranged. At the founding of the town the name of Hidalgo was still proscribed by the Spanish rulers and the transposition of the letters of his name was made in order to avert the attention of the authorities.

Hid'denite, a yellowish-green or emerald-green, transparent variety of spodumene, discovered by W. E. Hidden, in 1880, in Alexander County, N. C. The emerald-green varieties have been used as gems. They resemble the emerald, but show a greater wealth of color on account of their pleochroism.

Hides and Leather. There are few arts, among the many that are used for the benefit of mankind to-day, that are of such ancient origin as that of tanning. It is only necessary to study the carvings upon the monuments that the modern archæologist has unearthed to ascertain the fact that the old Egyptians were not only acquainted with several processes of tanning and working in leather, but that its preparation was one of the most important branches of Egyptian industry. So far as our knowledge of their methods of work extends, we know that these ancient workmen prepared their tan in earthen vessels and that they were able to preserve skin either with or without the hair attached. Among the Hebrews, who undoubtedly derived their knowledge of the art of preparing leather from the Egyptians, the trade of the tanner was despised, largely because of the bad odor connected with it, and those who followed this source of livelihood were obliged to locate their working places outside the limits of the city. Often they were situated by the side of streams, or on the shore of the sea, as was the case in Joppa, where the building said to have been the house of Simon the Tanner was located on the shore south of the city.

According to the most authentic records the first tannery to be operated in this country was established in Virginia, about the year 1630. A year or two later another tannery was established in New England, in the village of Swampscott, or Lynn, Mass., by Francis Ingalls, a colonist who had learned his trade in Lincolnshire, England. As it was impossible not to recognize the importance of the industry it was greatly encouraged by the colonial authorities, in evidence of which fact there are many laws on the old statute books regulating, not only the manufacture of leather, but the saving of skins needed by the tanners, under serious penalties for noncompliance. For example, a law was passed in Massachusetts, in 1646, prohibiting the exportation of raw hides, or unwrought leather, under heavy penalties which not only affected the shipper, but reacted upon the master of the vessel that attempted to sail with such freight, for these were the days when the small tanners who had shops scattered throughout the country were entirely dependent upon the surrounding neighborhood for their hides, but so effective were the restrictions placed upon importations of skins by the authorities, that leather was relatively more plentiful in the American colonies than it was in England.

One of the most prominent leather manufacturers of the old days was Colonel William Ed-

wards, who sent the first tanned leather to the Boston market in 1794. Beginning his business in Hampshire about 1790, when he was less than 20 years of age, he immediately inaugurated a series of improvements in the mechanical branch of the art, which, as they were afterward adopted and extended by others, were the means of infusing a much-needed spirit of enterprise into the business. In fact, it was the new ideas in mechanism and in the arrangement of the tannery which he evolved that paved the way for the most important improvements which have since been made in the manufacture of leather. The first company in the business to be incorporated also owed its existence to Colonel Edwards' enterprise, for it was his extensive tanneries at Northampton, Cummington, and Chester that were purchased by the men who incorporated the Hampshire Leather Manufacturing Company of Massachusetts, with a capital of $100,000, in 1809. These works then had a capacity of 16,000 full-grown hides per annum.

By 1810, the tanning industry had extended so widely that there were tanneries in operation in almost every portion of the country. Bark was so plentiful that it was much cheaper than in England, and, as the result, it was not long before the exportations of American leather had attained an aggregate of 350,000 pounds per annum, while the importations were confined to morocco, and some peculiar kinds of English leather which could not then be produced in this country. At this time (1810) the value of all the manufactures of hides and skins was stated by the census office to be $17,935,447, but, owing to the fact that the census at that time was so crudely conducted that it was very incomplete, it is safe to say that $20,000,000 would be much closer to the correct figure. From that date, however, the business increased, slowly at times, perhaps, but steadily, until, in 1840, it was reported that there were about 8,000 tanneries in the country, with a capital of $16,000,000, and employment for fully 26,000 hands. By 1850, the capital had increased to more than $20,000,000, while the value of the annual product had reached the quite respectable figure of $38,000,000. In 1860, this product, including the making of morocco and patent leather, had almost doubled, being in excess of $72,000,000, while, in 1870, the 7,569 establishments in the country were employing no less than 35,243 persons, at an aggregate wage of $14,505,775, to produce an annual output that was value at $157,237,597. At this time the capital invested in this business was reported as being more than $61,000,000.

As the establishments engaged in the making of leather were enumerated very differently by the census of 1890 and 1880, it is quite impossible to obtain a reliable basis of comparison from the published statistics. In preparing the census of 1880, the government's enumerators not only counted all the smaller businesses, but they must have reckoned twice all that were engaged in both tanning and currying, with the result that they were able to make an aggregate of 5,628 establishments. As the later census enumerators have confined their attention solely to the large establishments the discrepancy is too great to be readjusted by estimate. Thus, for example, the 1890 census reports 1,787 establishments, while the 1900 census has but 1,306. The other census figures follow:

THE LEATHER INDUSTRY, 1880 TO 1900.

	1880	1890	1900
Capital	$73,383,911	$98,088,698	$173,977,421
Number of employees	40,282	42,392	52,109
Wages paid	$16,503,828	$21,249,989	$22,591,091
Cost of material used	156,384,117	122,946,721	155,000,004
Value of product	200,264,944	172,116,092	204,038,127

Among the first patents taken out for the application of any special process in the making of leather was in 1823, when an inventor patented a method of forcing the tanning liquor through the skin by hydrostatic pressure. In 1831, William Drake devised a modification of this method. According to his process two skins were sewed together and the liquid, which was placed in the receptacle thus formed, was permitted to remain until the tanning had been completed. Some years prior to that time a patent had been issued for a method which provided for the suspension of the hides in a closed vessel, in which their conversion into leather would be much accelerated by the removal of

LEATHER PATENTS.

Purpose for which Issued	Date of First Patent	Approximate Total Number of Patents to Date
Processes and apparatus for leaching and making extracts from tan-bark	Aug. 10, 1791	100
Bark-mills	July 19, 1794	100
Processes employing apparatus for tanning leather	July 9, 1808	100
Leather-splitting machine	July 9, 1808	75
Unhairing-machine	July 12, 1812	75
For rolling leather	Oct. 19, 1812	25
Scouring and setting machine	Nov. 21, 1831	70
Tanners' vats and handling appliances	Jan. 9, 1834	75
Machines for boarding and graining leather	March 25, 1835	35
Compounds for depilating hides and skins	June 30, 1836	60
For fleshing machines	June 17, 1837	25
Compounds for bating hides and skins	Feb. 3, 1838	40
Whitening, buffing, and shaving leather	May 10, 1838	30
Compounds and materials for tanning and tawing leather and preparing raw hides	July 12, 1838	175
Processes for tanning leather	Aug. 1, 1838	275
For currying leather	Aug. 1, 1838	25
Machines for stoning, polishing, finishing, glassing, glazing, flinting, creasing, and dicing leather	March 15, 1845	75
Compounds for coloring and polishing leather	Oct. 9, 1847	40
Methods for manufacturing enameled, japanned, and patent leather	Jan. 9, 1855	20
For stuffing leather	Feb. 6, 1855	20
For pebbling leather	May 6, 1856	30
For employing mineral substances for tawing hides and skins	Aug. 4, 1857	20
For stretching leather	Feb. 8, 1859	40
Bark-rossing machines	Jan. 9, 1863	10
For preserving hides	Sept. 11, 1866	15
Machines for shaving or making leather of uniform thickness	Sept. 24, 1867	5
Apparatus for blacking leather	Sept. 20, 1870	15
Measuring-machines	Aug. 28, 1877	25
Striking-out machines	March 27, 1883	4

all the air by an air-pump. To enumerate all, or even the most important of these inventions within any brief space would be impossible, but the preceding table gives the dates when the first patent was issued for each of the details which enter into the manufacture of leather, as well as an estimate of the number of patents that have been issued in each division of the industry up to the present time.

Hides, as the term is generally accepted today, may be conveniently divided into three classes: (1) Hides proper, which consist of the skins of the larger and more common animals, such as oxen, cows, and horses; (2) kips, which comprise the skins of small, or yearling cattle, which are too large to be classified as calfskins, and (3) skins, including those of calves, sheep, goats, deer, pigs, seal, and the various kinds of fur-bearing animals, many of which, including most of the latter, retain their hair after tanning. The heavy hides are converted into sole, belt, and harness leather; the calfskins are chiefly used for material for the manufacture of the uppers for leather shoes and boots, and are also in much demand by bookbinders; the sheepskins are used for a large variety of purposes, including linings for shoes, aprons, cushions, and covers, gloves, women's shoes, bellows, whips, etc.; the goatskins are used almost exclusively in the making of gloves and ladies' shoes — the morocco leather so extensively manufactured until recent years having now given place to the cheaper and more durable "glazed kid"; the hogskins are utilized in the making of saddle-leather, traveling bags, etc., while dogskins, because of their thin and tough characteristics, are particularly useful in the manufacture of gloves. The durability of the porpoise-skin has recommended its use in the making of shoe-strings, while the buffalo, alligator, kangaroo, deer, elephant, hippopotamus, rhinoceros, walrus, and shark, are among the many other creatures whose skins are utilized in various fields of manufacture after they have left the hands of the tanner.

There is probably no vegetable growth containing tannin that has not been tried by those who are interested in discovering the best and most economical methods of tanning leather, but, while nearly all of them have met with some favor, oak-bark is now held to be the best agent obtainable for this purpose. Among the other tannages that have been utilized with success, however, one may mention hemlock-bark, union, Dongola, alum, chrome, combination, electric, sumac, and gambier.

Practically the only change that has taken place in the tannage process of sole-leather is represented by a slight diminution in the time required for the work, but as experiments are constantly being made along these lines it is believed that the day will come when such leather will be turned out in as many days — perhaps hours — as it now takes weeks. The change that has already been made along these lines in the preparation of the lighter skins has been almost as radical. The introduction of Dongola kid, in 1880, completely revolutionized the manufacture of kid or morocco. It was the discovery of James Kent, of Gloversville, N. Y. The system of tanning, or tawing, by the use of chromium compounds was discovered as early as 1856 by a German chemist, but each of the many experiments which followed this discovery had failed because there was no known method by which the tannage could be made permanent. At last it was found that hyposulphite of sodium contained the long-sought remedy, and by this process the tannage was made lasting. It was due to this discovery, and to its successful application, that some of the largest and best equipped leather manufactories in the world have since been established in the United States.

Hierarchy, hī'ē-rär-kĭ (from Gr. *hieros,* sacred, and *arche,* government), sacred government or "the administration of sacred things," first used by the pseudo-Dionysius in the 5th century in his work on the Celestial and Ecclesiastical Hierarchies. It is now generally used to signify the body of officials in the Church organically graduated in their ranks and orders from the supreme head to those in the most subordinate position. In the Roman Catholic Church a threefold distinction is recognized: (1) A hierarchy of divine right, which embraces, under the primacy of the popes, bishops, priests, and deacons. This hierarchy is held by Church to be of divine institution. (2) A hierarchy by ecclesiastical right, consisting of the Roman pontiff and the three original divine orders and of the five minor orders (two in the East), subdeacons, acolytes, exorcists, lectors, and porters (ostiarii). (3) A hierarchy of jurisdiction, which includes all the judicial and administrative authorities, ordinary and delegated, charged with the maintenance of the faith among Christians, its union, its discipline, and its general care and supervision. All its powers proceed from the pope as primate, either expressly or by implication. In this category are ranked cardinals, patriarchs, exarchs, metropolitans, and archbishops, and as deriving their powers from these, archpriests, archdeacons, rural-deans, vicars-general, etc. The Anglican Church also recognizes a hierarchical rank in its body, comprising bishops, priests, and deacons. The other Protestant bodies practically reject hierarchical government.

Hiero I., hī'ērō, king of Syracuse in Sicily: d. Catania, 467 B.C. He was brother and successor of Gelon. Hiero's reign, though less glorious than the preceding, was marked by a peculiar splendor on account of his generous encouragement of learning. Though some blemishes tarnish the first years of Hiero's reign, he compensated for his first faults by the noble actions which signalized the remainder of his life. A long sickness was the main cause of this alteration. Since he could no longer occupy himself with the cares of royalty, he collected around him a society of learned men, and thus becoming acquainted with the pleasures of learning, he never afterward ceased to value it. His court became the rendezvous of the most distinguished men of his time. The names of Simonides and Pindar appear among those of his most constant companions, and when Æschylus left Greece, he betook himself to Hiero, to close his days in his kingdom. He was several times victor in the Grecian games.

Hiero II., king of Syracuse: b. before 306 B.C.; d. 216 B.C. He was the son of Hierocles, a noble Syracusan, who claimed a descent from the family of Gelon. During Hiero's reign began the first Punic war, and he was able, by his

adroitness, to preserve the friendship of both Romans and Carthaginians. The glory of Hiero and the prosperity of Syracuse culminated in the period which intervened between the first Punic war and the second; for in that season of peace Hiero enacted wise laws, and was devoted to the happiness of his subjects. His encouragement of agricultural pursuits enriched him and doubled the revenues of the state. He left the crown to his grandson Hieronymus.

Hieronymus. See JEROME, SAINT.

Hieroglyphics, hī″ē-rō-glĭf′ĭks (from Gr. *hieros*, sacred, and *glypho*, engrave), the inscriptions sculptured on buildings in Egypt, with the implication that the writing was confined to sacred subjects, and legible only by the priests. The term has also been applied to picture-writing in general, such as that of the Mexicans and the still ruder pictures of the North American Indians. Two different modes of hieroglyphic writing were used by the ancient Egyptians., the hieratic, and the demotic. Pure hieratic writing is the earliest, and consists of figures of material objects from every sphere of nature and art, with certain mathematical and arbitrary symbols. Next was developed the middle hieratic or priestly writing, the form in which most Egyptian literature is written, and in which the symbols almost cease to be recognizable as figures of objects. Hieratic writings of the third millennium B.C., are extant. In the demotic or enchorial writing, derived directly from the hieratic, the symbols are still more obscured. The demotic was first used in the 9th century B.C., and was chiefly employed in social and commercial intercourse. Down to the end of the 18th century scholars failed in find a clue to the hieroglyphic writings. In 1799, however, M. Bouchard, a French captain of engineers, discovered at Rosetta the celebrated stone which afforded European scholars a key to the language and writing of the ancient Egyptians. It contained a trilingual inscription in hieratics, demotic characters, and Greek, which turned out to be a decree of the priests in honor of Ptolemy V., issued in 195 B.C. The last paragraph of the Greek inscription stated that two translations, one in the sacred and the other in the popular Egyptian language, would be found adjacent to it. In deciphering these inscriptions the discovery of an alphabet was the first task. The demotic part of the inscription was first examined by De Sacy and Akerblad, and the signification of a number of the symbols ascertained. The hieratic part was next carefully examined and compared with the demotic and Greek. At last after much study Champollion and Dr. Thomas Young, independently of each other, discovered the method of reading the characters (1822), and thus provided a clue to the decipherment of the ancient Egyptian writing.

Cartouche of Cleopatra, i.e. Kleopatra.

Cartouche of Ptolemy, i.e. Ptolemaios.

Hieroglyphic characters are either ideographic, that is, using well-known objects as symbols of conceptions, or phonetic, that is, representing words by symbols standing for their sounds. The phonetic signs are again divided into alphabetical signs and syllabic signs. Many of the ideographic characters are simple enough; thus the figure of a man, a woman, a calf, indicate simply those objects. Others, however, are less simple, and convey their meaning figuratively or symbolically. Water was expressed by three zigzag lines, one above the other, to represent waves or ripples of running water, milk by a milk-jar, oil by an oil-jar, fishing by a pelican seizing a fish, that is, fishing; seeing and sight by an eye; and so on. The nature of the phonetic hieroglyphs, which represent simply sounds, will be understood from an explanation of the accompanying cuts.

(1) The first hieroglyph in the name of Kleopatra is a knee, which is *kne* or *kle* in Coptic, and represents the K of Kleopatra. (2) The second hieroglyph in Kleopatra is a lion couchant, which is *laboi* in Coptic, and *labu* in the old Egyptian, and represents the L of both names. In Kleopatra it occupies the second place, and in Ptolemaios the fourth. (3) The third hieroglyph in Kleopatra is a reed, which is *aké* in Coptic and *aak* in the old Egyptian, and represents the E of Kleopatra. The reed is doubled in Ptolemaios and occupies the sixth and seventh places, where it represents the diphthong *ai* of Ptolemaios. (4) The fourth hieroglyph in Kleopatra is a noose, which represents the O of both names and occurs in the third place of Ptolemaios. (5) The fifth hieroglyph in Kleopatra is a mat, which represents the P of both names, and is the initial of Ptolemaios. (6) The sixth hieroglyph in Kleopatra is an eagle, which is *akhoom* in Coptic, and represents the A, which is found twice in the name of Kleopatra. (7) The seventh hieroglyph in Kleopatra is a hand, which is *toot* in Coptic, and represents the T of Kleopatra, but does not occur in Ptolemaios, where it might be expected to occupy the second place. The second place of Ptolemaios is occupied by a semicircle, which is found at the end of feminine proper names, and is the Coptic feminine article T. The researches of Champollion satisfied him of the existence of homophones, or characters having the same phonetic value and which might be interchanged in writing proper names. (8) The eighth hieroglyph in Kleopatra is a mouth, which is *ro* in Coptic, and represents the R of Kleopatra. (9) The ninth hieroglyph in Kleopatra is the eagle, which is explained in No. 6 above. (10) The semicircle is the T of Ptolemaios, which with (11) the egg found at the end of proper names of women, is a feminine affix. In the name of Ptolemaios there is still the M and the S to account for. The fifth hieroglyph in the cartouche of Ptolemaios is a geometrical figure, consisting of three sides of (probably?) a parallelogram, but now called a hole, because the Coptic *mu* has that signification, and represents the M. The hook represents the S of the word Ptolemaios. Vowels were only regarded by the Egyptians as they were needed to avoid ambiguous writing. There are groups of hieroglyphs of which one element is an ideographic sign, to which a phonetic complement is added to indicate the pronunciation of the ideographic sign. The

words of a text could be written in hieroglyphs in three ways — (1) by phonetic hieroglyphs; (2) by ideographic hieroglyphs; and (3) by a combination of both. According to Ebers, in the perfected system of hieroglyphics the symbols for sounds and syllables are to be regarded as the foundation of the writing, while symbols for ideas are interspersed with them, partly to render the meaning more intelligible, and partly for ornamental purposes. Consult: Brugsch, 'Ægyptologie' (1891); Erman, 'Life in Ancient Egypt' (1894); and 'Egyptian Grammar' (1894).

Hierosolyma. See JERUSALEM.

Hig'gins, Anthony, American politician: b. Red Lion Hundred, Del., 1 Oct. 1840. He was educated at Yale and after studying law at the Harvard Law School was admitted to the Delaware bar in 1864. From 1869 to 1876 he was United States attorney for Delaware, and becoming interested in politics was chairman of the Republican State Convention in 1868. In 1881 he secured the vote of the Republican members of the Delaware legislature for the National Senate and in 1884 was defeated as a Republican candidate for Congress. He was United States Senator 1889–95.

Hig'ginson, Ella Rhoads, American novelist and poet: b. Council Grove, Kan., 1862. She was married to R. C. Higginson and has passed her life mainly in the vicinity of Puget Sound, Wash. She has contributed much to periodicals, and her work, which has a distinctly original flavor, has attracted much attention from its vigorous presentation of life on the upper Pacific slope. Her most noteworthy book is 'Mariella, or Out West,' an extremely strong novel (1902); and other works of hers are 'The Flower that Grew in the Sand' (1896); 'From the Land of the Snow Pearls' (1897); 'A Forest Orchid' (1897); and several collections of poems.

Higginson, Francis, English clergyman in colonial America: b. 1587; d. Salem, Mass., 6 Aug. 1630. He was educated at Cambridge, England, and subsequently became rector of a parish in Leicester, but becoming gradually a Nonconformist, was deprived of his benefice, and was employed among his former parishioners as a lecturer. While apprehending a summons to appear before the high commission court, he received an invitation from the Massachusetts Company to proceed to their colony, which he accepted. He embarked in May 1629, and it is related by Cotton Mather that as the ship was passing Land's End, he called the passengers about him and exclaimed: "We will not say, as the Separatists were wont to say at their leaving of England, 'Farewell, Babylon; farewell, Rome!' but we will say, Farewell, dear England! farewell, the church of God in England, and all the Christian friends there. We do not go to New England as Separatists, though we cannot but separate from the corruptions of it. But we go to practise the positive part of church reformation, and propagate the gospel in America." He arrived at Salem 29 June, and on 20 July was chosen teacher of the congregation established there. Subsequently Higginson drew up "a confession of faith and church covenant according to Scripture," which on 6 August was assented to by 30 persons, who associated themselves as a church. He wrote 'New England's Plantations, or a Short and True Description of the Commodities and Discommodities of the Country' (1630), and an account of his voyage, printed in Young's 'Chronicles of the First Planters' (1846). Consult: T. W. Higginson, 'Life of Francis Higginson' (1891).

Higginson, Francis John, American rear-admiral: b. Boston 19 July 1843. He was graduated from the United States Naval Academy in 1861 and served in the United States navy during the Civil War becoming lieutenant-commander in 1866. He was commander of the Massachusetts during the Spanish-American War 1898, was promoted commodore that same year, and rear-admiral in March 1899.

Higginson, Henry Lee, American banker: b. New York 18 Nov. 1834. He was educated at Harvard, studied music abroad and served in the Federal army during the Civil War and was brevetted lieutenant-colonel. He has been long connected with the Boston banking firm of Lee-Higginson & Co., and has contributed large amounts toward the organization and support of the Boston Symphony Orchestra.

Higginson, Mary Thacher, American author, wife of T. W. Higginson (q.v.): b. Machias, Maine, 27 Nov. 1843. She has written 'Seashore and Prairie' (1876); 'Room for One More' (1879); and 'Such as They Are' (1893), poems written in collaboration with her husband.

Higginson, Sarah Jane Hatfield, American writer: b. Philadelphia 15 Jan. 1840. With her first husband, a Dutch jurist, she lived for several years in the Dutch East Indies, and after his death returned to the United States, where she was married to Stephen Higginson, a former American consul in the Dutch East Indies. She has written: 'A Princess of Java: a Tale of the Far East' (1887); 'Java, the Pearl of the East,' a book of travel (1890); 'The Bedouin Girl.'

Higginson, Thomas Wentworth, American author: b. Cambridge, Mass., 22 Dec. 1823. He is descended from Rev. Francis Higginson (q.v.) and was graduated from Harvard in 1841, and from Harvard Divinity School in 1847. He became pastor of a Unitarian church in Newburyport, Mass., in 1847, but resigned from the pastorate in 1850, his anti-slavery views being unacceptable to his congregation. In the year last named he was the unsuccessful "Free Soil" candidate for Congress, and he was pastor of a Free (unsectarian) church at Worcester, Mass., 1852–8. In the interim he had been prominent in anti-slavery agitation, and for his share in the attempted rescue of the fugitive slave Anthony Burns (q.v.), was indicted for murder in 1854 with Wendell Phillips, Theodore Parker and others, but owing to a flaw in the indictment the defendants were discharged. He also aided in the Kansas Free State efforts, and during the Civil War was captain of the 51st Massachusetts regiment of volunteers, becoming colonel in November 1862, of the 1st South Carolina volunteers, the earliest regiment of freed slaves in the Federal service. He resigned from the army in October 1864, by reason of disability, and has since given his attention to literature, residing at Cambridge, Mass., since

1878. He has been almost a life-long advocate of woman suffrage and of the higher education of woman, and was a member of the Massachusetts legislature 1880–1, serving on the State board of education, also, 1881–3. He is a polished, graceful speaker, and has frequently appeared on the lecture platform, his latest appearance being as Lowell lecturer on American literature in Boston in 1902. As an after-dinner or occasional speaker he is especially happy, his felicitous sentences being almost always illuminated by the play of a very delicate humor. He is president of the Round Table, a social Boston club, and vice-president of the Boston Authors Club, as well as a member of many other organizations, social and literary. He has been for a generation a constant contributor to periodicals of the highest class and has figured in literature as essayist, novelist, poet, and historian. His principal work in fiction is 'Malbone' (1869), in which his first wife is outlined as Aunt Jane. As an essayist he is perhaps seen at his best, the essay form seeming peculiarly adapted to his genius. Among collections of essays by him may be cited: 'Outdoor Papers' (1863); 'Atlantic Essays' (1871); 'Women and Men' (1887); 'The New World and the New Book' (1891); and 'Concerning All of Us' (1892). His 'Young Folks' History of the United States' (1875) has been widely popular, and other histories by him are 'Larger History of the United States' (1885); 'English History for Americans' (1893); 'Massachusetts in the Army and Navy, 1861–5' (1895–6). His verse is included in 'The Afternoon Landscape' (1889); 'Such as They Are' (1893). Yet other important works by him are 'The Monarch of Dreams,' a strikingly original sketch (1886); 'Army Life in a Black Regiment' (1869); 'Cheerful Yesterdays' (1898); 'Old Cambridge' (1899); 'Contemporaries' (1899); and lives of Margaret Fuller (1884); Francis Higginson (1891); Henry W. Longfellow (1903); John Greenleaf Whittier (1903); 'History of the United States' (1905). He translated the complete works of Epictetus (1865, revised edition 1891). With Samuel Longfellow (q.v.) he completed a well-known anthology of seaside verse, 'Thalatta' (1853), and with Mrs. E. H. Bigelow 'American Sonnets' (1890). Several of his works have been translated into French, German, Italian, and even modern Greek. He was the friend of very many of the older New England writers and has been especially helpful to many of the younger ones, not a few of whom owe him much in the way of kindly criticism or suggestion, the fruit of ripe scholarship.

High Church, a term applied to a faction in the Church of England. It was applied first to the younger clergy during the latter part of the reign of Elizabeth who asserted that Calvinism was inconsistent with the ancient doctrine and constitution of the primitive church, and who claimed a divine right for episcopacy. Bishop Andrews was the chief writer of this faction, and Laud became its most active leader. The term now generally refers to those who exalt the authority and jurisdiction of the church, and attach great value to ecclesiastical dignities and ordinances, being more or less identified with the ritualistic party. See RITUALISM.

High Bridge, Engagement at. See FARMVILLE.

High-Frequency Oscillating Current. This term is especially applicable to electrical currents, the high frequency interruptions of which are obtained by means of condenser discharges in contradistinction to those produced by a disrupted static current, without the interposition of a metallic condenser in series with one or both terminals. The latter differs in several characteristics and is essentially a high potential current, 10,000 to 50,000 volts, with a minimum amperage, usually about .0005.

To generate a high-frequency current it is usual to charge two Leyden jar condensers with a high potential current, the source of which may be a static machine or induction coil, shunting the two wires with a spark-gap for the purpose of disrupting the current. The external armatures of the condensers are short-circuited through a solenoid or helix consisting of a few turns of coarse copper wire (D'Arsonval). The helix may be substituted by a straight copper bar (Sheldon). By prolonging the helix from 50 to 100 turns, this constitutes the resonator of Oudin. The upper part of the helix resonates in unison with the lower, when properly in tune, as would a tuning-fork resonate with another of the same pitch. The office of the extended helix is to amplify the current.

Another arrangement is after Tesla: The primary of a specially constructed induction coil is energized by an alternating current. The secondary terminals, giving a potential of 15,000 volts, are connected, one to each side of a suitable condenser. From each of these terminals a shunt is taken. One leads to one end of the primary of a Tesla coil; the other, broken by a spark-gap, is connected to the second terminal of the primary. The frequency obtained from the Tesla apparatus is fabulously high — millions a second. The potential may be hundreds of thousands or millions of volts. The amperage is sufficient to light to full candle-power several incandescent lamps. The primary of the induction coil consumes 15 to 25 amperes. For maximum high frequency effects this type of apparatus seems to be essential. The brush discharge from the terminals may be 20 or even 50 inches in length. There are many modifications of this apparatus.

The one characteristic of the high-frequency oscillating current is its lack of power to excite the motor, and, aside from a slight sensation of warmth, the sensory nerves at the point where the electrode touches the body. The accepted explanation for this fact is, that the nerves respond to certain frequencies of stimulus; for the motor nerves, reaction takes place up to about 5,000 frequencies; if these are gradually increased muscular contraction diminishes and finally ceases. This theory is in line with reasoning as to the cause for action of the special senses — sight and hearing.

At the terminals of a working high-frequency apparatus is seen a beautiful brush discharge or effluve of a peculiar blue color, which will leap to any object brought near it. Interpose a plate glass one half inch thick (or more), and

the effluve will penetrate it. If the object be a vacuum tube it will glow almost as brightly as if nothing intervened. It is an ideal current for igniting Geissler and low-vacuum X-ray tubes; only one terminal need be connected.

The high-frequency discharge is a rich ozone generator, and, applied to unhealthy granulations and various skin diseases, acts as an oxidizer, antiseptic, and disinfectant. Applied to the skin before incision, it will render the site aseptic.

For general effect the patient is placed upon an auto-condensation couch or in the centre of an auto-conduction cage. In the treatment of sub-acute and chronic rheumatism, sciatica, neurasthenia, etc., it is most useful.

JOHN M. GARRATT, M.D.

High Priest, the head of the Jewish priesthood. In the books of Moses the holder of this dignity is simply designated the priest, the epithet high occurs on one or two occasions, but as a distinctive epithet it appears to have been added subsequently. The formal consecration of Aaron, the brother of Moses, together with his sons, to a hereditary priesthood, is recorded in Ex. xxviii. The high-priesthood continued in the line of Aaron, sometimes in one, and sometimes in another branch of it, until the coming of Christ. After the subjugation of the Jews by the Seleucidæ, the Ptolemies, and the Romans, it was often arbitrarily conferred by the foreign masters. The dignity of the priest's office is indicated by the splendor and costliness of his garment, which was among the most beautiful works of ancient art. To the high priest belonged the regulation and superintendence of the worship of God, the declaration of the oracles of Jehovah to the people (he alone being permitted to consult them on important public occasions), and the preservation of the national sanctuary. Although the administration of justice was committed to particular judges, yet to him the last appeal was made in difficult cases, even in temporal affairs, and nothing important in war or peace could be undertaken without his assent.

High Schools, the term applied in the public school system of the United States to the institutions for secondary and higher education preparatory to a college course. They were generally established at public expense between 1820 and 1850, to correspond in grade to the academies or schools maintained by endowment or at private expense in which young men were prepared for college.

The European representatives of the American high schools are the public schools and colleges of Great Britain, the lyceums of France, Spain, and Italy, and the gymnasia of Germany; the universities in Germany are officially called high schools (Hochschulen).

The term "high school" was applied as early as the 16th century to a celebrated educational establishment of a liberal character, a grade below the university, in Edinburgh, Scotland.

In 1647 the Massachusetts Colony enacted a law that every town of 100 families should maintain a school, the teacher of which should be "able to instruct youth, so far as they may be fitted, for the university." This law, though imperfectly obeyed, introduced very early into Massachusetts and New England a small number of classical schools, and subsequently prepared the way for the endowment of a few academies in which young men were prepared for the colleges. Of these especially endowed academies, many of which rendered eminent service, the more notable are the Hopkins Grammar Schools of Hartford and New Haven, Conn.; the Hopkins Academy in Hadley, and Phillips Academy at Andover, Mass.; Phillips Exeter Academy at Exeter, N. H., and Amherst Academy, Mass. Among the public schools of the country, the Boston Latin School, a colonial foundation, was for a long time almost the only classical school supported by public taxation at which students could be prepared for college. It was pre-eminent alike for the thoroughness of the education which it gave, and the freeness with which this was proffered to all the residents of Boston. In 1821 the English High School, supplementary to the Latin School, was established in Boston. In Philadelphia the corresponding institution still bears the name of the Central High School, while in New York city the original Free Academy has developed into the College of the City of New York. With the reorganization of the public school systems of the older States, and the foundation of such systems almost simultaneously with the redemption of the soil from the forest and wild prairie in the newer States, provision was made for a system of high schools, to give a thorough preparation for the college curriculum. These high schools are now in vigorous operation from one end of the United States to the other. See EDUCATION, SECONDARY.

High Seas. Among maritime nations both in ancient and modern times the necessity for some international regulations to govern their communications by sea has been found a necessity. The views of jurists on this subject have fluctuated between two opposite principles. Nations possessing a powerful marine, are disposed to push their privileges to the utmost, and to claim exclusive accession to, or a superiority and protective rights over, extensive tracts of the ocean highway. The weaker maritime nations, on the other hand, and the commercial rivals of these most especially privileged, have contended for the liberty of the seas. The most memorable instance of this controversy occurred in connection with the claims arising out of the great maritime discoveries of the Portuguese at the close of the 15th century. Under the grant of Pope Alexander VI. the Portuguese claimed the right to exclude other nations from the seas between the eastern coast of Africa and the coasts of India. Against this claim Grotius wrote his celebrated treatise, the 'Mare Liberum,' which appeared in 1609. The English, who had their own claims of jurisdiction, were not then, or for long after, prepared to admit the liberty of the seas. The general principle of international law now accepted is that the jurisdiction of maritime nations extends only for three miles, or within cannon range of their own coasts; the remainder of the seas being high seas, accessible on equal terms to all nations. Inland seas and estuaries, of course, are excepted.

High Treason (Fr. *trahison,* betrayal), is defined in English law as the most heinous of all offenses against the law, and consists in imagin-

ing or devising the death of the ruling monarch, or proposing to kill, maim or restrain the king or queen; or levying war against him; adhering to his enemies; killing his wife or eldest son, or heir; violating his wife, or daughter, or heir's wife; killing the lord chancellor; killing the chancellor of the exchequer, or a justice in office. High treason against the United States consists in levying war against them; adhering to their enemies, or giving their enemies aid and comfort. Treason against a State is generally defined as hostility to a State only. The former punishment of treason in English law was death by hanging, drawing and quartering. The penalty is now hanging or imprisonment. This crime is punishable in the United States according to the act of 1862 by death or imprisonment with hard labor for a period of not less than five years, a fine of not less than $10,000 and a perpetual disability to hold any office under the United States. The act of 1862 adds: "No person shall be convicted of treason unless on the testimony of two persons to some overt act, or on confession in open court. The Congress shall have power to declare the punishment of treason, but no attainder of treason shall work corruption of blood (q.v.) or forfeiture except during the life of the person attainted."

Highbinders, a name given to a secret organization among the Chinese in the United States which has caused much bloodshed in the Chinese quarter of San Francisco, Cal., necessitating intervention on the part of the authorities. The Chinese call these societies "hatchet" societies, and the members "hatchet men." The organization seems to be an offshoot of the Six Companies (q.v.), though some claim that it is merely a revival of one which originated over 200 years ago in China.

Higher Criticism, The. The higher criticism is a science whose aim is the determination of the literary history of books and writings. It sets forth the facts and principles by which we must determine, in the case of any writing, its literary form, its unity, its date, the place of its composition, its authorship, the method of its composition or construction, its integrity, and the amount and character of any subsequent editing it has received, so far as these matters can be discovered by the use of such internal evidence as is presented in the writing itself. It is thus the science for ascertaining the literary form and the literary history of any writing by means of internal evidence. These same matters may also be determined, in part or in whole, by external evidence in many cases; that is, by history or tradition. This latter method will not necessarily be either better or worse than the method which employs internal evidence. The greater probability of the result, in every case, will depend upon the amount and the character of the evidence which is attainable. Sometimes external evidence may be more abundant and trustworthy than the internal evidence, and sometimes the reverse may be true.

The science under consideration is termed higher criticism to distinguish it from the related science of lower, or textual, criticism. This latter science has for its object the ascertaining of the history of writings as the work of penmen and printers. It seeks to determine just the words and the letters which the author himself wrote, and what are the changes which his work has suffered in transmission. Since the literary history of a writing is, on the whole, of more importance than the history of the written or printed text, the science of the literary history is justly termed the higher criticism.

The higher criticism is a science which is equally applicable to all literatures. It may be used to determine the literary history of a writing of any age, language, or people. But, of late, it has been especially brought into notice in its application to the literature of the Bible. On this account, it is sometimes spoken of as if it were a science belonging to Biblical study only. But the fact is that Biblical higher criticism is only one department of higher criticism in general.

As employed in Biblical study, higher criticism adopts the following method: (1) it sets forth the principles by which, according to the teachings of general literary criticism, we may correctly determine the literary form, the unity, the date, the place of composition, the authorship, the method of composition or construction, the integrity, the amount and character of subsequent editing, of each of the Biblical books and writings; (2) it then presents the evidential facts to be found in each of the Biblical books and writings, to which these principles will apply; and (3) finally it gives the conclusions which result from the application of these principles to the evidential facts. In practice, however, different schools of Biblical higher critics come to very different conclusions upon the same basis of evidential facts, while using the same principles of criticism. This results from the varying opinions held by these critics in relation to the value and significance of the evidential facts, due to their differing views about the history of Israel, and their philosophical convictions concerning the place of the supernatural in that history. Those critics who refuse to allow the existence of any supernatural element in the history of Israel, and hold that this history was the product of only those forces which shape and determine all human history, so that it was exactly like the history of every other people, cannot put the same value and meaning upon the historical testimony and references to be found in the Biblical books, as those critics must who believe that the history of Israel was, to no inconsiderable extent, a supernatural history, and, therefore, different from the history of every other people. In the case of the Old Testament, for example, some critics hold, because of their philosophical opinions in regard to the supernatural, and the universality of the working of the evolutionary forces of history, that the historical material of the Old Testament, as we now have it, is not to be accepted as the true basis of Old Testament history, and that this history must be constructed out of this material, under the guidance of some philosophical theory. Other critics accept the historical material which is now to be found in the Old Testament, as furnishing in itself the true Old Testament history. Since the evidential facts used in higher criticism receive their value and meaning from their evident relation to a previously determined history, it is clear

that each of two so different histories cannot be a basis for the same critical conclusions. But it is to be noted that the determination of the histories is not a work of higher criticism, but is a matter which results from the philosophical opinions held by historians. The consequence of these facts is that the only results which have thus far been reached by Biblical higher criticism, which all schools of critics would accept, seem to be: (1) The existence of different documents in the Pentateuch, which have been used in its compilation, although there is, among critics, quite a little difference of view in relation to the age of these documents and the time of their compilation into the Pentateuch; (2) the plural authorship of the books of the Old Testament known as the books of Isaiah and Zechariah; and (3) the fact that older sources have been used in the making of the synoptic gospels and the book of Acts. From all that has been said, it will be seen that it is not the duty of higher criticism to assert or deny anything in relation to the inspiration of the Scriptures, or their authority for belief or conduct. With these matters this science has absolutely nothing to do.

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S. Burnham, D.D.,
Dean of the Hamilton Theological Seminary, Colgate University.

Higher Law, a famous phrase used by William H. Seward (q.v.) 11 March 1850, in the United States Senate, on the admission of California as a State, which was held up by the Southern element to force the Congress to admit it as a slave State, or at least to divide it on the line of the Missouri Compromise (q.v.). Seward denied that the principle of compromise applied only to slavery, which was only one of many institutions, and held it equally applicable to the Territories, which were a possession to be enjoyed and administered in common by the States; and declared that the older States had no arbitrary power over them. He went on: "The Constitution regulates our stewardship; the Constitution devotes the domain to union, to justice, to defense, to welfare, to liberty. But there is a higher law than the Constitution, which regulates our authority over the domain, and devotes it to the same noble purposes. The territory is a part . . . of the common heritage of mankind, bestowed upon them by the Creator of the universe. We are his stewards, and must so discharge our trust as to secure in the highest attainable degree their happiness." And to Webster's assertion that it was absurd to re-enact the laws of God, he answered that "there is no human enactment which is just that is not a re-enactment of the law of God." It was his first set speech in the Senate, and at once made him the recognized leader of the radical section. The conservatives denounced it as treasonable, implying that no one was under any obligation to support the Constitution if he believed it in opposition to the law of God, and making the execution of any laws impossible.

Higher Plane Curves. See Curves, Higher Plane.

High'land Cattle, a variety of small, rough-coated, usually red or black cattle, with upturned horns, kept half wild upon the moors of the Scottish Highlands, and believed to represent in part the cattle of the aboriginal Britons, which are replaced in the south of Great Britain by the short-horned breeds introduced by the Roman conquest. Compare White Cattle.

Highlanders, Scotch, in the United States. After the Jacobite risings in England in 1715 and 1745, in favor of the Old and Young Pretenders, which were zealously supported by the Highlanders (who indeed formed their backbone), the English government exerted itself to drain their strength by colonizing them elsewhere; and many who were in danger of vengeance came to America voluntarily. The chief movement was after 1745, when the government thoroughly reorganized the Highlands, broke up the clans, and deported large numbers to the colonies; but after 1715 many, in bands or as individuals, had come over, especially to the Carolinas. Some settled in western South Carolina, as farmers or Indian traders; a considerable body near Fayetteville, N. C., where their descendants still speak Gaelic in preference to English, and have their church ministrations in that language; and a number of different colonies in the future Georgia, where Oglethorpe found them when he came over in 1733 with a patent for a new colony. Especially he won the hearts of a settlement at Darien, under a Capt. Mackay. These Highlanders gave him priceless help in his incessant fights with the Spaniards and constant negotiations with the Indians; but they strongly opposed the slave trade or the introduction of slaves into Georgia. Some Highland companies sent to the Mohawk Valley, during the French and Indian war, were disbanded there, and remained as settlers, a recognizable element during the Indian troubles of the early Revolution.

Hil'da, Saint, Anglo-Saxon abbess: b. about 614; d. 680. She was consecrated as a nun by Bishop Aidan, and was successively head of the abbey of Hartlepool, and of the famous monastery founded by her in 657 at Whitby, Yorkshire. This continued for several centuries a religious house of great power and influence, in the time of its founder perhaps the strongest in Great Britain. Cædmon (q.v.), the Anglo-Saxon poet, was attached to the monastery during her rule, and it was there that the celebrated synod took place in 664 in which the Celtic ritual was condemned. Consult: Bede, 'Ecclesiastical History.'

Hil'debrand. See Gregory VII., Pope.

Hil'dreth, Richard, American historian: b. Deerfield, Mass., 22 June 1807; d. Florence, Italy, 11 July 1865. He was graduated at Harvard in 1826, studied law at Newburyport, entered practice in Boston, and abandoned it in 1832 to become editor of the 'Boston Atlas.' In this position a series of articles by him in 1837, relative to the separation of Texas from Mexico, did much to stimulate the resistance which that movement encountered in the free

States. In 1834 his anti-slavery novel, 'The Slave,' was written. This work was republished and favorably received in England, and in 1852 an enlarged American edition appeared under the title of 'The White Slave: Memoir of Archy Moore' (1837). In 1837–8 he was Washington correspondent of the 'Boston Atlas,' and resumed his editorial post as an advocate of the election of General Harrison, of whom he wrote a campaign biography. He then abandoned journalism, and in 1840 published, under the title of 'Despotism in America,' a volume on the political, economical, and social aspects of slavery, to which in the edition of 1854 was appended a chapter on the 'Legal Basis of Slavery.' In 1840–3 he resided in Demerara, British Guiana, and at Georgetown edited two free labor newspapers. Later, for several years, he was a member of the New York *Tribune* staff, and in 1861 was appointed United States consul at Triest. His best known work is his 'History of the United States' (1849–56), which extends from 1492 to the end of President Monroe's first term. The author sought an authentic presentation of the conspicuous figures of earlier American history. His work is accurate and careful, though with a Federalistic viewpoint; but so uninteresting in manner as to be ill-adapted for continuous reading. Hildreth also wrote: 'Theory of Morals' (1844); 'Theory of Politics' (1853); 'Japan as it Was and Is' (1855); and 'Atrocious Judges' (1856).

Hilgard, hĭl'gärd, **Eugene Woldemar,** German-American chemist and geologist: b. Zweibrücken, Bavaria, 5 Jan. 1833. He came to the United States in 1836, returned to Europe for purposes of study and was graduated (Ph. D.) at Heidelberg, 1853. In 1858 he became State geologist of Mississippi, in 1873 was appointed professor of geology and natural history in the University of Michigan, and in 1875 was made professor of agricultural chemistry and director of the agricultural experiment station in the University of California. He received the Liebig medal from the Munich Academy of Sciences in 1894, and his investigations into the chemistry and physics of soils have done much to promote agricultural science.

Hill, Adams Sherman, American educator: b. Boston, 30 June 1833. He was graduated from Harvard College 1853 and Harvard Law School 1855, and in 1875 became Boylston professor of rhetoric and oratory at Harvard University. He has written: 'Principles of Rhetoric' (1878); 'Our English' (1889); 'Foundation of Rhetoric' (1892).

Hill, Ambrose Powell, American military officer: b. Culpeper County, Va., 9 Nov. 1825; d. 2 April 1865. He was graduated at the United States Military Academy 1847; served in the Mexican War, but resigned from the army in March 1861, and was made colonel of the 13th Virginia regiment of the Confederate army. Having distinguished himself in service, he was promoted major-general in May 1862, and lieutenant-general 20 May 1863, and placed in command of one of the three corps of the army of Northern Virginia. He led his corps at Gettysburg and later at Bristow Station and the assault on the Weldon railroad in 1864. He was killed in the attack on Petersburg, Va.

Hill, Benjamin Harvey, American legislator: b. Jasper County, Ga., 14 Sept. 1823; d. 16 Aug. 1882. He was graduated at the State University of Georgia in 1844 and chose law as a career. In 1851 he was elected to the State legislature. He in vain attempted to withstand the secession sentiment of his State, but at last yielded to the movement, and was elected to the Provisional Confederate Congress, and from the assembly promoted to the Confederate Senate. He supported Greeley for the presidency in 1872, and was defeated for the United States Senate the following year, but after being elected to the House of Representatives in 1875, was given a seat in the United States Senate 1876 and held it for the remainder of his life.

Hill, Daniel Harvey, American military officer: b. Hill's Iron Works, York district, S. C., 12 July 1821; d. Charlotte, N. C., 24 Sept. 1889. He was graduated at the United States Military Academy in 1842, and served in the Mexican War; became professor of mathematics and military tactics in Washington College, Va., in 1849, professor of mathematics in Davidson College, N. C., in 1854; and was made president of the North Carolina Military Institute in Charlotte in 1859. At the outbreak of the Civil War he entered the Confederate army as colonel; was promoted to lieutenant-general in 1863, and commanded a corps at the battle of Chickamauga. After the close of the war he resumed his educational work, and in 1877 became president of the Arkansas Industrial University, where he remained until shortly before his death.

Hill, David Bennett, American lawyer and politician: b. Havana, N. Y., 29 Aug. 1843. He entered a law office in Elmira, N. Y., as clerk and student in 1862, and after admission to the bar in 1864, rapidly built up a law practice and was an acknowledged leader of the local bar. He was active in politics, and acquired a leadership there also, through his genius for organization. He was a member of the State assembly 1870–1, and president of the Democratic State convention in 1877 and 1881. In 1882 he was elected mayor of Elmira, and lieutenant-governor in the same year, with Cleveland as governor. In 1885, when Cleveland resigned to take up his duties as President, Hill became governor. He was subsequently twice elected governor, serving till January 1892, when he took his seat in the United States Senate. During his first administration as governor, the legislature was Republican, and he was involved in a number of partisan struggles. As senator, he opposed on some issues the policy of President Cleveland; he was also opposed to the income tax clause of the Wilson Tariff Bill. In 1892 he was a prominent candidate for the presidency at the Democratic National convention, and at the convention of 1896 was one of the chief leaders of those who favored the gold standard and were opposed to radicalism in the party. In 1894 he was again candidate for governor of New York State, but was defeated by Levi P. Morton. In 1902 he practically dominated the Democratic State convention, and was active throughout the campaign.

Hill, David Jayne, American educator and diplomat: b. Plainfield, N. J., 10 June 1850. He was educated at Bucknell University, where he became professor of rhetoric 1877–9, and then president of the institution. He was elected president of Rochester University, N. Y., in 1888, resigning to spend three years in Europe studying international law and diplomacy. He became first assistant United States secretary of state in October 1898, and in 1903 was appointed United States minister to Switzerland. He has written biographies of 'Washington Irving' (1879); and 'William Cullen Bryant' (1879); 'Principles and Fallacies of Socialism' (1885); 'International Justice'; 'A Premier of Finance'; etc., and several school and college textbooks.

Hill, Frank Alpine, American educator: b. Biddeford, Maine, 12 Oct. 1841; d. Brookline, Mass., 12 Sept. 1903. He had long been prominent among New England educators, and after being head-master of high schools in Milford, Chelsea, and Cambridge, Mass., became secretary of the Massachusetts State Board of Education in 1894. He was a trustee of the Massachusetts Institute of Technology, of the State Agricultural College at Amherst, and of the Boston Museum of Fine Arts, as well as a commissioner of the State School Fund.

Hill, Frank Pierce, American librarian: b. Concord, N. H., 22 Aug. 1855. He was graduated from Dartmouth in 1876. In 1881 he became librarian of the Lowell public library, and in 1885 he organized the first free public library in New Jersey at Paterson. He also organized the Salem public library, and the Newark library in 1889. At Newark a new building was erected under his administration and the library brought to a high degree of efficiency so that it is recognized as one of the model public libraries. In 1901 he was appointed chief librarian of Brooklyn, under the new system established upon the receipt of Mr. Carnegie's gift.

Hill, Frederic Stanhope, American sailor and author: b. Boston, 24 Aug. 1829. He went to sea when a boy, and during the Civil War was an officer in the United States navy. He was with Farragut at the capture of New Orleans and Vicksburg, and was also in command on the Texas coast and in the Mississippi squadron. He has written: 'Twenty Years at Sea' (1896); 'Story of the Lucky Little Enterprise'; 'Twenty-six Historic Ships' (1903); and has been editor of the Cambridge 'Tribune.'

Hill, George Birbeck, English educator and author: b. Tottenham, Middlesex, 7 June 1835; d. Hampstead, London, 24 Feb. 1903. He was a nephew of Sir Rowland Hill (q.v.), was educated at Oxford, and was head-master of Bruce Castle School 1859–76. Since the latter date he had devoted his attention to literature and was well known in the United States through his 'Harvard College, by an Oxonian' (1894). Other works by him are: 'Talks about Autographs' (1896); 'Dr. Johnson: his Friends and his Critics' (1878); 'Life of Sir Rowland Hill' (1880); 'Foot-steps of Dr. Johnson in Scotland' (1890); 'Memoirs of the Life of Edward Gibbon' (1900).

Hill, Henry Wayland, American lawyer: b. Isle La Motte, Vt., 13 Nov. 1853. He was graduated from the University of Vermont in 1876, was principal of Swanton, Vt., union school 1877–9, and of Chateaugay, N. Y., academy 1879–83. He was admitted to the bar at Albany, N. Y., in 1884, and entered upon the practice of his profession at Buffalo. He was a member of the New York assembly 1896–1900, and has been State senator since 1901, representing each time a constituency in Buffalo. He is the author of several constitutional provisions and of several general statutes now in force. During his public career he has secured for Buffalo large State appropriations for the new 74th and 65th regiment armories, for the Historical Society building, for harbor improvement and other public purposes. He also advocated measures designed to provide home rule for cities, reform in election methods, etc., and many important State measures, such as the Primary Election law, the Civil Service law, the Franchise Tax law, the Pharmacy law, and the Canal Improvement referendum of 1903. He has made a study of waterways in this and other countries, and contributes the article on that subject in this encyclopedia. He is the author of 'The Development of Constitution Law in New York,' and a contributor to the 'Bibliophile Edition of the Odes and Epodes of Horace.'

Hill, James J., American capitalist: b. near Guelph, Ont., 16 Sept. 1838. At 18 in the village of St. Paul, Minn., he became check-clerk and caretaker of freight at the steamboat landing. At that time there was not a mile of railroad in the State. In 1862 the first 10 miles of railroad were finished from the levee in St. Paul to the riverside in St. Anthony, and known as the St. Paul and Pacific railroad, of which Hill later became the agent. After the Civil War, Hill clearly discerned the great resources and possibilities of the Red River country—Western Minnesota and Eastern Dakota. He went East, contracted for his boilers and machinery, and on the bank of the river built a flat-bottomed steamer called The Selkirk, which in the summer of 1870 began to run between Winnipeg and the head of navigation, to rival the line operated by the Hudson Bay Company. The same year, 1872, Hill consolidated his transportation interests with those of the Hudson Bay Company, forming the Red River Transportation Company. The St. Paul and Pacific railroad now reached the western boundary of the State at Breckenridge. For several years the St. Paul and Pacific system of railroads, consisting of 437 miles of completed track, was in poor condition. The stockholders, mostly Holland capitalists, were weary with delay and misfortune. Because of his faith in the future of the region Hill formed a syndicate of five persons which soon gained possession of the road, and in June 1879, the system was consolidated into a single ownership as the St. Paul, Minneapolis and Manitoba Railroad Company. In 1880 the road was extended to the Pacific coast, traversing vast tracts of land without human habitation. The track was well laid, but the stations were often only freight cars, remote from one another, and from other human settlements. The road is now known as the Great Northern. Coal fields were discovered, a branch road carried their product for the use

of the main line and settlements formed for preparing the lumber for shipment. To ship valuable lumber eastward was an excellent plan; but to send empty cars after it was out of the question; and Hill conceived the idea of shipping grain for the Japanese steamers to carry to the Orient. An agent was sent to China and Japan to find out what the price of wheat must be to compete with rice, and the result was that the Japanese Navigation Company, the third largest steamship company in the world, began to carry large shipments of grain to China and Japan. Large docks for these steamers were built at Seattle, Wash., the western terminus of the road. The original 437 miles of completed road of which Hill took charge as manager, developed into the Great Northern system of 6,000 miles. In 1883 he became president of the company. The road extends from Puget Sound to St. Paul, or during the season of navigation to Duluth and Superior, where it connects for Buffalo with its own steamers. A fleet of six freight vessels are added to these. The grain ships moving through the "Soo" give that canal rank over the Suez in point of tonnage.

In developing this scheme the plan increased enormously in the process. Besides laying the foundation of a great fortune, it opened a very rich and vast new country, reached out to new markets for many American products, and brought benefit to great numbers of people. All along the line of the road Hill encouraged the most diversified and productive farming, and introduced new methods and labor-saving devices.

Hill, Octavia, English social reformer: b. about 1838. She began work among the London poor under F. D. Maurice (q.v.); and in 1864, supported by Ruskin, began her great work of improving the homes of workingmen in the slums of London. Her methods were based upon the principle of teaching the people to help themselves, by inculcating in them right notions of cleanliness, order, and self-respect. Her efforts have been crowned with great success; the houses which have been improved yield a good percentage on the money spent in effecting the improvements; and through her hundreds have been helped to lead more comfortable and better lives. She has written 'Homes of the London Poor' (1875); 'Our Common Land and other Essays' (1878).

Hill, Robert Thomas, American geologist: b. Nashville, Tenn., 11 Aug. 1858. He was graduated from Cornell University in 1886; and was immediately given a position on the United States Geological survey. He was also a lecturer in the school of economics at the University of Michigan, and professor of geology at the University of Texas for two years, which position he resigned to return to the United States Geological Survey. He has been engaged in geological and geographical explorations in the southwestern States, Mexico, Central America, and the West Indies. His work in the two last-mentioned localities has been the investigation of the origin of the land forms, and the problem of the union of the continents. Among his most valuable contributions to geological science have been the proof of the existence of the lower cretaceous formation in the United States and the announcement of the possibility of artesian wells in Texas. In May 1902 he was sent by the National Geographical Society at the head of the expedition to investigate the volcanic eruption of Mount Pelée in Martinique. His publications include 'On Occurrence of Artesian and Other Underground Waters in Texas' (1892); 'Cuba and Porto Rico with other Islands of the West Indies' (1898); and numerous contributions to the bulletins of the geological survey and periodicals.

Hill, Rowland, English popular preacher: b. Hawkstone, Shropshire, 13 Aug. 1744; d. London 11 April 1833. He was ordained in the Anglican Church, but embracing the views of the Calvinistic Methodists, soon began to preach in barns and meeting-houses, and when they were too small or too distant, or not to be procured, in streets, fields, and highways. In 1783 he laid the foundation of Surrey Chapel, Blackfriars Road, London, where he preached with great success every winter for about 50 years, making summer excursions to the provinces, where his eloquent but eccentric preaching attracted immense crowds. He published sermons and other theological works, of which the best known are his 'Village Dialogues.'

Hill, Rowland, Viscount, English soldier: nephew of Rev. Rowland Hill (q.v.); b. Prees, Shropshire, 11 Aug. 1772; d. near Shrewsbury, England, 10 Dec. 1842. He entered the army in 1790 and served with distinction from Toulon to Waterloo. In 1812 he was made a K. B., and in 1814, a peer by the title of Baron of Almaraz and of Hawkstone. At the battle of Waterloo, Lord Hill commanded the right wing of the British. In 1828 he was appointed general commanding-in-chief of the British army. This important office he continued to hold under several successive ministries, and only resigned it a few months before his death. He was made a viscount in 1842. He was often styled "the right arm of Wellington." See Sidney's 'Life of Lord Hill' (1845).

Hill, Sir **Rowland,** English postal reformer: b. Kidderminster, 3 Dec. 1795; d. 27 Aug. 1879. He was engaged as a schoolmaster till 1833, shortly after which he was appointed secretary to the commissioners for the colonization of South Australia. In 1837 he published a pamphlet recommending the adoption of a low and uniform rate of postage throughout Great Britain and Ireland. The scheme was approved by a committee of the House of Commons, and early in 1840 the penny postage system, which seems to have been originally proposed by James Chalmers of Dundee, was carried into effect with the assistance of Rowland Hill, who, for this purpose, received an appointment in the Treasury. In 1846 he received a public testimonial of the value of upward of £13,000. In 1846, he was made secretary to the postmaster-general, and in 1854 chief secretary to the Post-office. In 1860 he became K. C. B.

Hill, Thomas, American Unitarian clergyman and mathematician: b. New Brunswick, N. J., 7 Jan. 1818; d. Waltham, Mass., 21 Nov. 1891. Left an orphan at 10 years; at 12 he was apprenticed to the printer of the 'Fredonian' newspaper, where he remained four years. He then entered an apothecary's shop, after a year's attendance at school, and served in it several years. He was graduated from Harvard College in 1843; and from the Divinity School in 1845,

and was settled as pastor at Waltham the same year. He was president of Antioch College, Ohio, 1859–62. He accompanied Agassiz on his expedition to South America and was pastor of the Unitarian Church at Portland, Maine, 1873–91. He published 'Elementary Treatise on Arithmetic' (1845); 'Geometry and Faith' (1849); 'First Lessons in Geometry' (1855); 'Treatise on Curves' (1855); 'The Natural Sources of Theology' (1875); 'In the Woods and Elsewhere', verse (1888); etc.

Hill, Thomas, American painter: b. Birmingham, England, 11 Sept. 1829. He came to the United States in 1841. Returning to Europe he studied under Paul Mayerheim for several months, but is practically a self-taught artist. He painted the 'Yosemite Valley' which was chromo-lithographed by Prang. He has continued to confine himself to the grander aspects of American scenery, and notable among his productions are 'The Home of the Eagle'; and 'Grand Cañon of the Sierras.'

Hill, Walter Barnard, American lawyer and educator: b. Talbotton, Ga., 9 Sept. 1851: d. Athens, Ga., 28 Dec. 1905. He was graduated from the University of Georgia in 1870, and from the law school in 1871, with the degree of A.M. He was admitted to the bar, and practised law in Macon, Ga., from 1871 to 1899. He was a member of the Georgia Bar Association, and was its president in 1888; a member also of the American Bar Association and the chairman of the committee on judicial administration. He also was actively interested in educational progress, being trustee of Vanderbilt University at Nashville, Tenn. In 1899 he was appointed chancellor of the University of Georgia; as an educator he strongly approved the work of the Tuskegee and similar institutions for the negro. He wrote articles on legal and educational subjects and compiled the law code of Georgia (1873, 1882).

Hill, Walter Henry, American Roman Catholic priest and educator: b. near Lebanon, Ky., 21 Jan. 1822. He was graduated from St. Mary's College in 1843, was tutor there for a time, and also studied medicine at St. Louis University. In 1847 he became a member of the Jesuit order, taught at St. Joseph's College and at St. Louis University and completed his theological studies. In 1861 he was ordained a priest; in 1865–9 he was president of St. Xavier College at Cincinnati; he was socius of the provincial at St. Louis University in 1869 and professor of mental and moral philosophy there in 1871. From 1884 to 1896 he was pastor of the church of the Sacred Heart in Chicago, and in 1896 retired from all active duties. He has written 'Elements of Philosophy, comprising Logic and Ontology' (1873); 'Ethics of Moral Philosophy' (1877); 'Historical Sketch of St. Louis University' (1879); and valuable contributions to the 'American Catholic Quarterly.'

Hill River. See HAYES RIVER.

Hillard, hil'ard, **George Stillman,** American author and lawyer: b. Machias, Maine, 22 Sept. 1808; d. Boston 21 Jan. 1879. He was graduated from Harvard in 1828, and from the Harvard Law School four years later. He was a member of the Massachusetts senate in 1850, where his policy as a legislator was warmly commended by Daniel Webster; a member of the Massachusetts constitutional convention in 1853; and United States district attorney in 1866–70. Though successful as a lawyer his tastes were largely literary; he was well known as a lecturer; was editor of the 'Christian Register' with George Ripley, and associate editor of the Boston *Courier;* wrote 'Six Months in Italy' (1853); 'Life of George Ticknor' (with Mrs. Ticknor); 'Life of George B. McClellan' (1864), and edited a series of school readers which bore his name, and the works of Spenser.

Hillebrand, Karl, kärl hĭl'lĕ-brănt, **German** critic and historian: b. Giessen, 17 Sept. 1829; d. Florence 19 Oct. 1884. For participation in the insurrection in Baden (1849) he was imprisoned, but escaped to France, where he was graduated at the Sorbonne, and in 1863 became professor of foreign languages at Douai. On the outbreak of the Franco-Prussian War, he removed to Italy and passed the remainder of his life there. Among his publications in French, German, Italian, and English, are: 'On Good Comedy' (1863); 'Contemporary Prussia' (1867); 'Italian Studies' (1868); 'Times, Peoples, and Men' (1875–85); 'History of the Government of Normandy' (1863–73); 'Public Instruction in the United States' (1869); 'Lectures on German Thought during the Last Two Hundred Years' (1880). Consult Homberger, 'Karl Hillebrand' (1884).

Hil'legas, Howard Clemens, American journalist and author: b. Pennsburg, Pa., 30 Dec. 1872. He was graduated from Franklin and Marshall College, Lancaster, Pa., in 1894, and after being connected with several Pennsylvania journals was war correspondent of the New York *World* in South Africa 1899–1900. He has published 'Oom Paul's People' (1899); 'The Boers in War' (1900); 'With the Boer Forces' (1900).

Hillern, Wilhelmine von, vĭl-hĕl-mē'nĕ fŏn hĭl'ĕrn, German novelist: b. Munich 11 March 1836. In early life she was an actress at Coburg, and in 1857 married Baron von Hillern who died in 1882. Her novels began to appear in 1862 and became rapidly popular. Among them are: 'Double Life' (1865); 'A Physician to the Soul' (1869); 'The Geyer-Wally' (1873). Translations of her novels have been widely circulated in America. Her efforts as a dramatist have not endured, but one or two of her novels have been adapted for the stage.

Hill'house, James, American politician: b. Montville, 21 Oct. 1754; d. New Haven, Conn., 29 Dec. 1832. He was graduated in 1773 at Yale, of which institution he was treasurer from 1782. He studied law, and took an active part in the struggle of the Revolution; was a Federalist member of Congress in 1791, and in 1795–1810 a member of the United States senate. He was also a member of the Hartford Convention of 1815. It was chiefly through his initiative in the planting of trees that New Haven came to obtain the title of 'Elm City.'

Hillhouse, James Abraham, American poet: b. New Haven, Conn., 26 Sept. 1789; d. near there 4 Jan. 1841. He was the son of James Hillhouse (q.v.). He was graduated at Yale College in 1808, entered commerce in New York, and published in London his drama of 'Percy's Masque,' reprinted in New York with

changes in 1820. In 1822 he removed to a country seat near New Haven, where he passed the remainder of his life. In 1825 he published his second drama, 'Hadad'; and in 1839 a collected edition of his writings appeared under the title of 'Dramas, Discourses, and other Pieces.' His dramatic writings, once greatly praised, now appear grandiose and dull.

Hilliard, hĭl'yard, **Henry Washington,** American lawyer: b. Fayetteville, N. C., 4 Aug. 1808; d. Atlanta, Ga., 17 Dec. 1892. He was graduated at South Carolina College in 1826, was admitted to the bar in 1829, in 1831–4 was a professor in the University of Alabama (Tuscaloosa), in 1838 was chosen to the Alabama legislature, in 1842–4 was United States *chargé d'affaires* in Belgium, and in 1845–51 represented an Alabama district in Congress. Though opposed to secession, he became a brigadier-general in the Confederate army. He was United States minister to Brazil, in 1877–81. He wrote: 'Speeches and Addresses' (1855); 'De Vane, a Story of Plebeians and Patricians' (1865); and 'Politics and Pen Pictures' (1892).

Hillis, hĭl'ĭs, **Newell Dwight,** American Presbyterian clergyman: b. Magnolia, Ia., 2 Sept. 1858. He was educated at Iowa College and Lake Forest University, studied theology at McCormick Theological Seminary, entered the ministry of the Presbyterian Church, and held pastorates at Peoria, Ill. (1887–90), and Evanston, Ill. (1890–4). In 1894 he was appointed pastor of the Central Church, Chicago, an independent congregation, and in 1899 of Plymouth Church of Brooklyn. He became known also as a lecturer, and has published: 'The Investment of Influence'; 'A Man's Value to Society'; 'How the Inner Light Failed'; 'Foretokens of Immortality'; 'Great Books as Life Teachers'; 'The Influence of Christ in Modern Life'; 'The Quest of John Chapman' (1904); and many other books.

Hills'boro, Ill., city, county-seat of Montgomery County; on the Cleveland, C., C. & St. L. railroad; about 45 miles south by west of Springfield, and 52 miles northwest of East Saint Louis. Its chief manufactures are flour, furniture, woolen goods, carriages and wagons, and dairy products. There is a coal-mine nearby. It is the commercial centre of an agricultural section of the State. Pop. (1900) 1,937.

Hillsboro, Ohio, village, county-seat of Highland County; on the Norfolk & W. and the Baltimore & O. S. R.R.'s; about 60 miles southwest of Columbus and 50 miles east by north of Cincinnati. It is in an agricultural and stock-raising region. The chief manufactures are furniture, foundry products, flour, lumber, dairy products, and cigars. It is the trade centre for a large part of Highland County. It has a public library containing about 8,000 volumes, and a number of fine public and private buildings. The city owns and operates the waterworks. Pop. (1900) 4,535.

Hillsboro, Texas, city, county-seat of Hill County; on the Missouri, K. & T. and the St. Louis S. R.R.'s; about 52 miles southwest of Dallas and 38 miles north of Waco. It is situated in an agricultural and stock-raising region. Its chief manufactures are cottonseed-oil, cotton goods, hosiery, flour, candy, men's clothing, agricultural implements, and lumber. The trade is largely in live stock, cotton, hides, grain, hay, and lumber. It has cotton-gins, cotton-compresses, planing-mills, and hay presses. The city owns and operates the waterworks. Pop. (1890) 2,541; (1900) 5,346.

Hills'dale, Mich., city, county-seat of Hillsdale County; on the Lake Shore & M. S. railroad; about 88 miles southwest of Detroit and 60 miles west of Toledo, Ohio. The first permanent settlement was made about the year 1840. It is situated in a rich agricultural region in which are raised large quantities of fruit. The chief manufactures are flour, fur garments, screens for doors and windows, wagon-wheels, tables, furnaces, furniture, and canned fruits The trade, in addition to the manufactures, is chiefly in grain, fruits, vegetables, and live-stock. Baw Beese Park, outside the city limits, is owned by the city. Hillsdale is the seat of Hillsdale College (q.v.). The electric-light plant and the waterworks are owned and operated by the city. Pop. (1900) 4,151.

Hillsdale College, a coeducational institution founded in 1855 under the auspices of the Free Baptist Church, in Hillsdale, Mich. Since its establishment it has graduated about 1,000 students. The number of professors and instructors in 1903 was 24, the number of students 350. Special attention is given to the classical and scientific work, but the modern languages are not neglected.

Hilo, hē'lō, Hawaii, town on the Hilo Bay, on the eastern coast of the island; about 38 miles from Mauna Loa, 36 miles from Mauna Kea (the highest peak of the group), and 28 miles from Kilauea. Hilo is the second town in size in the Hawaiian Islands. It has the best harbor belonging to the group. The lighthouse in the harbor can be seen many miles. Large lava-fields are near; on the northwest side of the town and in the vicinity are extensive forests. The craters of Loa and Kilauea, the largest in the world, are visited annually by many tourists who land at Hilo. The inhabitants of the town include many races; but people from the United States who have engaged in business in Hilo are quite prominent. Hilo has good schools to which attendance is compulsory. The population of the town, which is co-extensive with the district of the same name is (1900) 19,785.

Hilongos, hē-lŏng'ōs, Philippines, pueblo of Leyte, on the southwest coast at the mouth of the Salog River, 62 miles southwest of Tacloban. It has a good harbor. Pop. 13,813.

Hilprecht, Herman Volrath, hĕr'măn fōl'rät hĭl'prĕHt, American Assyriologist: b. Hohenerxlehen, Germany, 28 July 1859. He was graduated at Leipsic in 1883 and was curator of the Semitic section of the museum of the University of Pennsylvania, to which he presented the greater part of the 27,000 original cuneiform inscriptions which it contains. He was made professor of Assyrian and Comparative Semitic philology in the same institution 1886. In 1888-89 he was Assyriologist and scientific director of the University of Pennsylvania's expedition to Nippur, Babylonia, and editor-in-chief of its publications. Among his works may he mentioned: 'Old Babylonian Inscriptions, chiefly from Nippur'; 'History of the Babylonian Expedition of the University of

Pennsylvania to Nippur'; 'Recent Researches in Bible Lands'; 'Explorations in Bible Lands during the 19th Century' (1903).

Hilton Head, an island, at the mouth of the Broad River, off the southeast coast of South Carolina; a part of Beaufort County. Fort Walker, a Confederate fortification, was erected here during the Civil War. On 5 Nov. 1861, the fort was attacked by a Union fleet, under Commodore Dupont; Commodore Tatnall, with a Confederate flotilla, or "mosquito fleet," assisted Fort Walker, but it was captured by Dupont. The reports gave Union loss 8 killed and 23 wounded; Confederates, 10 killed and 10 wounded.

Himalaya, hĭm-ä'lā-yạ or hĭm-ạ-lā'yạ (from the Sanskrit signifying the abode of snow), a mountain system of Asia containing the highest peaks in the world, the principal mass of which is near the southern edge of the central section of the continent, between lon. 65° and 110° E., and lat. 28° and 37° N. The system extends approximately from northwest to southeast for about 2,000 miles, while its breadth varies from 100 to between 500 and 600 miles. The elevated plateau of Tibet, between the Himalaya proper and its extension, the Kuen-Lun range, is the widest part of the system. While the term Himalaya is usually confined to the range forming the northern barrier of India, the Hindu-Kush, on the northwest, and the Karakoram with the Kuen-Lun to the north are not distinct chains as frequently represented, but are all portions of the same connected mountain mass, having very little to distinguish them from the rest of the elevated system to which they belong. The Himalaya is connected on the east with the mountains of China and the Indo-Chinese peninsula, and on the west with the mountains of Baluchistan and Afghanistan. The Pamir Plateau described as a "huge boss or knot" north of the Hindu-Kush connects the Himalayas with the Thian-Shan, another mountain system which extends northeastward for about 1,200 miles. From the Ganges-watered plain of northern India which has an elevation of about 1,000 feet above the sea, the Himalayas ascend by successive slopes. The transition from this plain to the ascent of the range is marked in the northwest by a belt of dry, porous ground, broken up into numerous ravines. East of this is the "Terai," a belt of sloping marshland covered with forest and jungle, very malarious and crowded with wild animals. Beyond this lies the "Bhabar," a belt of gravelly and sandy nature covered with forests of valuable timber trees. The "duns," "maris," or "dwars," longitudinal valleys partly cultivated and partly yielding forest growth, occupy the space between the Bhabar and the slopes of the Himalayas. The principal passes are the highest in the world and include the Ibi-Gamin pass in Garwhal 20,457 feet, the Mustagh 19,019 feet, the Parangla 18,500 feet, the Kronbrung 18,313 feet, and the Dura Ghat 17,750 feet. The greatest elevations of the Himalayan system are Mt. Godwin-Austen 28,250 feet in the Karakoram range, and in the Himalayas proper the Gaurisankar or Mount Everest 29,002 feet, the highest peak in the world, Kunchinjinga 28,176 feet, and Dhawalagiri 26,826 feet. On the north the limit of the snow line is 17,400 feet, on the south 16,200 feet. From the southern slope of the central portion of the great chain flow the various streams which unite in the Ganges; from the southern slope of the northwestern portion spring the rivers of the Punjab or "Five Waters," which unite to swell the Indus which rises on the northern slope and flows southwestward to the Arabian Sea; also on the northern slope not far from the source of the Indus springs the Brahmaputra which flows east, southwest, and south to the Bay of Bengal; and also from the plateau of Tibet north of the main Himalayan range flow the Salwin, Mekong and other rivers of the Indo-Chinese peninsula, the Yangtse, Hwang-ho, and other rivers of the Chinese Empire. The whole system is of granitic formation associated with gneiss and mica-slate, followed in descending by metamorphic and secondary rocks, until the alluvial deposits are reached. Minerals abound; copper and lead have been mined from ancient times, iron more recently, coal is found at the foot of the mountains, gold in the beds of the mountain torrents, zinc, sulphur, plumbago and salt are also obtained, and there are numerous mineral springs. The vegetation is luxuriant; rhododendrons are in rich profusion, and there are forests of pine, spruce, silver-fir and deodar cedar at varying altitudes. Consult Schlagintweit, 'Scientific Mission to India and High Asia'; Waddell, 'Among the Himalayas.'

Hinck'ley, Thomas, American colonial governor: b. England, about 1618; d. Barnstable, Mass., 25 April 1706. In 1635 he emigrated to America, and settled at Scituate, but four years later removed to Barnstable. He was deputy governor of Plymouth Colony in 1680 and afterward governor.

Hincks, Sir Francis, Canadian statesman: b. Cork, Ireland, 14 Dec. 1807; d. Montreal, 18 Aug. 1885. He went to Canada in 1831, set up in business at Toronto, and there became editor of the 'Examiner.' In 1841 he entered the first United Parliament as a prominent Liberal. He undertook the editorship of the 'Pilot' of Montreal in 1844. From 1851 to 1854 he was Canadian premier, and as such developed the railway facilities and mining resources of the country, and negotiated a treaty of commerce with the United States. In 1855–62 he was governor of Barbadoes, in 1862–9 of British Guiana, later minister of finance, and from 1873 editor of the Montreal 'Journal of Commerce.' Among his publications are: 'Canada: Its Financial Position and Resources' (1849); 'The Political History of Canada between 1840 and 1855' (1877); 'The Boundaries Formerly in Dispute between Canada and the United States' (1885).

Hind, hīnd, John Russell, English astronomer: b. Nottingham 12 May 1823; d. Twickenham 23 Dec. 1895. In 1840 he obtained a situation in the Royal Observatory at Greenwich. He was a member of the commission appointed to determine the exact longitude of Valencia (1844), and on his return was appointed the observer in Bishop's Observatory, Regent's Park. There he calculated the orbits of more than 70 planets and comets, noted several new variable stars and nebulæ, and discovered 10 minor planets. In 1851 he obtained from the Academy of Sciences at Paris the Lalande medal, and was elected a corresponding member; and in 1852 received the Astronomical

Society of London's gold medal, and a pension of $1,000 a year from the British government. In 1857–91 he was director of the 'Nautical Almanac,' and in 1880 president of the Royal Astronomical Society. He wrote: 'The Solar System' (1846); 'Astronomical Vocabulary' (1852); 'The Comets' (1852); 'Elements of Algebra' (1885); 'Introduction to Astronomy' (1871), and other works.

Hindman, hĭnd'măn, **Thomas Carmichael,** American soldier: b. Tennessee 1818; d. Arkansas 1868. He studied law, entered practice in Mississippi, fought in the Mexican War as a lieutenant of Mississippi volunteers, and in 1858–61 was a Democratic representative in Congress. Not long after the outbreak of the Civil War, he was commissioned brigadier-general, was defeated at Newtonia and Prairie Grove, was promoted major-general at Shiloh, and later served in Arkansas.

Hin'doos, in American history, a nickname given in New York State in 1854 to the American (q.v.) or Know-Nothing Party, from a charge that its candidate for governor, Daniel Ullmann, was born in Calcutta. He was in fact a Delaware man and a graduate of Yale.

Hinduism, in its widest sense, the religion and religious philosophy of the inhabitants of Hindustan, which is professed by nearly half of mankind. Hinduism, historically considered, presents three periods of development. The first is the Vedic age. The Vedas (q.v.) are hymns of worship, and the study of them reveals very clearly the nature worship of primitive Hindustan. In these hymns the elements of nature are addressed as divine beings. Agni, fire, lightning; Surya, the sun; Indra, the cloudless firmament; Maruts, the winds; Ushas, the dawn, are the principal deities of this poetic pantheon. They are addressed in high and sometimes beautiful language, as the senders of temporal blessings. Offerings of delicious viands are made to them; but they are not to be propitiated by bloody sacrifices of beasts, much less by human sacrifices. Libations are poured to them of soma, an exhilarating drink, made from the fermented juice of the soma (q.v.) or milk-plant. Throughout the Vedic hymns runs the under-notion of a supreme being, the creator and ruler of all. This is less discernible in the Brahmana or the Veda than in the Upanishads (q.v.). The Brahmana is a later class of Vedic hymn in which the henotheism suggested in the Upanishads has given place to a highly artificial classification of the divine powers, with a careful estimate of the rank of each. In the Upanishads, Agni, Indra, and Surya become symbols whose united significance may help the mind to understand the existence of one supreme and absolute being, and in this class of Vedic hymn we see the principles of the most enlightened form of native religion in India. The one world soul, in all its manifestations, is reflected in the soul of man, whose destiny is to be reunited with it. The moral responsibility of man, and the judgment of the supreme being against wrong-doing, are plainly taught in these hymns; but there is no trace in them of the later doctrine of moral purification through reiterated metempsychosis.

The second period in the development of Hinduism may be called the epic period. It receives full illustration in the great epic poems, the Ramayana, and the Mahabharata. Side by side with the pictorial teaching of these poems, in which an attempt is made to present the working of the divine economy in relation to specific human lives, there rises a philosophical system, rudimentary indeed, but laying foundations for the later Sankhya, Nyaya, and Vedanta systems. In the Mahabharata, with all its episodes and fantastic incidents, is vividly put forth the doctrine that the union of the human soul with the great, divine soul of the world is aided and expedited by penances of various sorts, such as are detailed with systematic prolixity in the Yoga. In the epic period the doctrine of metempsychosis is clearly enunciated. The soul, after the death of its temporary possessor, must be born again in some material semblance, in order that it may complete the work left unfinished in some previous state of existence, and must repeat the same experience until its task be accomplished and perfection be attained. A decided change is apparent in the popular Hinduism of the third or Puranic period (see PURANAS; TANTRAS). In the Puranas there is almost a Götterdämmerung discernible: no longer do peace and concord prevail in the pantheon where Brahma, Vishnu and Siva still reign supreme, but all is discord, confusion, and destruction. The legends of the epic poems are amplified with childish variations. The simple ideas of the Vedic hymns have vanished. The unbridled imagination of imitators and commentators has overstepped the limits of reverence, dignity, and even poetic beauty in the Puranas, which do not show any advance even in philosophical earnestness, acuteness, or profundity. Worship has become an empty ceremonial. The Vedanta philosophy is now the intellectual creed of the thoughtful and learned (see VEDANTA), and this philosophy is a sort of Deistic agnosticism, only slightly more definite than that of Herbert Spencer, as propounded in his 'First Principles.' For it is the main tenet of the Vedanta that there is one supreme divinity, but, however imagination and speculation may seek to invest this first principle with all the perfections which the human mind is capable of conceiving, the essence of the one divine being lies far beyond the grasp of human thought.

The philosophical creed and henotheism of the educated Brahmin is a sort of esoteric Hinduism which has not supplanted among the general people the influence of a wild polytheism. While it is said that the inferior gods of India make up a pantheon of 330,000,000 divinities, the most important among them are but few in number. These are styled "Guardians of the World," and comprise the elemental gods worshipped in the Vedic hymns. Next in rank to Vishnu, Siva, and Brahma, the supreme triad, are Indra, Agni, Yama (the god of hell), Surya, Varana (the god of water), Purana (the god of wind), Kuvesa (the god of wealth), Soma or Chandra (the moon god), etc. Among sacred animals are bulls; snakes, whose union with the demigods produced monkeys, and some birds, such as the ganada. Among trees, the banyan is held to be divine.

The sects of Hinduism are numerous, and their existence illustrates a principle which is

found to have prevailed in the mythological religion of Greece. Each of these sects worships a particular divinity, and teaches that this divinity possesses all the attributes of a supreme being. Thus polytheism does not mean in India, generally, the worship of many gods by each devotee, but very often merely the worship of one god under many names. For example, the Saivas worship Siva; the Sauras, Surya the sŏn; the Ganapatyas, Ganesa, the god of wisdom, and so on to an almost indefinite length. They ask from each of these gods the same gifts, and the exercise of the same powers. Other sects are Buddhists, Jainas (q.v.), and Sikhs (q.v.). These last profess a pure theism, yet blended with all the absurdities of Hindu mythology and the monstrous fables of Islam; nevertheless they despise Hindus and Mussulmans alike and do not recognize the distinctions of caste. They reject all the Hindu sacred books and look upon warfare as a religious deity. This sect was founded at the beginning of the 16th century A.D. by Nanak Shah.

The philosophy of Hinduism is almost altogether occupied with those questions for which a religious solution is generally sought, namely, the origin and destiny of man, and his relation to the supreme being or the absolute. There are six schools of this philosophy, namely, the Nyaya, Vaiseshika, Sankhya, Yoga, Mimansa, and Vedanta. They all agree in essential points. Their object is to prescribe rules by which man may be delivered from the bondage of ignorance, and be absorbed into the deity. Their doctrine of the soul as something eternal and inextinguishable, distinct from mind, senses, and body, yet sharing in the merit or guilt of good or bad deeds, the latter of which are caused by ignorance of what is best and highest, is identical. They all teach the doctrine of metempsychosis and accept the authority of the Vedas. There is complete agreement among them as to how ignorance is to be gradually illuminated and right apprehension acquired; to this end the Scriptures must be studied and clearness of intellect and heart secured by sacrifices, alms giving, pilgrimages, the repetition of sacred words. The Sankhya are atheistic in their belief, but all the other schools teach the existence of one supreme being.

Consult: Wurm, 'Geschichte der Indischen Religion' (1874); Vergaigne, 'La Religion Védique d'apres les Hymnes du Rig-Véda' (1878–83); Barth, 'Les Religious de l'Inde' (1879); Muir, 'Original Sanskrit Texts'; Colebrook, 'Essays on the Religion and Philosophy of the Hindus' (1858); Mullens, 'Religious Aspects of Hindu Philosophy' (1860).

Hindustan, hĭn-doo-stän', **Hindostan,** hĭn-dō-stän', or **Indostan,** signifying "the land of the (river) Indus," a word of Persian derivation, formerly applied to India (q.v.).

Hingham, hing'am, Mass., town in Plymouth County; on Massachusetts Bay, and on the New York, N. H. & H. railroad; about 15 miles southeast of Boston. In the town are the villages of South Hingham, West Hingham, and Hingham Centre. The first permanent settlement was made in 1633, and it was then called Barecove. In 1635 it was incorporated under its present name. Its chief manufactures are awnings, cordage, wooden-ware, toys, boot-heels, furniture, leatherette and upholstery. It has a meeting-house which was built in 1681. It contains a public library and is the seat of Derby Academy. Some of the noted people who have lived in Hingham are John A. Andrew, John D. Long, Benjamin Lincoln, and James Hall, the famous geologist who for a number of years was State geologist of New York. Joshua Hobart, the Puritan ancestor of the Hobarts of New York State, lived in Hingham. Pop. (1900) 5,059. Consult: 'History of the Town of Hingham.'

Hink'son, Katherine Tynan, Irish novelist and poet: b. Dublin, Ireland, 3 Feb. 1861. She was educated in a convent at Drogheda and since her marriage to H. A. Hinkson in 1893, has lived in Ealing, a suburb of London. She is a voluminous writer of prose and verse, and her books are well known in the United States. Among them may be named: 'Shamrocks,' verse (1887); 'The Way of a Maid' (1895); 'Oh! What a Plague is Love' (1896); 'Three Fair Maids' (1900); 'That Sweet Enemy' (1901).

Hinman, Russell, American editor of text-books: b. Cincinnati 23 Jan. 1853. He was educated at Antioch College, Ohio, went into business as a civil engineer; and later became editor of geographical text-books for Messrs. Van Antwerp, Bragg & Co. of Cincinnati. Since 1890 he has been in charge of the editorial office of the American Book Co. He has written 'Eclectic Elementary Geography'; 'Eclectic Complete Geography'; 'Eclectic Physical Geography.'

Hinoyossa, hē-noi-ŏs'sä, **Alexander d',** Dutch colonial governor in America: b. and d. Holland. He came to America in 1650 as lieutenant in a small military force sent to accompany 150 immigrants. In 1659 he became director of Nieuer Amstel, a Dutch colony on the eastern bank of the Delaware River. Although, owing to disagreements and illness, this colony was not at first a success, it was greatly developed by Hinoyossa's wise rule. Hinoyossa was for a time involved in a conflict of authority with Director Petrus Stuyvesant of New Amsterdam, who had general superintendence of the commissioners constituting the government of Nieuer Amstel. In 1663 he obtained autnority over all the settlements on the Delaware. The Swedish colonists submitted, and Stuyvesant relinquished his control. Upon the conquest of New Netherland by England, Hinoyossa returned (1674) to the continent where he fought in the Dutch army against the French invasion by Louis XIV.

Hin'ton, Richard Josiah, American author: b. London, England, 25 Nov. 1830; d. 20 Dec. 1901. He settled in the United States in 1851; studied topographical engineering at the Columbia School of Mines; and removing to Kansas in 1856 became a supporter of the cause of John Brown. He served in the National army in 1861–5; and was the first white man appointed to raise and lead colored troops. After the war he engaged in newspaper work in Washington, New York, and San Francisco. He was the author of 'Life of William H. Seward'; 'Life of Gen. P. H. Sheridan'; 'John Brown'; etc.

Hip, that part of the trunk comprised between the abdominal wall and the lower limb,

particularly the region over the hip-bone (the crest of the ilium).

Hip Joint, the joint of the upper leg or thigh (femur) where it joins the trunk. It is a ball and socket joint, formed by the sinking of the smooth globular cap into the deep hollow, called acetabulum (vinegar bowl), of the os innominatum. Its movements are controlled by five ligaments: the capsular; the ilio-femoral; the teres; the cotyloid; and the transverse. These movements are more wonderful than even those of the arm, being flexion, extension, abduction, adduction, and rotation inward and outward. It is the most powerful joint in the body and hardest to dislocate.

Hip Joint, Disease of, a disease of the ball and socket of the hip. It often results from scrofula; comes on in children or young persons, from very slight causes; is often traced to a long walk, a sprain in jumping, or a fall. In the early stage of the disease the whole of the structures of the joint are inflamed and after proper treatment may be sometimes subdued with no worse consequences than a more or less rigid joint. Usually, however, abscesses form around the joint, and often communicate with its interior; and the acetabulum and the head and neck of the thigh-bone become disintegrated, softened, and gritty. In a still more advanced stage, dislocation of the head of the thigh-bone commonly occurs, either from the capsular ligament becoming more or less destroyed, and the head of the bone being drawn out of its cavity by the action of the surrounding muscles, or from a fungous mass sprouting up from the bottom of the cavity, and pushing the head of the bone before it.

As the disease advances, abscesses occur around the joint. True shortening of the limb now takes place, which at the same time becomes adducted and inverted. From this stage, if the health is pretty good, and the lungs are sound, the patient may be so fortunate as to recover with an anchylosed (or immovable) hip-joint; but the probability is that exhaustion and hectic will come on, and that death will supervene, from the wasting influence of the purulent discharges occasioned by the diseased bone.

Hipparchus, hĭ-pär'kŭs, Greek astronomer: b. Nicæa in Bithynia. He lived about 160–125 B.C.; resided for some time at Rhodes, but afterward went to Alexandria, then the great school of science. A commentary on Aratus is the only work of his extant. He first ascertained the true length of the year, discovered the precession of the equinoxes, determined the revolutions and mean motions of the planets, prepared a catalogue of the fixed stars, etc.

Hipparion, hĭ-pā'rĭ-ŏn, a genus of fossil three-toed *Equidæ*. See HORSE. EVOLUTION OF.

Hippel'ates, a genus of midges to whose agency is ascribed the spread in many instances of the southern ophthalmic disease of cattle called pink-eye. See FLIES; PINK-EYE.

Hippocrates, hĭ-pŏk'ra-tēz, Greek physician, the father of medicine: b. in the island of Cos 460 B.C.; d. Larissa, Thessaly, 357 B.C. Besides practising and teaching his profession at home he traveled on the mainland of Greece. His writings, which were early celebrated, became the nucleus of a collection of medical treatises by a number of authors of different places and periods, which were long attributed to him, and still bear his name. The best edition is that of Littré (in 10 vols. Paris, 1839–61). He has the great distinction of having been the first to put aside the traditions of early ignorance and superstition, and to base the practice of medicine on the study of nature. He maintained, against the universal religious view, that diseases must be treated as subject to natural laws; and his observations on the natural history of disease, as presented in the living subject, show him to have been a master of clinical research. His accounts of phenomena show great power of graphic description. In treating disease he gave chief attention to diet and regimen, expecting nature to do the larger part. His ideas of the very great influence of climate both on the body and the mind, were a profound anticipation of modern knowledge. He reflected in medicine the enlightenment of the great age in Greece of the philosophers and dramatists.

Hippodrome (from the Greek, *Hippos,* a horse, and *Dromos,* a race course), the name given by the Greeks to places where races were held. This included both chariot and single horse racing, but the hippodrome later took the form of a circus, other games, such as wrestling, boxing, running, etc., being added, and for a short time after the introduction of Roman customs and manners it became the scene of gladiatorial combats, but as sights of this nature did not find favor in the sight of the Greeks, these combats were eventually eliminated and the main feature of the games, as in the beginning, was the chariot race. To the brutal taste of the Roman populace flowing blood acted as an elixir, but to the more refined Eastern people the amphitheatre was abhorrent. Though numerous amphitheatres were scattered throughout western Europe very few were ever built within the limits of the Eastern empire and then only where the influence and manners of the Romans were most powerful.

The first mention of a hippodrome is made by Homer, but it is believed that the term then applied to any course over which a race of any kind was run and that it did not necessarily have a fixed location. As the chariot-racing became the national game, the proper courses for the holding of such events became necessary, as in these races, though much of the success depended upon the courage and skill of the driver, the loss of life was often great, through collision, the overthrow of the chariot in turning caused by rough ground, the breaking of an axle, or numerous other accidents. The hippodrome was built for the purpose of avoiding, as much as possible, the possibility of such mishaps, by providing a wide and smooth track, thus leaving plenty of space for the contestants. Of the ancient hippodromes (as distinguished from circus, amphitheatre, etc.), probably the most famous are those of Olympus and of Constantinople, and while the Circus Maximus of Rome may to a great extent have been more of a circus than race course, it was planned after the Greek race courses, was used by the Romans for this purpose, and thus may properly be classed with the other two.

The origin of the hippodrome at Olympus tradition gives to Hercules, but the only de-

scription of it obtainable is found in the passages of Pausanias (v. 15 φ 4; vi. 20 φ 7 foll.) though from the explorations of the German archæologists the ground plans of most of the structures described by Pausanias have been traced. Of its length and breadth there is no precise information, the overflow of the Alphus River having washed away the indications of its limits, though probably the distance from the starting place of the races to the goal, or from one goal to the other, was 770 metres or 4 Olympic stradia, and it was about one fourth as wide, or the same as each side of the starting place.

In general form the hippodrome was an oblong, one end of which was semicircular; on three sides having seats for the populace and on the fourth, where the races were started, seats for the royalty and nobles. The right side, formed by an artificial mound, was a little longer than the left side, which was built on the natural slope of a hill, the base of the fourth side being formed by the portico of Agnaptus, named after its builder. The form of the starting place was not unlike the prow of a ship, each side being 400 feet long, and containing stalls for the chariots and their horses. In the arena were two goals around which the chariots passed several times to complete the race; one of these goals having a bronze statue of Hippodameia upon it, the other an altar dedicated to "Taraxippus, the Terror of the Horses." The principal difference between the Greek hippodrome and the Roman circus was in the width of the arena, in the latter only four chariots being able to race at one time; there was also some slight difference in the arrangement of the carceres.

The erection of the hippodrome of Constantinople was due to two Roman emperors, Septimus Severus and Constantine the Great, who each in turn captured Byzantium by storm. About six years after its capture by him (197 A.D.) Severus commenced operations a little to the west of Byzantium, but in that year was called away by a rebellion in the West and never returned to the city. For over a hundred years it remained untouched, until 323, when Constantine, having conquered the city, pushed the work to completion after changing the details in the original plans. On 11 May 330 it was inaugurated.

The external appearance of the hippodrome was imposing for its vastness, its height, and even for its beauty. The walls were of brick, laid in arches, and faced by a row of Corinthian columns 260 in number and standing 11 feet apart. There were four entrances from the city each flanked with towers, but of the stairways leading to these entrances no description has come down to us.

Some idea of the immensity of this prodigious structure may be given by the fact that its dimensions were 1,400 feet in length by 400 feet in width, covering an area of 535,866 square feet, or 12.3 acres. On the north was a structure containing the apparatus for the games, the servants' and attendants' apartments, the chariots and horses, the arsenal, etc., called by the Romans the *carceres* and by the Greeks μάγγανα. This apartment was separated from the arena by pillars with latticed gates, 12 in number. Next to these gates was the little church or oratory, where the rival contestants prayed before the games.

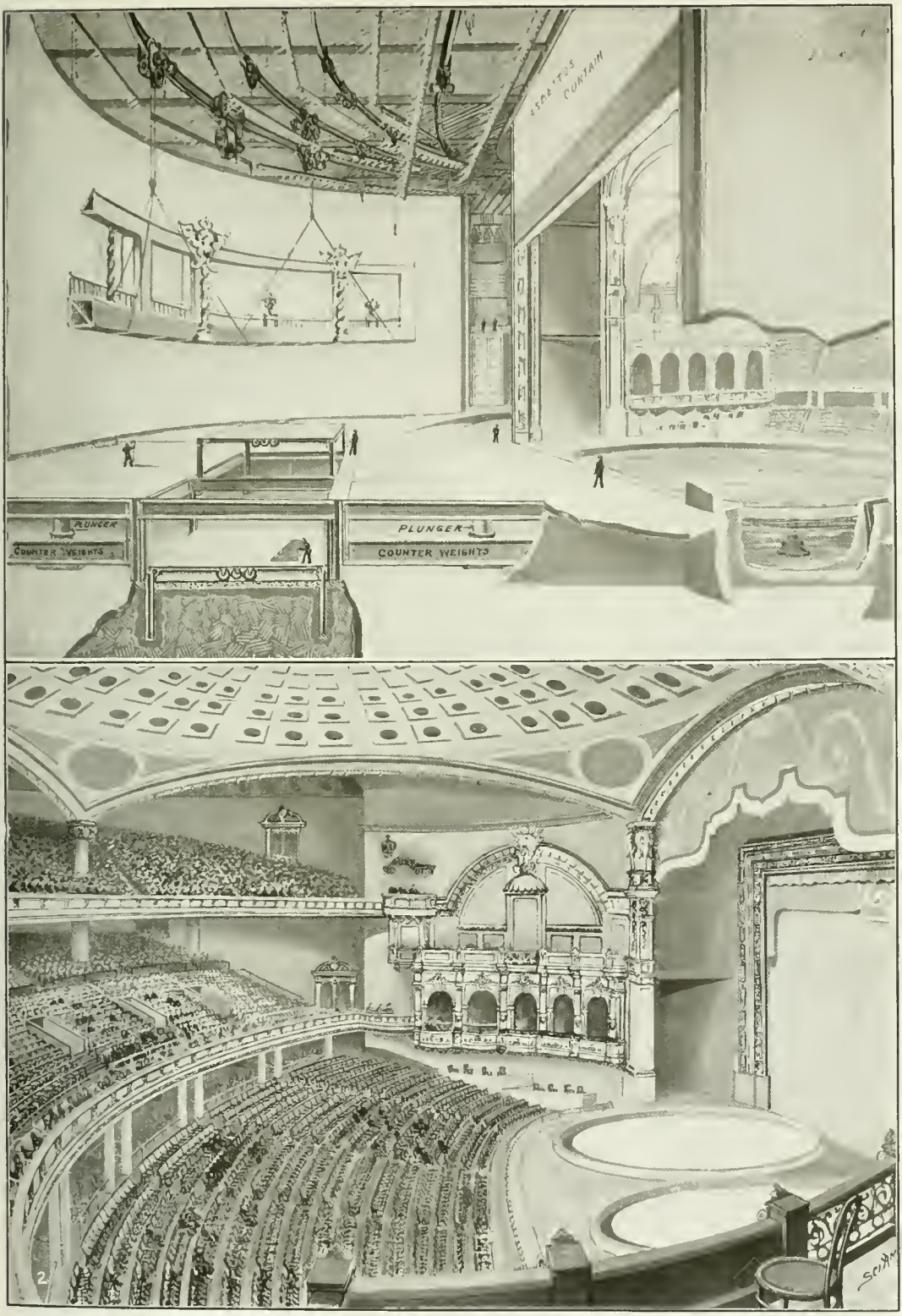
The ground story was 20 feet high. On it rested the palace of the Kathisma or Tribunal, in the centre of which, supported upon 24 marble pillars was the platform in Kathisma proper, on the front of which was the emperor's throne. On either side and a little below the emperor were the seats for courtiers, ambassadors, etc. Far down the western side of the hippodrome and nearly opposite the built column was the gorgeous chamber of the empress, this supported upon four porphyry pillars and hence called the tetrakion.

The eastern, western, and southern portions were occupied by parallel rows of seats, appropriated to the spectators according to their rank. Behind these rose tier upon tier of benches until nearly half way to the top where was a broad promenade bounding the entire extent of the hippodrome except on the northern side. This promenade was without roof or covering, and, standing nearly 40 feet above the ground, protected by a solid marble railing reaching to the breast, the spectator had a spacious avenue 2,766 feet long. It is estimated that the hippodrome would seat 60,000 persons and have comfortable standing room for 20,000 more, while with a little crowding 100,000 might be accommodated.

The arena was 211 feet wide by 1,190 feet long and was bounded by a narrow walk called the Euripus, paved in tesselated stone. The semicircular southern portion of the arena, that included in the curve of the Sphendone, was reserved for the criminals and there too was the place for executions. In the centre of the arena and lying parallel to it was the Spina; a stadium, 607 English feet in length, it marked and governed the beginning, duration, and end of each course of a race. At each end of the Spina was a high, narrow framework, surmounted by seven poles, on one group being placed seven fish, on the other seven eggs; one of each was taken down upon the completion of each circuit during the race until the race finished. Toward the southern end of the Spina was the Phiale, a broad basin of running water devoted to the victims of accidents. The space between the northern goal and the carceres was called the Stama, where wrestlers and acrobats performed.

Many additions to the works of art already gathered by Constantine were made during the 700 succeeding years, but in 1203 the hippodrome was sacked by the Franks and Venetians and all were either carried off or destroyed. The most famous of these was the 'Four Golden Steeds,' which was stolen by the Venetians and which in turn was brought to Paris by Napoleon, and is now standing guard over the main entrance of the cathedral of Saint Mark. Among the others are the statues of Hercules, the Shewolf and Hyæna, the Virgin Goddess Diana, the Brazen Ass, the Caledonian Boar, Helen of Troy, the God of Wealth, and eight Sphinxes, beside the statues of the early Roman emperors, martyrs, teachers, philosophers, etc. In the early days of the city games were of frequent occurrence, but as time went by they became less and less frequent owing probably to the great cost (it is estimated that a single celebration cost 1,000,000 francs) and at last were celebrated only on 11 May and 25 December, the birthdays of the city and Christ respectively.

It is not known precisely when this hippodrome was entirely destroyed, but as there is no definite reference to any chariot race later than the reign of Isaac Angelus, who was dethroned



MECHANICAL FEATURES OF THE NEW YORK HIPPODROME

1. Stage, showing mechanism of movable portion and electric hoist for handling scenery. Tank beneath front stage or apron.
2. The auditorium, the front stage or apron, and the proscenium arch.

in 1105, and as the place was sacked in 1203–4 it is probable that it did not survive the beginning of the 13th century.

The Circus Maximus at Rome was for a long time the only structure of its kind in the world, taking its form from the Greek hippodrome and furnishing the model for all later *circi*. In the Vallis Murcia, between the Palatine and Avantine hills, wooden seats were first constructed by Tarquinius Priscus (Liv. I., 35); were frequently burned and rebuilt until the time of Julius Cæsar, when the steps were constructed of stone and greatly improved. At that time it probably accommodated about 100,000 people. After its destruction by fire in 31 B.C. Augustus completely restored it, making several magnificent additions. The upper tier of seats on the Aventine side was again destroyed by fire in 36 A.D., but Claudius not only restored these, but greatly enlarged the entire circus. These additions were supplemented by others made during the reigns of Trajan and Constantine until it was estimated that the circus held 385,000 spectators, while the 'Notitia' places the possible number at 485,000.

The general plan of the Circus Maximus compared favorably with the Greek hippodromes, the main difference being in the arena around which Cæsar had constructed a moat 10 feet wide and 10 feet deep to prevent beasts from injuring the spectators, and in the width of the arena as before stated. Before the reign of Augustus the circus was used for gladiatorial fights with wild beasts and other forms of butchery, but after the erection of the amphitheatre of Statilius Taurus the circus was no longer used for such purposes. The popularity of this as of the Greek hippodrome also declined and it gradually decayed, now only a few of the remains standing.

The term hippodrome has also been applied to race tracks in England and on the continent, the most famous of these so called hippodromes being those at Vincennes, Longchamps, Chantilly in France, Newmarket and Epsom in England, and Curragn in Ireland. The modern hippodrome, or indoor circus, had its beginning in Paris, where the first was constructed in 1845. It was built entirely of wood, the arena was 108 metres long and 104 wide, and it had a seating capacity of 15,000 persons. This was destroyed in 1870 by fire. The word hippodrome was first utilized in this country when Franconi conducted a circus where now stands the Fifth Avenue Hotel, at 23d Street and Fifth Avenue, New York.

The first hippodrome of the accepted type to be built in America was the New York Hippodrome, which occupies an entire block on Sixth Avenue, between 43d and 44th streets. This structure was begun on 1 July 1904 and finished in five months, the opening performance occurring 12 April 1905. The main façade has a length of 200 feet, and the building extends 240 feet east on 43d and 44th streets. It is built of brick, marble, and steel, and rises to a height of 72 feet on Sixth Avenue, and 110 feet in the rear, the total cost being $1,750,000. It is the largest playhouse in the world, having a seating capacity of 5,200.

In the interior decorations the general scheme of coloring is a Roman red as a background, with all the structural features done in ivory, gold, and silver. The carpetings are of the same color, and the wall hangings, draperies, and upholstery are executed in a Roman red velvet enriched with heavy gold and silver embroidery and tassels.

The auditorium is about 160 feet long and 160 feet wide in the first story, and the balcony and gallery occupy the building in front of the stage above the first story. At the rear of the balcony is the mezzanine floor, below the rear seats of the balcony being the wide segmental promenade with main entrances and flights of shallow stairs at each end leading to the street. Behind the promenade the space, 20 to 50 feet wide and 200 feet long, is occupied by smoking rooms, parlors, waiting rooms, and cloak rooms. The promenade and lobbies are finished in marble and cæn-stone, relieved by rich illuminations of the ornamented parts in gold and silver. A special feature of the auditorium is the arrangement and construction of cages for animals of the feline kind. Their dens are arranged in a segmental curve in the promenade floor, and have plate glass fronts with iron bars behind.

The chief point of interest in the hippodrome centres the stage and the entirely novel mechanical arrangements for operating the movable platforms, filling and emptying the tank, raising and lowering the stage, and handling the scenery. The depth of the stage from the extreme front to the back wall is 110 feet, or 50 feet from the back wall to the proscenium opening and 60 feet from the arch to the front of the stage. This latter part of the stage lying forward of the proscenium arch is known as the "apron." It is large enough to contain two regulation circus rings, each 42 feet in diameter. Beneath the "apron" is built a huge steel and concrete tank, over 14 feet in depth, and large enough for the whole "apron" to sink within it. When aquatic performances or naval pageants are given the tank is filled with water and the movable "apron" is submerged below the water to the bottom of the tank.

Bibliography.—As before stated, the only description of the Olympia as it originally stood is contained in 'Pausanias' (v. 15 ϕ 4; v. 120 ϕ 7 foll.). From results of excavations the best descriptions of the old hippodromes of the world may be had in the following: Curtius, 'Olympia' (Berlin 1852); Grosvenor, 'Hippodrome of Constantinople' (London 1889); Lehndorf, 'Hippodromos' (Berlin 1876); Pollack, 'Hippodromica' (Leipsic 1890). For descriptions of chariot races consult: Homer's 'Iliad,' and Livy, and "Lew" Wallace, 'Ben Hur' (New York 1880). Of the New York Hippodrome probably the best description is contained in the 'Scientific American' (Vol. XCII., No. 12; 25 March 1905). For a study of the architectural features of the structures of those times consult Sturgis, 'European Architecture' (New York 1896).

Hippopot'amus, the generic and popular name of a great amphibious ungulate, allied to the swine, of which two species are known. One (*H. amphibius*) is common throughout the greater part of Africa; the other (*H. liberiensis*) is not only smaller, but has other important differences, and is found only in the African west coast rivers, and those flowing into Lake Tchad. The former species has a thick and square head, a very large muzzle, small eyes

and ears, thick and heavy body, short legs terminated by four toes, a short tail, two ventral teats, skin about two inches thick on the back and sides, and without hair, except at the extremity of the tail. A curious feature of the skin is the reddish exudation which pours from its pores when the animal is excited or in pain. It is called "bloody sweat," but the blood has no part in it. The incisors and canines of the lower jaw are of great strength and size, the canines or tusks being long and curved forward. These tusks sometimes reach the length of two feet and more, and weigh upward of six pounds. The animal is killed by the natives partly as food, but also on account of the teeth, their hardness being superior to that of ivory, and less liable to turn yellow. The hippopotamus has been found as much as 14 feet long, and nearly 5 feet high, but usually measures much less. It delights in water, living in lakes, rivers, and estuaries, and feeding on water-plants or on the herbage growing near the water, where it can walk as well as swim. It often leaves the water after nightfall, and goes, sometimes long distances, to grassy pastures to feed; regular paths are worn through the reeds, and here the Africans often arrange pits, deadfalls, or other traps for their capture. These animals are quick of sense, timid and anxious to escape danger; but when brought to bay or enraged prove formidable antagonists and often destroy canoes. They are excellent swimmers and divers, and can remain under water eight or ten minutes. The behemoth of Job is considered to be the hippopotamus. Several extinct species are found in Old World Tertiary formations, and modern species formerly inhabited not only Madagascar, but southern Europe and India, where they were contemporary with the men of the Stone Age.

Hippuric (hĭ-pū′rĭk) **Acid**, an organic acid, $C_9H_9NO_3$, existing in the urine of herbivorous animals, and, in small quantities, in that of human beings. It is increased by a vegetable diet, and by the disease called diabetes, and may be caused to appear in the human urine in considerable quantities by the administration of benzoic acid with the food. It is most conveniently prepared by boiling horse urine with milk of lime, filtering, neutralizing with hydrochloric acid, and evaporating to about one eighth of its volume. The concentrated urine is then acidified with hydrochloric acid and allowed to stand, when impure hippuric acid comes down as a yellowish-brown precipitate. To purify the crude product, it is heated to 212° F. with not quite enough water to entirely dissolve it, and chlorine gas is passed through the solution until the unpleasant smell has entirely disappeared. The solution is then filtered while hot, and the crystals which separate upon cooling are isolated and subjected again to the same treatment, the chlorine being passed through the solution, in this second treatment, until the solution is bright yellow. When thus prepared, hippuric acid crystallizes from water in the form of large prismatic plates, belonging to the trimetric system. Its crystals are colorless or white, free from odor, and have a slightly bitter taste. Hippuric acid has a specific gravity of about 1.308, and melts at 369° F.; it begins to boil at about 465° F., giving off benzoic acid and benzonitrile. It is insoluble in benzene, carbon disulphid, and cold chloroform, and is but slightly soluble in ether and in cold water. It is very soluble, however, in boiling water, and in hot alcohol. With bases, hippuric acid forms salts that are remarkable for the beauty of their crystalline forms. When boiled with dilute hydrochloric, sulphuric, nitric or oxalic acid, it yields benzoic acid and glycocoll.

Hiram College, a coeducational institution, founded in 1850, in Hiram, Ohio, under the auspices of the Christian Church. It was first called the Eclectic Institute, but was incorporated as a college in 1870. In 1903 there were in attendance about 400 pupils in the departments of oratory and music and in the preparatory department and college. There are about 6,200 volumes in the library.

Hiroshima, hē-rō-shē′mä, Japan, a town on the island of Hondo, about 160 miles from Kobe, and after Osaka the most important port on the inland sea. Pop. (1899) 122,306.

Hirsch, Emil Gustav, American rabbi: b. Luxemburg, Germany, 22 May 1852. He studied at the University of Pennsylvania and at Berlin, was rabbi successively in Baltimore, Md. (1877) and Louisville, Ky. (1878–80), and in 1880 was chosen minister of the Sinai congregation of Chicago, Ill. In 1880–7 he was editor of the 'Zeitgeist' of Milwaukee, Wis., and later became editor of the 'Reform Advocate' of Chicago. He was appointed professor of rabbinical literature in Chicago University in 1892. He appeared as an orator on various patriotic and other occasions, and wrote several monographs on religious and Biblical topics. He was also prominent in Republican State politics, and in 1896 was presidential elector-at-large for Illinois.

Hirsch, Maurice, Baron de (Baron Maurice de Hirsch de Gereuth), Austrian Jewish capitalist and philanthropist: b. Munich 9 Dec. 1831; d. Ogyalla, Hungary, 21 April 1896. His fortune was computed to be $200,000,000, and his yearly income at about $20,000,000. His benefactions equaled nearly $100,000,000, the most of this sum being directed toward the improvement of the condition of the Jews in all parts of the world. The De Hirsch trust for the United States is a fund of $2,500,000 for the Americanizing and education of Rumanian and Russian Jews. Other large gifts were those of $5,000,000 for the endowment of schools in Galicia, and of $50,000,000 to the Jewish colonization association for the establishment of colonies in Argentina. In 1888 he offered to the Russian government $10,000,000 for schools, with the condition that in the distribution of the amount no discrimination as to race or religion be made. This offer was not accepted. Baron de Hirsch made extensive sums through the construction of railways in Turkey.

Hirth, Friedrich, German-American educator: b. Gräfentonna, Saxe-Coburg, Germany, 1845. He studied at Leipsic, Berlin, and Greifswald, entered the Chinese customs service in 1870; retired in 1897, and in 1902 was called to the newly created professorship of Chinese in Columbia University. In the summer of 1902 he was in St. Petersburg, cataloguing a collection of manuscripts taken at Peking. He made a valuable collection of Chinese porcelains, now in the museum at Gotha, and one of printed

HIPPOPOTAMUS (*Hippopotamus Amphibius*)

books and MSS., now in the Berlin Royal library. Among his publications are: 'China and the Roman Orient' (1885); 'Ancient Porcelain' (1888); 'Chinesische Studien' (Vol. I., 1890); and 'Ueber fremde Einflüsse in der Chinesischen Kunst' (1896).

His'cock, Frank, American legislator: b. Pompey, Onondaga County, N. Y., 6 Sept. 1834. In 1855 he was admitted to the bar, in 1860–3 was district attorney of Onondaga County, and in 1867 a member of the State constitutional convention of New York. He was a Republican representative in Congress in 1879–87, and obtained recognition as a party leader and speaker. In 1887 he was United States senator from New York and then returned to professional practice.

Hispania, hĭs-pā'nĭ-a. See SPAIN.

Histol'ogy, the science of animal and vegetable tissues. It investigates by means of the microscope the various tissues of man, animals and plants in their anatomical relations and compositions. Topographical histology considers the more minute structures of the organs and systems of the body; normal histology deals with the healthy tissues; and pathological histology investigates the changes they undergo in disease. Marie François Xavier Bichat (1771–1802) is generally credited with the foundation of the science of histology. Unfortunately the imperfect condition of the microscope in his time prevented Bichat and his contemporaries from carrying their investigations to the point which Schleiden, Schwann, Johann Müller, Virchow, Von Recklinghausen, Cohnheim, etc., have reached. It has been found that all structures however complex are made up of cells, and that the parts of a body may be resolved into a small number of elementary tissues now grouped as: (1) epithelium, which lines almost all the cavities of the body and is directly or indirectly in communication with the atmosphere; (2) the nervous tissues, which as nerve cells originate and as nervous fibres transmit all nervous impulses; (3) muscle, which produces motion whether voluntary or involuntary; (4) glandular tissue which consists of cells standing in close relation with the blood-vessels which take from the blood certain substances and secrete them; (5) connective substances which support and hold together the more delicate and important structures, especially forming the cartilages and bones. See CELL; ANATOMY, COMPARATIVE; ANATOMY OF PLANTS.

Many tissues have the power of repairing injuries that happen to them. This power is called regeneration, and is found especially in the lower animals, in polyps, worms, and in many amphibious creatures and reptiles. In other cases the lesion is supplied by a new growth of connective substance. In diseases the tissues undergo many changes and many of these diseases in the organism are shown also by the changing of color. The science of such changes is generally called pathological histology. It is a comparatively young science and has been cultivated by Virchow, who was the founder of cellular pathology.

Vegetable histology is that department of botany which deals with microscopic phytotomy or the anatomy of plants, especially investigating the plant cells and plant tissues. It is properly subordinate to morphology and is a distinctively descriptive science. It deals with the question in what relation the cells or forms of tissue stand to the vital activity of plants, what functions they perform, and in what respect they are constituted for the fulfilling of those functions. (Compare CYTOLOGY.) Owing to the excessive minuteness of the cells which form the tissues of all plants the investigation relies almost entirely on the microscope, and naturally has made its advance in proportion as the microscope has been made more perfect. Microscopes that are now used magnify at least 1,000 diameters, and the materials used have to be carefully prepared and mounted. Many of them have to be colored with hæmatoxylin, fuchsin, saffranin, and other alcoholic or aqueous dyes. Consult Delafield and Prudden, 'Handbook of Pathological Anatomy and Histology' (1901).

Historical Societies in the United States. John Pintard, of New York, deserves the credit of being the first who endeavored to organize historical societies in the United States. He was born 18 May 1759, received his education at Princeton College, and became actively identified with several military expeditions in the War of the Revolution, being also deputy commissary for American prisoners. He was especially zealous in the study of American history, and appreciated the need of preserving the literature, muster-rolls, private and public documents, relics, and other material of the colonial period, at that time uncollected. In 1789 he visited the Rev. Jeremy Belknap, in Boston, who writes: "When Mr. Pintard was here he strongly urged forming a society of antiquarians." In August 1790 Mr. Belknap, following this suggestion of Mr. Pintard, drew up an outline for such a society, in which was the following clause, "Letters shall be written to gentlemen in each of the United States requesting them to form similar societies and a correspondence shall be kept up between them for the purpose of communicating discoveries and improvements to each other," and quaintly concludes, "When ye societie's funds can afford it salaries shall be granted to the secretaries and other officers." In February 1791 Mr. Belknap writes: "We have now formed our society and it is dubbed, not the Antiquarian, but the Historical Society. It consists at present of only 8, and is limited to 25. We intend to be an active, not a passive, literary body; not to be waiting like a bed of oysters for the tide (of communication) to flow in upon us, but to seek and find, to preserve and communicate literary intelligence, especially in the historical way." In 1794 the membership was increased to 60, and by act of legislature in 1857, the limit of resident members was placed at 100. Associated with Jeremy Belknap in the new society were Rev. John Eliot, Rev. James Freeman, James Sullivan (later governor of Massachusetts), Rev. Peter Thatcher, William Tudor, the noted lawyer, Thomas Wallcut, the antiquary, James Winthrop, for years librarian of Harvard, Dr. William Baylies, a physician of Dighton, and George R. Minot, the author. The position held to-day by the Massachusetts Historical Society is so well recognized at home and abroad that it would be futile to attempt to describe either its valuable contributions or its stimulating example to similar societies, during its unqualified success of over 100 years. Its

officers in 1903, were: President, Charles Francis Adams; vice-presidents, Samuel Abbott Green, M.D., Thomas Jefferson Coolidge; recording secretary, Edward James Young; corresponding secretary, Henry Williamson Haynes; treasurer, Charles Card Smith; librarian, Samuel Abbott Green, M.D.; cabinet-keeper, Henry Fitch Jenks.

To John Pintard is due the credit for the first meeting, 20 Nov. 1804, of the New York Historical Society. Those present included John Pintard, Judge Egbert Benson, DeWitt Clinton, Rev. Wm. Linn, Rev. Samuel Miller, Dr. David Hosack, Rev. John M. Mason, Rev. John N. Abeel, Samuel Bayard, Peter G. Stuyvesant and Anthony Bleecker. These patriotic founders organized "for the purpose of discovering, procuring, and preserving whatever may relate to the natural, civil, literary, and ecclesiastical history of the United States in general, and of this State in particular." The valuable library of John Pintard was acquired in 1807, thus forming the nucleus of the 100,000 volumes owned by the society in 1903. The first gift from outside sources, recorded in the minutes of the Society, came in 1810, when 10 volumes of the publications of the Massachusetts Historical Society were presented. The society is now erecting a new home on Central Park West, 76th and 77th streets, where its thousand members may more adequately enjoy its collections; including the galleries of American portraits and old masters; the famous Egyptian collection of Dr. Henry Abbott, the Nineveh sculptures presented by James Lenox, the original Audubon water colors, together with countless original papers, engravings, prints, broadsides and relics of the Colonial and Revolutionary periods. Meetings are held the first Tuesday of each month, October to June inclusive, at which papers, dealing with American history, are read. The society established a fund for printing its proceedings and collections; 28 volumes have been issued since 1868, as follows:

Vol. I.—'The Continuation of Chalmer's Political Annals of the American Colonies' (1685–96); 'The Colden Letters on Smith's History of New York' (1759–60); 'Documents Relating to the Administration of Jacob Leisler' (1689–1769).

Vol. II.—'The Clarendon Papers, Relating to New York and New England' (1662–7); 'The Destruction of Schenectady' (1690); 'Montague's Arguments on Acts of New York Assembly' (1701); 'Colden's Letter on Smith's History of New York' (1759); 'Plowden's New Albion' (1632–50); 'Gardiner's History of East Hampton, New York' (1798); 'Collection of Evidence and Vindication of the Rights of New York to the New Hampshire Grants.'

Vol. III.—'Territorial Rights of New York Against the Government of New Hampshire,' a brief by James Duane; 'Old New York and Trinity Church' (1730–90); sermon by the Rev. Francis Makemie (1707).

Vol. IV., Vol. V., Vol. VI., Vol. VII.—'The Papers of Major-General Charles Lee' (1754–1811).

Vol. VIII.—'Letters of General Pattison, Commandant of New York City' (1779–80); 'Letters to General Lewis Morris (1775–82).

Vol. IX., Vol. X.—'Official Letter-Books of Lieutenant-Governor Cadwalader Colden' (1760–75).

Vol. XI.—'Papers of Charles Thomson, Secretary of the Continental Congress' (1765–1816); 'Letters of Colonel Armand' (1777–91); 'Letters to Robert Morris' (1775–82).

Vol. XII.—'Trial of General Schuyler' (1778); 'Trial of General Robert Howe' (1781); 'Journal of Commissary Rainsford, Enlistment of Hessian Troops' (1776–78).

Vol. XIII.—'Trial of General St. Clair' (1778); 'Journal of Occurrences at Quebec' (1775–76); 'Case of William Atwood, Chief Justice of New York' (1703); 'Vesey's Sermon in Trinity Church, at the Funeral of Lord Lovelace' (1709); 'Letter of Dominie Michaelius, First Minister in New Netherland' (1628); 'Records of the Court of Lieutenancy, New York Militia' (1686–96).

Vol. XIV.—'Journals of the Engineer Officers, Colonel James and Captain John Montressor, of Services in America' (1757–78).

Vol. XV.—'Journal of Lieutenant Von Krafft, of the Hessian Army' (1776–84); 'Letter-Book of Captain Alexander McDonald, of the Royal Highland Emigrants' (1775–79).

Vol. XVI., Vol. XVII.—'Papers of Lieutenant-Colonel Stephen Kemble, Adjutant-General of the British Army in America, Journals and Correspondence (1775–89); 'General Orders of the British Army in America' (1775–8); 'Journals, Documents, and Correspondence of the Expedition to Nicaragua' (1780–1).

Vol. XVIII.—'The Burgher Right and Roll of Burghers of New Amsterdam' (1648–61); 'Roll of Freedom of New York City' (1675–1866); 'Register of Indentures of Apprentices of New York City' (1694–1708).

Vol. XIX. to XXIII.—'The Deane Papers, Correspondence, Official and Private, of Silas Deane' (1774–89).

Vol. XXIV.—'Muster Rolls of New York Provincial Troops' (1755–64).

Vol. XXV.—'Abstracts of Wills on File in the Surrogate's Office, City of New York' (1665–1707).

Vol. XXVI.—Same (1708–29), with Appendix.

Vol. XXVII.—Same (1730–44).

Vol. XXVIII.—Same (1744–).

The officers of the New York Society for 1903 are: President, Samuel Verplanck Hoffman; first vice-president, Frederic Wendell Jackson; second vice-president, Francis Robert Schell; foreign corresponding secretary, Archer Milton Huntington; domestic corresponding secretary, George Richard Schieffelin; recording secretary, Sydney Howard Carney, Jr., M.D.; treasurer, Charles Augustus Sherman; librarian, Robert Hendre Kelby.

Following in the steps of these two oldest societies hundreds of a similar character exist to-day. Indeed, hardly a city or county in each State of the Union but has had its own local historical society. A casual glance at a few local societies in Massachusetts and New York will give an idea of the spirit which prevails for the preservation of the historic past:

The American Antiquarian Society, Worcester, Mass., was incorporated 24 October 1812; this inland city being selected as less exposed to possible invasion from the sea, with the consequent loss of historical collections.

The Essex Historical Society, Salem, Mass., was originally started by Dr. Edward A. Holyoke, of Salem, and incorporated in 1821. Some 15 years later the Essex County Natural History Society was incorporated, and in 1848 both of these societies united, forming the Essex Institute. Of other societies in Massachusetts a few will suffice. The New England Historic Genealogical Society, Boston; The Quoboag Historical Society, Brookfield; Historical Society, Nantucket; Old Residents' Association, Lowell; Old Colony Historical Society, Taunton; Pocumtuck Valley Memorial Association, Deerfield; The Pilgrim Society, Plymouth; The Rumford Historical Society, Woburn. Rehoboth, Watertown, Westborough, Weymouth, and Winchester have each local societies.

In New York State mention may be made of the Long Island Historical Society, Brooklyn; Suffolk County Historical Society, Sag Harbor; Oneida Historical Society, Utica; Onondaga Historical Association, Syracuse; Rochester Historical Society; Buffalo Historical Society; Westchester Historical Society, and Tarrytown Historical Society. In many States the various religious denominations have historical societies and there was organized recently the American Jewish Historical Society, New York.

The various organizations in the several States have assumed so much usefulness that there now exists an "American Historical Association," organized at Saratoga, N. Y., 10 Sept. 1884, incorporated by Act of Congress, approved 4 Jan. 1889, and reports annually to Congress through the Smithsonian Institution. The more recent

patriotic societies, such as the Sons of the Revolution, Society of Colonial Wars, Mayflower Society, Daughters of the Revolution, Colonial Dames, and Huguenot Society, are largely indebted to the historical societies for their existence. Indeed, the Sons of the Revolution was formed in the hall of the New York Historical Society.

The following list of historical societies existing in 1903, is arranged in alphabetical order of States, with the information furnished, in so far as replies have been received, from the secretaries of States, or officers of historical societies:

Alabama.— The Alabama Historical Society, organized 8 July 1850 at Tuscaloosa, Chancellor Alexander Bowie being first president. Incorporated by Act of the General Assembly 5 Feb. 1852. During Civil War all work was suspended, many documents being lost. 1874 revived by Dr. Joshua H. Foster, its first secretary. 10 Dec. 1898; The Alabama History Commission was created at Montgomery, Hon. Thomas M. Owen being secretary and treasurer.

Alaska.— Society of Alaska, Natural History and Ethnology, incorporated 11 April 1888 at Sitka. Alaska Historical Library and Museum incorporated 6 June 1900, at Sitka.

Arizona.— The Arizona Pioneer Historical Society, located at Tucson, was established some years ago.

Arkansas.— There are two historical societies in the State, both styled "Arkansas Historical Society," one at Little Rock, Fay Hempstead, secretary; the other at the University of Arkansas, Fayetteville, J. H. Reynolds, secretary.

California.— The California Historical Society, organized in 1886, San Francisco.

Colorado.— The State Historical and Natural History Society, Denver; incorporated 11 July 1879. Charles R. Dudley, secretary.

Connecticut.— The Connecticut Historical Society, Hartford, organized 1825; revived by the general assembly 1839; Albert C. Bates, secretary; New Haven Colony Historical Society, New Haven, 1862; New London County Historical Society, New London, 1870; Fairfield County Historical Society, Bridgeport, 1881; and the Middlesex County Historical Society, Middletown, 1902.

Delaware.— The Historical Society of Delaware, Wilmington, incorporated 1868; Hon. Chas. B. Lore, president; Wm. Hall Porter, recording secretary.

District of Columbia.— The Columbia Historical Society, organized 9 March 1894; Mrs. Mary Stevens Beall, recording secretary; and also the American Historical Society.

Georgia.— The Georgia Historical Society, Savannah; Hon. William Harden, secretary.

Idaho.— The Historical Society of the State of Idaho, Boise City; Hon. Wm. A. Goulden, secretary.

Illinois.— The Illinois State Historical Society, organized 30 June 1899. Local organizations in the State cooperate with the Society. The last legislature made the society a part of the Illinois State Historical Library, which library has heretofore issued publications of the society. Mrs. Jessie Palmer Webb, librarian of State Historical Library, and secretary and treasurer State Historical Society.

Indiana.— The Indiana Historical Society, organized 1830.

Iowa.— The State Historical Society of Iowa, Iowa City; organized 1857; present articles of incorporation date April 1892; F. E. Horack, secretary. The historical department of the State Library, Des Moines, should not be confused with this society.

Kansas.— The Kansas State Historical Society, Topeka; organized 14 Dec. 1875; Geo. W. Martin, secretary; "this library contains 24,424 books; 72,789 pamphlets; 25,926 volumes of newspapers; 25,977 manuscripts; 6,696 relics; 5,751 pictures; and 5,129 atlases and maps.

Kentucky.— The Kentucky Historical Society; organized 1839–40. The legislature donated rooms to the society 1879–80. In August 1902 it became a department of the State. Gov. J. C. W. Beckham, president; General Fayette Hewitt, first vice-president; W. W. Langmoor, second vice-president; Mrs. Jennie C. Morton, secretary and treasurer.

Louisiana.— The Louisiana Historical Society; organized 15 Jan. 1836; Judge Henry A. Bullard, president; reorganized 1846 with Judge F. X. Martin, president; incorporated 1847 and a new charter given 30 April 1877, transferring it from Baton Rouge to New Orleans. From 1860 to 1888 Judge Charles Gayarré, president, being succeeded by Judge W. W. Howe. Since 1894 Prof. Alcée Fortier has been president.

Maine.— The Maine Historical Society, Portland; organized 1822; H. W. Bryant, recording secretary; The Bangor Historical Society, Bangor; The Kennebec Antiquarian Society, Augusta; York Institute, Saco; The Sagadahoc Historical Society, Bath; The Lincoln County Historical Society, Wiscasset; The Skowhegan Historical Society, Skowhegan; The Waterville Historical Society, Waterville; and The Eliot Historical Society, Eliot.

Maryland.— The Maryland Historical Society, Baltimore; Geo. W. McCreary, librarian; The Frederick County Historical Society, Frederick; The Harford County Historical Society, Belair, Dr. Archer, president.

Massachusetts.—See data previously given.

Michigan.— The Michigan Pioneer and Historical Society, Lansing; organized 22 April 1874; issues each year a volume of historical collections; Henry R. Pattengill, secretary.

Minnesota.— The Minnesota Historical Society, St. Paul, is the only society in that State.

Mississippi.— The Mississippi Historical Society; organized 1898; Dr. F. L. Riley, secretary; Dunbar Rowland is director of the department of archives and history of the State of Mississippi, Jackson. This department was created 26 Feb. 1902 and is under the auspices of the historical society.

Missouri.—The Missouri Historical Society, St. Louis; chartered in 1875; The State Historical Society, Columbia, in 1899.

Montana.— The Montana Historical Society, Helena; organized December 1864; incorporated February 1865 and is a part of the State Library; Miss Laura E. Hovey, secretary and librarian.

Nebraska.— The Nebraska State Historical Society, Lincoln.

New Hampshire.— The New Hampshire Historical Society, Concord.

New Jersey.— The New Jersey Historical Society, Newark; organized 1845; William Nelson, corresponding secretary; Bergen County Historical Society, Hackensack, 1902; New Brunswick Historical Club, New Brunswick, Hunterdon County Historical Society, Flemington; Salem County Historical Society, Salem; Princeton Historical Association, Princeton; Woodstown and Pilesgrove Historical Society, Woodstown.

New Mexico.— The Historical Society of New Mexico; incorporated 5 Feb. 1881; home office, Santa Fe.

New York.— See previous references.

North Carolina.—The Historical Society of North Carolina was chartered in 1833; rechartered 22 March 1875; Dr. K. P. Battle, department of history University of North Carolina, Chapel Hill, secretary; The North Carolina Literary and Historical Society, Raleigh; W. J. Peele, secretary; and The Trinity Historical Society, Durham; Dr. J. S. Bassett, secretary.

North Dakota.— The North Dakota Historical Society; incorporated 8 March 1895; Col. C. A. Lounsberry, secretary, Fargo.

Ohio.— The Ohio State Archæological and Historical Society, Columbus; incorporated 13 March 1885, E. O. Randall, secretary. There are many local societies in Ohio: The Western Reserve Historical Society, Cleveland; The Fireland Historical Society, Norwalk; The Ohio Philosophical and Historical Society, Cincinnati; and others.

Oklahoma Territory.— The Oklahoma Historical Society, founded by the Oklahoma Press Association at Kingfisher, May 1893. By act of territorial legislature 21 Feb. 1895 it became trustee of the Territory "for the care, collection and preservation of all kinds of historical matter, and for the expending of any appropriation made by the Territory for such historical purposes, and located the society at the University building at Norman." In June 1901 the society accepted the offer of the entire upper floor of the Carnegie Library, Oklahoma City, pending the erection of a capitol building. Lincoln McKinlay, president; Sidney Clark, custodian.

Oregon.— The Oregon Historical Society, organized 17 December 1899; F. G. Young, secretary, University of Oregon.

Pennsylvania.— The Historical Society of Pennsylvania, Philadelphia; organized 1824; John W. Jordan, librarian; Bucks County Historical Society, Doylestown; Montgomery County Historical Society, Norristown; York County Historical Society, York; Lancaster County Historical Society, Lancaster; Wyoming Historical and Geological Society, Wilkes-Barre; Washington County Historical Society, Washington; Lebanon County Historical Society, Heilman Dale; Chester County Historical Society, West Chester; Delaware County Historical Society, Chester; Berks County Historical Society, Reading; Tioga Point Historical Society,

Athens; and the Presbyterian, Baptist, and Methodist Historical Societies. Philadelphia.

Rhode Island.— The Rhode Island Historical Society, Providence; founded in 1822; The Newport Historical Society, Newport, R. I.

South Carolina.— The South Carolina Historical Society, Charleston: organized 1855; Gen. Edward McCrady, president; A. S. Salley, Jr., secretary.

South Dakota.— The Department of History in the State of South Dakota; administered by the State Historical Society; was organized by act of legislature 21 Jan. 1903; located at Pierre; Doane Robinson, secretary.

Tennessee.— Tennessee Historical Society, Nashville; Robert T. Quarles, corresponding secretary.

Texas.— The Texas State Historical Society; organized 2 March 1897; Hon. John H. Reagan, Palestine, president.

Utah.— The State Historical Society of Utah; organized 31 Dec. 1897; Salt Lake City.

Vermont.— The Vermont Historical Society; organized 1838; Montpelier; Joseph A. Deboer, recording secretary.

Virginia.— The Virginia Historical Society, Richmond; organized 1831; William G. Stanard, corresponding secretary and librarian.

Washington.— The Washington State Historical Society, Tacoma; Hon. Ezra Meeker, president; E. N. Fuller, secretary.

West Virginia.— State Historical Society, Charlestown.

Wisconsin.— The State Historical Society of Wisconsin, Madison; organized 1849; re-organized 1853, this latter date being considered the real date of organization.

Wyoming.— The Wyoming Historical Society; organized 1895; Robert Morris, secretary, Cheyenne.

SYDNEY H. CARNEY, JR., M.D.

History is a record of events which have occurred among mankind; embracing an account of the rise and fall of nations, and other great mutations which have affected the political and social condition of the human race. In a more limited sense, history is a record of the progress of mankind in civilization; and, therefore, deals especially with those nations which have performed great achievements and exerted a commanding influence upon the fortunes of the human race.

History is generally divided into three great epochs — Ancient History, Mediæval History, and Modern History. Ancient History begins with the first appearance of historic records, and ends with the fall of the Western Roman Empire 476 A.D. Mediæval History, or the History of the Middle Ages, extends from the fall of Rome 476 A.D., to the discovery of America 1492 A.D. Modern History embraces the period from the discovery of America to the present time. Sometimes, however, the world's history is divided into only two great periods — Ancient and Modern; Ancient History embracing the whole period before the fall of Rome, 476 A.D., and Modern History comprising the entire period since that event.

The three sources of history are written records, architectural monuments and fragmentary remains. Several races of men have disappeared from the globe, leaving no records inscribed upon stone or parchment. The existence and character of these people can only be inferred from fragments of their weapons, ornaments and household utensils, found in their tombs or among the ruins of their habitations. Among these races were the Lake-dwellers of Switzerland; the prehistoric inhabitants of the Age of Stone and the Age of Bronze of the British Isles; the builders of the shell-mounds of Denmark and India; and the Mound-builders of the Mississippi Valley.

The discovery of monuments of great antiquity has aided vastly in ascertaining the date of ancient events. The Parian Marble, brought to England from Smyrna by the Earl of Arundel, contains a chronological arrangement of important events in Grecian history from the earliest period to 355 B.C. The Assyrian Canon, discovered by Sir Henry Rawlinson, the great English antiquarian, consists of a number of clay tablets, constructed during the reign of Sardanapálus, and containing a complete plan of Assyrian chronology, verified by the record of a solar eclipse which must have occurred 15 June 763 B.C. The Fasti Capitolini, discovered at Rome, partly in 1547 and partly in 1817 and 1818, contains in fragmentary records a list of Roman magistrates and triumphs from the beginning of the Roman Republic to the close of the reign of Augustus. The Rosetta Stone, discovered by a French military engineer during Bonaparte's expedition to Egypt in 1708, contains inscriptions in the Greek and Egyptian languages, the deciphering of which has led to the discovery of a key to the meaning of the hieroglyphic inscriptions on the Egyptian monuments. The fragmentary writings of Sanchoniathon give us some light on Phœnician history; those of Berosus on Babylonia and Assyria; Manetho's lists of the 30 dynasties of Egyptian kings afford us valuable information; and the works of Herodotus, the «Father of History,» have given us a graphic account of the ancient nations — their annals, manners, and customs, as well as a geographical description of the countries which they inhabited.

Herodotus was the first of Grecian historians. Other Greek writers of history were Thucydides, the great philosophic historian; Xenophon, the writer of charming historical romances; Ctesias; Diodorus Siculus; Polybius; and Plutarch, the charming biographer of antiquity. Ancient Rome produced Livy, Tacitus, Sallust, and Cornelius Nepos, who have given us the facts of Roman history. For the history of the ancient Hebrews we are indebted to the books of the Old Testament and the works of Josephus, the celebrated Jewish historian, who wrote a complete history of his countrymen in Greek. Among early Christian Church historians were the Roman Eusebius and the Anglo-Saxon, the Venerable Bede. The Frenchmen Comines and Froissart were celebrated chroniclers of the Middle Ages. The Italian Macchiavelli achieved fame by his historical writings. Among modern historians have been many who have acquired celebrity by their works. Such were the great trio of British historians — Hume, Gibbon, and Robertson, whose works have always been regarded as standards. England has produced many famous writers of history; such as Macaulay, Carlyle, Grote, Thirlwall, Froude, Lingard, Arnold, Allison, Freeman, Rawlinson, Green, Knight, Merivale, Milman, Hallam, and others. France produced Rollin, Voltaire, Thiers, Guizot, Sismondi, Mignet, Michelet, and the brothers Thierry. Germany has given the world a great ecclesiastical historian in the person of Mosheim; and a number of German historians have given the world the benefit of their scholarly researches, among whom we may mention Niebühr, Neander, Rotteck, Heeren, Schlosser, Mommsen, Curtius, and Leopold von Ranke. Among American historians the most renowned

have been Hildreth, Prescott, Bancroft, Motley, Lossing, and Parkman.

The origin of nations has been involved in obscurity, which has only quite recently been removed by the diligent study and the patient research of modern European scholars. Investigation into the affinities of the various languages has given us some new knowledge upon this interesting and important subject. Comparing the languages of most of the modern European nations with those spoken by the ancient Romans, Greeks, Medes, and Persians, and Hindus, we observe that all these languages had a common origin, entirely different from those spoken by the ancient Chaldees, Assyrians, Phœnicians, Hebrews, Arabs, and Egyptians; these latter being related to each other, but not to those of the nations previously named. The former of these languages are called *Aryan*, the latter *Semitic* and *Hamitic;* while the Central Asian Tartar nomads have a language called *Turanian*.

The Aryan branch is called Japhetic, because it has been supposed to be descended from Japheth; while the Semitic branch is regarded as the posterity of Shem, and the Hamitic branch as the children of Ham. The name Aryan means "tiller of the soil"; wherein this race has differed from the Turanian, or nomadic races of Central Asia.

In the course of time nations became divided into civilized and uncivilized, as their intellectual development was furthered by talents and commerce, or retarded or cramped by dullness and by isolation from the rest of mankind. Uncivilized nations are either wild hordes under an absolute and despotic chief who wields unlimited power over his followers, or wandering nomadic tribes, guided by a leader, who, as father of the family, exercises the functions of lawgiver, governor, judge and high priest. Neither the wild hordes under their despotic chiefs, occupying the unknown regions of Africa (negroes), the steppes and lofty mountain ranges of Asia, the primeval forests of America (Indians), and the numerous islands of Oceanica (Malays), nor the nomadic races with their patriarchal government, find any place in history.

The oldest civilizations were those found in the Tigris-Euphrates and Nile valleys, in the Hindu peninsula, and in the remote empire of China. The exact origin of the ancient nations and civilizations is lost in the dimness of their remote antiquity. These regions were richly endowed by nature with the resources necessary for sustaining a dense population; and the oldest historic empires accordingly took their rise in the rich alluvial lands watered by the Tigris and the Euphrates in southwestern Asia and by the Nile in northeastern Africa.

Historical Asia is southwestern Asia; where the great Hamitic and Semitic empires of Chaldæa, Assyria, and Babylonia successively flourished, in the Tigris-Euphrates valleys; where the Hebrews and the Phœnicans played their respective parts in the world's historic drama; and where the Aryan race finally came upon the scene in the appearance of the great Median and Medo-Persian empires and the Græco-Macedonian empire of Alexander the Great and his successors, followed by the Parthian, Eastern Roman, and new Persian empires; after which the Semitic race again prevailed in the sudden rise of Mohammed's religion and the great empire founded by his successors; followed by the conquests of the Seljuk Turks from Tartary, the two centuries of warfare between Christendom and Islam for the possession of the Holy Land as represented in the Crusades, the terrible scourges of the conquering Mongol and Tartar hordes of Genghis Khan and Tamerlane; and, lastly, the rise of the now-decaying Mohammedan empires of the Ottoman Turks and the modern Persians.

Southern Europe was the seat of the greatest two nations of antiquity—the Greeks and the Romans—the former by their literature and philosophy and their political freedom, and the latter by their laws and political institutions influencing all future European nations. The other nations of ancient Europe were barbarians, many of whom were conquered and civilized by the Romans. The overflow of the Roman dominion in the 5th century after Christ entirely changed the current of European history by a redistribution of its population through the migrations and conquests of its vast hordes of northern barbarians, who 14 centuries ago laid the foundations of the great nations of modern Europe. America and Oceanica were wholly unknown to the ancient inhabitants of the Old World, and have only occupied the field of history since their discovery and settlement by Europeans within the last four centuries.

The cradle of civilization — if not the cradle of the human race — was the fertile alluvial Tigris-Euphrates and Nile valleys, where, with the dawn of civilization, flourished the old Chaldæan and Egyptian empires—the most remote of historical states of antiquity. History begins with Egypt, the oldest of historical nations.

Asia is the birth-place of the great religions and the home of absolute despotism. The two great pantheistic religions — Brahmanism and Buddhism; also the great monotheistic religions — Judaism, Christianity, and Mohammedanism — arose in Asia; while Asiatic governments today are what they have been from time immemorial — absolute monarchies, or despotisms; no republic or constitutional monarchy ever having flourished on Asiatic soil.

Europe, on the contrary, inhabited by the progressive Aryan race, has carried political institutions to the highest state of development; civil, political, and religious liberty having had a steady growth. Asiatic civilization has been stationary, while European civilization has been progressive. The Asiatics are passive, submissive, given to contemplative ease and disinclined to active exertion. The Europeans are active, energetic, vigilant and aggressive. Europe has also colonized other portions of the globe; the greater part of the present populations of North and South America being the descendants of Europeans who settled in the New World, and drove away, or assimilated with, the aborigines; while Europeans have also settled in portions of Africa, Asia, and Oceanica. The Asiatics, on the other hand, do not colonize.

History, Ancient. Objectively history is a succession of past events connected with one another as cause and effect; subjectively it is a record of such events as determined by the processes of investigation included in historical method. The history of mankind treats not so

much of individuals as of the progress and decline of communities and states with especial reference to morality, religion, intelligence, social organization, economic condition, refinement and taste, government, and the peaceful and military relations of governments to one another (cf. Andrews, 'Institutes of General History,' p. 3). Strictly there are no periods; the life of mankind flows continuously, never wholly changing the direction of its current at any definite time. But for the convenience of study history is more or less arbitrarily divided into periods, during each of which the resultant of changes in the life of mankind, or of a particular part of it, is supposed to be a determinable movement of progress or decline which the historian takes as characteristic of the period.

The familiar division of general history into ancient, mediæval, and modern may be accepted as the most practical, though it is exceedingly difficult to define these long and complex ages. Most obvious is the geographical characteristic. Leaving out of account India and the farther East, which have contributed little to the progress of the rest of the world, ancient history has to do (1) with the fertile river-valleys adjoining the east end of the Mediterranean; (2) with the Mediterranean basin itself; for the few outlying countries which had a share in ancient history depended upon this area for their civilization. Or taking race and religion as the basis of division, we may define ancient history as the development of pagan, non-Germanic civilization; for with the thorough establishment of Christianity and the coming of the Germans the Middle Age begins. Although ancient history includes many nations and numberless movements of growth and decay, it shows nevertheless remarkable unity. From simple though diverse beginnings the various peoples of the area above defined developed into the one complex political and social organization known as the Roman empire; and when with the wreck of this system the ancient world passed away, there began under new conditions that fresh life of mankind which in its earlier stage we call mediæval and in its more mature growth modern.

History does not concern itself with ultimate origins; it begins with man in the lowest condition in which it actually finds him, and with the help of anthropology, archæology, and kindred sciences it traces his improvement from that point upward through the earlier known stages of his existence. The prehistoric age, which precedes contemporary written records, is taken into account in so far as, by furnishing relative beginnings, it affords an explanation of later developments. Even when the historian reaches the period of contemporary documents and literature, he continues to use all available auxiliary sciences, principally epigraphy, archæology, numismatics, philology, and geography. In testing the genuineness and the historical value of sources he makes use of critical principles which are becoming more and more definite and effective with the growth of historical method into a science.

Nowhere has source material accumulated so rapidly in recent years as in the Orient. As a result of continued explorations there our knowledge of Oriental life has been vastly increased, and the beginnings of Oriental history have been pushed much farther back into the past. We are now able to study the Egyptians of the paleolithic age (cf. Petrie, 'History of Egypt' (4th ed. i. p. 5 ff), although no date can yet be assigned to that primitive culture, nor have yet been discovered all the links which connect it with the historic age. Beginning with the earliest appearance of written records in the Orient, we may divide ancient history into the following periods:

I. *The Dawn of Civilization; the old Egyptian Kingdom and the Chaldean and Syrian City-States, 5000–3000 B. C.*—Whether mankind first emerged from the Stone Age in the valley of the Nile or in that of the Tigris and Euphrates rivers is disputed, and the date of this event has not been even approximately determined. There can be no doubt, however, that early in the fifth millennium B.C. civilization in both these regions had reached a comparatively high development. People irrigated their fields, built cities, in which they lived under kings, and were acquainted with the elements of practical science as well as with the art of writing. The Egyptian alphabet of this period was hieroglyphic, the Chaldean cuneiform. Egypt achieved political unification under a monarch near the beginning of the period; Chaldea and Syria remained divided among rival city-states.

Through the most brilliant part of the period the Egyptian capital was Memphis, whose Pharaohs of the fourth dynasty (about 4000–3725 B.C.) constructed the great pyramids at Gizeh. This epoch is unique in the world's history for the bold attempt to surpass nature in the grandeur and strength of its buildings, which at the same time indicate the high centralization in the hands of the monarch. The people of Egypt, devoted to agriculture and the industrial arts, were peace-loving, submissive to authority, and intensely religious. Prominent among the Chaldean cities were Ur, Nippur, Agade (Accad), and Babylon, under independent kings who strove with one another for the mastery. In spite of their military occupation the people, like the Egyptians, engaged their best thought and energy in creating the elements of civilization. Among their early achievements were the science of astronomy, the calendar, and a system of weights and measures, which with some modifications afterward passed to Europe. Early in the fourth millennium Chaldean civilization began to affect Syria.

II. *The Middle Kingdom of Egypt; the Political Unification of Chaldea; the Neolithic and Æncolithic Ages in Greece, about 3000–2000 B. C.*—In the beginning of the period Thebes supplanted Memphis as the political centre of Egypt. The most brilliant dynasty was the twelfth (about 2775–2550 B.C.). The Pharaohs of this family with a firm hand controlled the feudal lords who since the sixth dynasty had been growing strong over all Egypt, and to whom most of the famous rock-graves of the period belong. The same dynasty conquered Ethiopia (Nubia), carried on a lively trade with Syria, and had commerce with countries as far west as Crete. They built splendid temples, and regulated the waters of the lower Nile by means of a great reservoir in the Fayûm. Their utilitarian works contrast strikingly with the grand though selfish idealism of the pyramid-builders. Meanwhile in Chaldea the strife among the cities continued till the whole country was unified under Babylon (2250 B.C.).

In the industries both nations reached a high stage of technical skill. The Egyptians excelled in inlaid work, the Babylonians in the engraving of gems. The architecture was massive, the Chaldean in brick, the Egyptian in stone. The sculpture, too, though lacking grace, showed great strength. The literature was looked upon by after ages as classic. In government we find a centralized monarchy with a bureaucratic administration regulated by written law (cf. the Code of Hammurabi (q.v.), about 2250 B.C.). The family was monogamic, and society was definitely organized in classes. The prime motive power in life was religion, which, manipulated by the priests, was already reducing the activities of man to a system of conventions and thus putting an end to originality.

In the region about the Ægean Sea the period is represented by the first settlement at Troy, of neolithic culture (3000–2500 B.C.), and by the second or "burnt" city, which was æneolithic (2500–2000 B.C.). Crete, in communication with Egypt, seems to have taken the lead in the civilization of this region.

III. *The Earliest Empires and Their Struggles; the Beginnings of Assyria, Phœnicia, and the Hebrews; the Bronze Age in Greece, 2000–1000 B. C.*—After the twelfth dynasty Egypt weakened; from the beginning of the second millennium the Hyksos (q.v.) a barbarous people from Asia, controlled the lower Nile valley for several, possibly five, centuries. After their expulsion the Egyptians became a conquering people. The eighteenth dynasty (about 1600–1325 B.C) extended their dominion on the south to the centre of Ethiopia and on the northeast to the Euphrates River. Cyprus and the "isles of the Great Sea" sent as tribute and gifts vases of Mycenæan manufacture.

Chaldea, ruled by Cossæan — Kassite — kings (1717–1140 B.C.), was not only unable to prevent these conquests, but even lost her hold upon Assyria, which now began a long winning struggle with Babylon for supremacy. Both countries courted the favor of the powerful Pharaohs. For the first time in history we have great states in relations of war and peace with one another — the beginning of diplomacy and "world-politics." Assyria (1125 B.C.) suddenly created an empire which extended northward to the sources of the two rivers and westward to the Mediterranean. She advanced beyond Egypt in the organization and administration of conquered countries, but her empire soon fell to pieces, partly from internal exhaustion and partly because of invasions from Arabia.

Before the rise of the Assyrian empire the Hittites had conquered eastern Asia Minor and had wrested northern Syria from Egypt; but their power was as speedily overthrown by swarms of invaders of unknown race from Asia Minor, who then made a fierce assault upon Egypt.

Before the end of the millennium the Phœnicians had planted many trading-stations on the islands and coasts of the Mediterranean and had created a "world-commerce." Sidon was at first the leading city, and afterward Tyre. Their civilization, with that of all Syria, was fundamentally Chaldean, affected to some extent by Egyptian commerce and conquest. About 1000 B.C. the Greeks adopted their phonetic alphabet.

Among the immigrants from Arabia into the civilized districts of Hither Asia were the Aramæans, who established themselves in northern Syria with their capital at Damascus, and the Hebrews, who conquered the country in southern Syria now known as Palestine (1150 B.C.). At first their government was a theocracy represented by prophets and "judges," but soon (about 1050 B.C.) they established a kingship.

In this period the creative energy of the Egyptians had exhausted itself. Life became artificial; wealth, flowing in from conquests, substituted magnificence for taste, and in the end enfeebled the national spirit. On account of the wars the military class came into great prominence; the king, more than before, became the proprietor of the state, and the priests gained control of the material as well as of the spiritual activities of the nation. In Hither Asia, also, artistic and industrial civilization suffered through the decline of Chaldea; for the Assyrian genius was chiefly political and military rather than artistic or intellectual. The Hebrews, however, were moving in the direction of monotheism, and Phœnicia was spreading Oriental civilization abroad over the Mediterranean lands.

Of enormous importance for history was the development of civilization in the Ægean region. The beginnings of the Bronze Age — proto-Mycenæan — are represented by the third, fourth, and fifth cities at Troy (2000–1500 B.C.), followed by the fully developed Mycenæan civilization, represented by the sixth city at Troy, by Tiryns, Mycenæ, and many other cities on the Greek peninsula, in Crete and the Ægean islands. Characteristic of the civilization are massive fortifications, large palaces, immense tombs, wonderfully skilful work in gold, in vase-making, gem-cutting, and inlaying with precious metals, also excessive ornamentation of apparel and effeminate luxury. Toward the close of the millennium this culture began rapidly to decline.

Parallel to this development in the Ægean, yet little affected by it, the Etruscans of central and northern Italy were creating a peculiar civilization,— less artistic and less grand than the Mycenæan,— which did not reach its height till the following millennium.

IV. *The Growth and Decline of the Syrian Kingdoms; the Rise of the Assyrian Empire; the Epic Age in Greece, 1000–700 B. C.*— Tyre, taking the place of Sidon, became the centre of the world's commerce. Under king David the Hebrews developed a great political power; but after the death of Solomon they split into two kingdoms, Judah and Israel. Damascus, which had belonged to the realm of David, again became the capital of an independent Aramæan kingdom. Near the end of the period, however, all Syria excepting Tyre fell under the Assyrian yoke. The people of Damascus (about 730 B.C.) and Israel (722 B.C.) were carried into captivity, and Judah became tributary. Babylon, too, was definitely conquered (728 B.C.). Egypt, again declining, divided into many small principalities, while Ethiopia rose to a power of the first importance. Her king conquered the Nile valley to its mouth in 728 B.C. But the greatest political event of the period was the rise of the Assyrian empire. Through persistent warfare carried on by a line of able

kings for crushing frequent rebellion as well as for new conquests, the empire reached the height of glory, though not yet its widest extent, under Sargon (722–705 B.C.).

Great progress was made in civilization. The Hebrews, afflicted by Assyria, were purging themselves of polytheism, and under the lead of inspired prophets were learning to look upon Jehovah as the only God, almighty, pure, and jealous, who demanded of his worshippers not only ceremonial exactness but clean hearts and spiritual devotion. With the Assyrians, notwithstanding their strong religious nature, political motives were dominant. For strengthening their empire they adopted the plan (1) of recruiting their armies partly from conquered peoples, (2) of transplanting populations from one part of the empire to another, to break up local attachments and weaken the power of resistance, (3) of organizing some of the conquered countries into provinces ruled by Assyrian officials, though many were still left under their native rulers. In government and administration, accordingly, Assyria was at this time the most progressive of nations.

The centre of interest in the growth of civilization, however, shifted to the Ægean region, where in this age the Ionic Greeks produced the first European literature — the 'Iliad' (q.v.) and the 'Odyssey' (q.v.) Colonists in a strange country, the Ionians were not in a condition to cultivate the Mycenæan arts, but drew their subsistence from grazing, agriculture, and war. With a high degree of refinement, mixed with barbarity, they possessed remarkably virile, elastic minds. In contrast with the slavish Orientals, the Greeks, represented by the Ionians, were in spirit free. To them neither nature nor religion was terrible; their gods were intensely human, generally the helpers, never the implacable enemies of man. Combined with this intellectual liberty and boldness was a rare sense of fitness and proportion, manifested in the Homeric poems referred to above. In Greek manhood, virility, freedom, intelligence, and taste combined to produce a civilization which was already rapidly advancing beyond that of the Orient.

V. *The Fall of Assyria and the Rise of the Persian Empire; in Greece Colonial Expansion and the Awakening of a National Consciousness; the Struggle Between Asia and Europe, in which Greece Becomes the Centre of Interest in the World's Politics; in the Central Mediterranean Region the Political Growth of Carthage and Etruria; at Rome the Primitive Kingship and the Beginning of the Republic, 700–479 B. C.*— Early in the period Lydia became a conquering state, and reached the height of its imperial power under Crœsus (560–546 B.C.), who ruled nearly all Asia Minor west of the Halys River. Egypt fell under the Assyrian power (664 B.C.); but soon throwing off the yoke, it enjoyed a long period of independence (645–525 B.C.). Before the loss of Egypt the Assyrian empire reached from Thebes on the Nile nearly to the Caspian Sea, and from the Persian Gulf nearly to the Black Sea — the greatest extent of country yet united under one ruler. In Nineveh, their new capital, the kings built magnificent palaces of brick, adorned with representations of their wars in sculptured reliefs. They established libraries, too, of Babylonian learning. But they had already ceased to make political progress, and they failed to give their empire an organic unity, and to inspire the conquered nations with loyalty to the central government. Suddenly the empire was overthrown by a combination of the Babylonians and the Medes, who destroyed Nineveh in 606 B.C. With this event Assyria disappeared from history.

Two empires — the Median and the Babylonian — divided between them the Assyrian domain. The former lay in the north of Hither Asia, the latter in the south. Under Nebuchadnezzar (606–562 B.C.). Babylon became the largest and wealthiest city in the world, a brilliant seat of industry and commerce. He destroyed Jerusalem, carried Judah into captivity (586 B.C.), and conquered Tyre. Of the other empire the ruling people were the Medes, who inhabited the plateau between the Tigris Valley and the Caspian Sea. Their sway extended westward, on the north of Babylonia, to the Halys River, and southward over their Persian kinsmen. Both empires, however, were short-lived; in 550 B.C. Cyrus, an Elamitic prince, at the head of a Persian revolt, established himself master of the Median realm. This event made the empire Persian. After conquering Lydia (546 B.C.) and Babylon (538 B.C.), Cyrus proceeded to subdue the countries to the east and northeast of Persia; so that at his death (529 B.C.) his empire extended from the Ægean Sea to the Indus River, and from the Persian Gulf to the Jaxartes River — an area perhaps five or six times as great as that of the Assyrian empire. His son and successor Cambyses added Egypt (525 B.C.), and Darius, the following king (522–485 B.C.), completing an organization begun by Cyrus, divided the empire into twenty satrapies (provinces), each under a governor termed satrap. This magistrate, appointed by the king, exercised full military and civil authority over his province, subject to royal regulations and commands. Though checked by the continual presence of a royal secretary and by the occasional visits of the king's "eye" (inspector), the satrap enjoyed the splendor and nearly all the power of a sovereign. Darius also built roads throughout the empire, distributed the taxes equitably, and established a system of gold and silver coins. He annexed Thrace to his empire, and made an unsuccessful attempt to conquer Greece.

In the beginning of this period the Greeks were extending the sphere of their influence through colonization. About 750 B.C. they had begun to settle in southern Italy and Sicily: and for two centuries the movement of expansion continued, till their settlements extended from Naucratis, Egypt, to the Pillars of Hercules, and from the northern coast of the Black Sea to Libya. With colonial enterprise the industries and commerce kept full pace. They manufactured armor, artistic bronze-ware, and tastefully painted vases. From Lydia they learned the art of weaving and dyeing fine woolens as well as of coining money; from Egypt they derived the elements of astronomy, of surveying, and of the other practical sciences. Great intellectual progress took place; lyric poetry flourished in all parts of Greece — a kind of poetry which shows that the Greeks were actively thinking on all subjects suggested by their expanding environment. They made a

beginning of geography, history, and philosophy. Thinking led to religious and moral progress; the Greeks began to exercise self-restraint and moderation in life. Their sympathies widened with their intelligence; they discovered that they were all of one blood, one speech, and one religion, and began to call themselves by the common name of Hellenes. They became aware, too, of the differences between themselves and foreigners, whom they termed "barbarians," and of their own superiority to all other races. Conflicts with foreigners made the Greeks feel that they ought to combine for mutual defense. In the preceding age (1000–700 B.C.) their whole country was divided among a multitude of small city-states, each under an independent king. While in the more progressive parts of the nation in the period now before us the government was rapidly developing from kingship through aristocracy, oligarchy or timocracy, and tyranny in the direction of democracy, a corresponding movement was going on toward political unity. The city of Sparta, after uniting by conquest Laconia, Messenia, and Cynuria in the strong military state of Lacedæmon, built up the Peloponnesian league with herself as leader. The basis of her superior military organization was the phalanx. Under the fear of Persian invasion this power expanded into an Hellenic league of all the loyal Greek states on the peninsula and on the neighboring islands. In Sicily a similar league grew up under Syracuse for defense against two formidable powers, Etruria and Carthage. The Etruscan dominion extended from the Alps to the vicinity of the present Naples, and probably included the then insignificant city of Rome, which after having been ruled from the earliest times by kings set up a republic in 509 B.C. The Etruscans, now at the height of their development, were equally powerful by land and sea. Even more formidable to the Greeks was Carthage, the greatest Phœnician colony, which united under its leadership all the other Phœnician settlements in the western Mediterranean region. By means of enormous wealth, accumulated through commerce, this city recruited a vast army of mercenaries, with which she hoped to overwhelm the western Greeks.

Checked by the growth of foreign powers, Greek colonial expansion came to an end about 550 B.C. Then the boundary of free Hellas on the east was pushed back by the Lydian and Persian conquests in Asia Minor. A revolt of the Ionians against Darius,— in which the insurgents were aided by the mother country,— precipitated between Asia and Europe a conflict destined to affect the whole future history of the world. An army sent into Greece by Darius, was beaten back by the Athenians at Marathon in 490 B.C. Ten years afterward, Xerxes, son and successor of Darius, led a vast host into Greece, hoping to overwhelm the free little country by the sheer force of numbers. But his fleet was shattered in the battle of Salamis (480 B.C.) and his army destroyed at Platæa by the forces of the Hellenic league (479 B.C.). Meantime at Himera, Sicily, the despot of Syracuse destroyed the invading mercenary army of Carthage (480 B.C.). The Greeks met with brilliant success both in the East and in the West: those of their race in Asia Minor were liberated; all were relieved from fear of foreigners; Greek civilization was free to develop without the restraint of alien rule; Greece came out of the struggle strong, proud, self-conscious, ready for great achievements in peace and in war.

VI. *The Culmination and Decline of Greek Political Power and of Greek Civilization; the Hellenization of the Orient; the Unification of Italy Under Rome, 479–264 B. C.*—The splendid naval force which Athens furnished for the war, together with superior statesmanship, placed her at the head of a new league of maritime Greek states, known as the Delian Confederacy (organized 477 B.C.). Rivalry for the headship of Greece between democratic Athens and oligarchic Sparta led to the Peloponnesian war, which involved a great part of the Greek world (431–404 B.C.), and which ended in the establishment of Spartan supremacy (404–371) over eastern Greece, while nearly all western Greece was united under Syracuse. Oppression on the one hand, and on the other the love of the Greeks for city-autonomy, caused the downfall of both political powers. For a short time under Epaminondas (371–362 B.C.) Thebes attempted to take the place of Sparta, but in vain; the Greek state-system,— consisting of leagues and hegemonies of cities,— was rapidly crumbling. Meanwhile Macedon, a territorial state under King Philip, taking advantage of the political disunion and mutual jealousies of the city republics, began to encroach on free Hellas. After defeating the combined forces of Athens and Thebes at Chæronea (338 B.C.) he imposed his protectorate upon the Hellenic state-system. His son Alexander the Great in a series of brilliant campaigns (334–331 B.C.) conquered the Persian empire, and afterward extended its boundaries to the northeast and the east. His empire was the largest the world had known. Among his improvements was the specialization of administrative functions, financial, judicial, and military. When he died, the empire after a long struggle among his generals ultimately divided into three great states,— Egypt, Asia (the Seleucid empire), and Macedon, including Greece. To regain and preserve their liberty many of the cities of eastern Greece entered into two federal unions, the Ætolian and the Achæan. These institutions, though long known to the Greeks, came into favor too late to save them from the domination — not of Macedon but of Rome. The western Greeks, however, were first to meet their fate.

After adopting a Republican constitution Rome engaged with her neighbors in a long, desperate struggle for existence (509–431 B.C.). Then by securing the headship of Latium (431–406 B.C.) and by the conquest of Veii she became one of the strongest powers in Italy. A series of wars with the Latins, Samnites, and Italiot Greeks (343–290 B.C.) gave her control of all Italy south of the Rubicon River. The success of the Romans was due to their improvement on the Greek phalanx, their strict discipline and obedience to authority, their laborious patience in fortifying acquired territory, and their liberality in the treatment of conquered peoples. The political system which in this period they gradually built up on the basis of Italian nationality recognized various gradations of rights and obligations among the communities of the system from the tributary subjection of the Gauls to the full Roman citizenship. Though

partly federal, the system left to Rome absolute control of foreign and military affairs. At the close of the period (264 B.C.) Rome and Carthage were the great powers of the western Mediterranean; those of the East were Macedon, Egypt, and the Seleucid empire.

The century and a half (479–322 B.C.) following the Græco-Persian war was in some respects the most brilliant in the history of civilization. The tremendous energy roused in Greece by the war displayed itself under the guidance of taste and reason in every field of activity. A wave of independence, overthrowing tyrannies and oligarchies, established popular governments in many cities, and intensified the democracies already existing. In Periclean Athens, which depended economically upon the labor of slaves and tributes from dependent allies, the citizens enjoyed a more liberal education and a wider range of political and social privileges than have ever fallen to any other community known to history. In close relation with this political and social development architecture, sculpture, and literature reached ideal perfection. The fifth century produced the Attic drama (Æschylus, Sophocles, Euripides, and Aristophanes), the noblest historical writing (Herodotus and Thucydides), and the inimitable Parthenon and Erechtheum. But the Peloponnesian war exhausted the energy and resources of eastern Greece. The growing refinement and love of peace which characterized the following century is indicated by the fact that the inhabitants of the city-states shirked military service, so that war came largely into the hands of mercenaries drawn from the less cultured territorial states. Thought prevailed over action; and in art strength was to some extent sacrificed to beauty and finish. While poetry declined, oratory and philosophy reached the height of their development in Demosthenes, Plato, and Aristotle, who brought classic Greek literature to a close.

Following the conquests of Alexander, commerce, colonization, and administrative policy spread Hellenic civilization over the Orient. In the post-classic period (after 322 B.C.) Pergamum and Alexandria became the most famous seats of Hellenistic culture, which was distinguished for painstaking scholarship rather than for creative power. The West, too, was falling under Hellenic influence. Rome adopted from the Greeks not only the phalanx, but also various deities and religious ideas, the alphabet,—either directly or through the Etruscans,—and other rudiments of civilization. From the Etruscans chiefly came the impetus to the building of public works,—temples, sewers, roads, bridges, fortifications,—in which the Romans showed creative genius. But to the end of the period they paid little attention to learning; they were without literature and had few if any schools. A realistic, practical people, they were narrow and unamiable in private and business relations, but excellent warriors and citizens. Duty and Discipine were the great commandments to which the family and society, citizens and soldiers, yielded religious obedience. These heroic virtues were not the least important factor in the creation of their empire.

VII. *The Expansion of the Roman Power over the Mediterranean World; the Growth of Plutocracy and the Decline of the Republic, 264–27 B. C.*—The extension of the power of Rome over the peninsula brought her into collision with Carthage, which had occupied nearly the whole of Sicily and was now threatening southern Italy. Not only did Rome feel bound to protect Italy, but her growing commercial class desired by conquest to extend its opportunities for trade and speculation. The First Punic War (264–241 B.C.) may be compared in character and importance with the recent war between the United States and Spain, which resulted in the occupation of the Philippine Islands by the former power. To meet the Carthaginians on their own element, Rome built a navy, and thus equipped herself for transmarine conquests. As a result of the war, Carthage surrendered Sicily to Rome in addition to paying a heavy indemnity. This island became the first Roman province (227 B.C.). Sardinia and Corsica, acquired soon after the war, were organized into a second province. Then by conquering the Gauls in the north of Italy (225–222 B.C.) the Romans extended their sway to the Alps. In the Second Punic War (218–201 B.C.) the Carthaginian Hannibal, one of the most eminent generals of all time, invaded Italy, defeated one Roman army after another, desolated the country, and came near wrecking the power of Rome. Her preservation was due to the wisdom of the senate, to the solidity of Roman character, and to the tie of common interests and of kindred blood which bound the Italians together against the alien intruder. This war of defense shows Rome at her best. Peace brought her two provinces in Spain and the destruction of her rival's navy. So greatly superior was now her strength that the conquest of the civilized world had become merely a question of a few years. In another series of successful wars (200–146 B.C.) she acquired Macedon, Greece, Asia Minor, and the country about Carthage. Corinth and Carthage were destroyed, and most of the acquired territory was organized into provinces. At this date (146 B.C.) Rome was the only great power in the entire Mediterranean basin. The further growth of her empire consisted mainly in the conversion of protected and dependent countries into provinces and an occasional conquest. To Pompey belongs the subjugation of Syria (65–62 B.C.), which alone remained of the Seleucid empire, and to Julius Cæsar the more important conquest of Gaul (58–50 B.C.). Egypt, long dependent, became a province in 30 B.C. The Roman empire, consisting of provinces and dependent allies, now included the whole circuit of the Mediterranean.

Some advantages came to the world from Roman rule: while in the East Græco-Oriental culture continued undisturbed, Latin civilization, which was falling more and more under Hellenic influence, gradually permeated the provinces of the West; throughout the empire the cities retained their own laws and self-administration under the government of their wealthy class; all parts but the frontiers enjoyed lasting peace. The evil effects of the system, however, soon began to outweigh its advantages. To secure a monopoly of commerce for themselves, the Romans restricted or even prohibited trade among the subject communities. Over all the empire they acquired vast estates, which they worked by slave labor, thus destroying everywhere the free peasantry. Their policy of farming the taxes was also unjust and oppressive.

The governors, too, with rare exceptions made office a means of amassing fortunes. In these ways the administrative and capitalist classes recklessly exploited the provinces for their own profit. At the same time commercial restrictions and the competition of slave labor were ruining the farmers and business men of Italy, and a worthless, dangerous mob was growing up in the capital.

The early government of Rome by magistrates, senate, and assemblies, although admirably adapted to a small community, proved unequal to its new and complex functions. The assemblies, now becoming corrupt, were in the hands of magistrates, ministers of the senate, which as a whole was controlled by a small knot of members, the curule ex-magistrates. This inner circle formed in the beginning a nobility of merit; it saved the state from Hannibal and conquered the Mediterranean world. But it soon transformed itself into an hereditary caste, which, monopolizing the domestic and imperial offices, used them as a means of absorbing the wealth of the world. In brief the nobility degenerated into a corrupt, self-seeking plutocracy. As to the general condition of the world at this time it should be noted that the want of competition, such as exists among nations of approximately equal power, by reducing the vitality of mankind, stopped progress, and decay was already setting in. Thorough reform was needed even to postpone the collapse of ancient civilization.

The Gracchi sacrificed their lives in a vain attempt to regenerate the peasantry and to restore Italy to its old condition of economic health; at the same time they showed the enormous power of the plebeian tribunate for purposes of reform or revolution. Far preferable to government by the corrupt aristocracy or by the mob, which Gaius Gracchus organized, would be the strong rule of one man; and the task of creating in the army a solid foundation for a government of the kind was accomplished by Gaius Marius. After him the governor (proconsul) of a military province employed his position as a means of acquiring an army for political use; and the proconsuls became rivals for the mastery of Rome. Finally Gaius Julius Cæsar, an aristocrat by birth but a champion of the people, allying himself with the tribunes, overthrew the republic and created a virtual monarchy. By radical reform of the entire administration this great creative statesman arrested the decay of civilization and gave the institutions of the ancient world a new lease of life. The assassination of the monarch, far from restoring the republic, was followed by a war of succession, in which his grand-nephew Octavius —after 27 B.C. Augustus — won the imperial prize (31 B.C.).

VIII. *The Empire at Its Height, 27 B. C.–180 A. D.*— Instead of recurring to the autocracy of Cæsar, Augustus hit upon a compromise between republic and monarchy (27 B.C.). The senate through its magistrates and promagistrates was still to govern Rome, Italy, and the peaceful provinces, while Augustus as holder of the military authority (*imperator*, hence emperor) was to rule directly the exposed and unquiet provinces and to exercise supervision even over those administered by the senate; the republic was to continue for Italy, the monarchy was established for the subject countries. In Rome Augustus held the tribunician power, and was sometimes elected to republican offices; but his chief influence over the home government was exercised not through office but in the capacity of political "boss,"— a position which the Romans dignified with the name of *princeps* (foremost citizen). The prince and the senate had not only their separate fields of administration but also separate treasuries and separate sets of officials. Augustus concealed the independent position of the prince; Tiberius brought the dyarchic antithesis into bold relief; the Claudian and Flavian princes, by gradual encroachment on the senatorial prerogatives, aimed to convert the dyarchy into a monarchy. As the senate declined, the officials of the prince, originally his friends and household servants, developed into an imperial bureaucracy. After the tyranny of Domitian the "Good Emperors" (96–180 A.D.), in reconciling the nobility to the principate, laid more firmly the constitutional basis of their power. The government may now be termed a monarchy, although some elements of the dyarchy remained, and though the senate, with its republican traditions, continued to be a material check upon the powers of the prince.

The emperors made few permanent conquests,— chiefly Britain and the Danubian provinces. Their fundamental task was to extend Latin civilization to the un-Hellenized parts of their dominion. In Africa west of Egypt, notwithstanding the survival of the Phœnician language in private life, Latin civilization took deep root. Spain and southern Gaul became perhaps even more thoroughly Latinized. Northern Gaul was less affected, and Britain still less, by the Romans, while the northern provinces east of Gaul varied greatly in their receptivity of Latin culture. The principal factor in the work of civilization was the city; in most of their European domains the Romans superseded the old tribal organization by the Italian municipal system, which gave the nations the refining and disciplining influence of comfortable homes, useful and artistic public works, schools, courts of justice, and local self-government. Each city was a centre from which Latin modes of life and Latin ideas radiated. Imperial rule cured most of the ills of republican administration. Abolishing the farming of direct taxes, it placed their collection in the hands of imperial officials, and distributed them on the basis of a careful census. The governors, now drawing their salaries from Rome, and deprived of their former unlimited opportunity for extortion, were held responsible to the emperor. The armies, placed under strict discipline and controlled by one will, no longer wasted the empire by civil wars. For the vast extent of the frontier the soldiers were few, and the burden of their support was light. The republic had looked upon the provinces as its estates; in the 2d century A.D. the emperor came to regard himself as the parent of the subject peoples, whom he was in duty bound to treat with love as well as with justice. Though oppression was not wholly eradicated, the imperial government was in a high degree efficient, just, and humane. The progress of civilization was followed by the extension of the Roman citizenship. The liberal policy of Claudius in bestowing it was continued by his successors, till shortly after the period

under discussion all freemen of the empire became Romans by the edict of Caracalla (212 A.D.).

In this period was tried the experiment of maintaining profound and lasting peace over the large area comprising the interior provinces. Prominent among the results was a material prosperity far greater than has ever blessed those countries in any other age. Another result was the development of the "feminine virtues." Men "became chaste, tender-hearted, loyal, religious, capable of infinite endurance in a good cause" (Seeley, 'Roman Imperialism'). They began to regard women as their equals, to treat children and slaves humanely, to show kindness even to animals, and in spite of gladiatorial contests, to abhor bloodshed. Morals, at their lowest ebb in the Rome of Nero, were rapidly purified by the coming in of the best families from the provinces, so that under the Good Emperors morality in the capital reached a high level. The spirit of the age expressed itself not only in the private and social virtues, but also in the Civil Law, which rested upon the principles of justice, kindliness, and equality among men.

The unimaginative Romans failed to produce a literature of the highest rank. In the late republic lived Lucretius, a poet of real genius, and Cicero, the versatile author of orations, philosophic works, and private correspondence. The Augustan age created the epic and rural poetry of Virgil, the 'Odes' and 'Satires' of Horace on social and moral topics, and Livy's stately history of the republic. The most splendid Latin writers of the age of the Good Emperors were the satirist Juvenal and Tacitus, the historian of the early empire. Among the most famous writers in the Greek language at this time were Pausanias, author of a 'Tour of Greece,' Appian, the historian, and Plutarch, the biographer of eminent men. Hellenism continued to be the chief liberalizing and refining force in the empire. Its highest intellectual product from Roman soil was Stoicism, which found its best expression in the writings and character of Marcus Aurelius.

IX. *From Limited Monarchy to Despotism; the Reorganization of Diocletian and Constantine; the Barbarian Invasions and the Decline of the Empire, 180–500 A. D.*— Writers generally agree in making the decline begin with the reign of Commodus (180–192 A.D.), though disintegrating forces had long been in operation and though for generations afterward the empire at times, as under Septimius Severus and Diocletian, showed great recuperative power. The century which intervened between the death of Marcus Aurelius and the accession of Diocletian (180–284 A.D.) we may regard as a period of revolution. The happiness of the Roman world under the Good Emperors had been chiefly due to the wisdom of a succession of rulers who were able to secure the good will of the senate and of the populace of Rome, the subordination of the pretorians and of the army, and the respect of surrounding nations. The weak, brutish Commodus allowed these nicely adjusted forces to conflict, and the result was civil war and anarchy. The revolution, sweeping away the influence of pretorians, populace, and senate, almost of Rome itself, brought new principles of government into play. The emperor was to be a despot of the Oriental type,— a God on earth,— who surrounded himself with stately splendor, and governed through a complex bureaucracy. He appointed a colleague, and two Cæsars were named as heirs of the emperors, all four dignitaries being men of eminent military ability. The empire was reorganized in prefectures, dioceses, and provinces under appropriate magistrates. These arrangements, chiefly the work of Diocletian (284–305 A.D.) and Constantine (sole emperor 324–337 A.D.), were in the main permanent. In making better use of the resources of the empire for the purposes of defense the new organization brought fresh strength, but rivalry between the emperors again caused civil wars with all their evil consequences. Under Constantine, who removed the capital to Byzantium, thereafter called Constantinople, the two imperial offices were again vested in one person, and were not definitely separated till the accession of Arcadius and Honorius, sons of Theodosius (395 A.D.). Even then the theory of a single empire ruled by two colleagues continued; and when in 476 A.D. Romulus "Augustulus" was deposed at Rome and the imperial trappings were sent to Constantinople, people understood merely that the collegial government had once more given way to monarchy.

Meanwhile from the heart outward through every limb the empire was falling to decay. The underlying cause, already referred to, was declining vitality, fundamentally due to lack of interest in the welfare of the state, of the community, of future generations. As the civilized part of the human race lost love of life and hope for the future, it began to die out. A related cause was slavery, which long before Marcus Aurelius had been destroying the free population; in his time the plague, and after him foreign and civil wars, continued to waste life, while the burden of taxation, always increasing, made life every day more wretched. The wealth of the empire flowed to the East in exchange for useless luxuries; and for want of gold and silver the coinage was debased; at the same time the cost of living became excessive. Then, too, the growing splendor of the imperial courts added to the burden. With their scant means many found it impossible to support families, and even the slaves grew fewer. In these conditions most of the lower population, free and slave, became hereditary serfs — *coloni* — bound to the soil and to the payment of fixed dues to their lords. But it was not only the poor who suffered. The municipalities had once enjoyed freedom in local affairs, each governed by a senate, whose members — *decuriones* — were the wealthier men of the community. Gradually the emperors encroached upon the liberty of these cities, till they had converted even the privileges of the senators into intolerable burdens. For as these officials were responsible for the taxes due from their districts, many of them, unable to wring the required amount from the poorer classes, were themselves reduced to poverty. Nevertheless they could in no way shirk their duty, but were held for life by an iron hand to the unenviable task of collecting and of paying oppressive taxes. Artisans and traders, too, were bound strictly to their hereditary vocations, in order that the government might be sure of the dues to which they were subject. In brief, society was forced into a rigid caste-like system, which crushed freedom and made the life of rich and poor, bond and free, almost

equally wretched. As under these circumstances the population grew unwarlike, the government found it more and more necessary to make up the armies of Germans, who consequently settled in the empire in ever increasing numbers. Although they readily adopted Roman civilization, their independent spirit, out of harmony with the conditions above described, acted as a new disintegrating force. Another power, which while aiming to make the world over on its own model tended to destroy ancient ideas and institutions,— including the empire itself,— was Christianity. Rome, essentially polytheistic, always tolerated the religions of the nations which she conquered; in the adoption of their gods into her pantheon she found a means of political centralization. Judaism, however, she regarded with disfavor, and attempted to suppress Christianity. These exceptions to her policy of toleration were due to the irreconcilable conflict between monotheism and polytheism and to the leveling tendency of the Christian religion. The apostles of Christ taught that the gods of Rome were demons, that the worship of the emperor was sinful, that all men from the emperor to the slave were equal before God, that the heaping up of wealth was an abomination; in brief their religion seemed to the Romans subversive of all the principles on which the empire rested. But although Christianity and Germanism were disintegrating the empire, they were destined in combination to make the old world new. The estimate of their value as creative agencies belongs to the mediæval period.

In appearance more formidable than internal decay were the hostile nations outside the empire. In the 3d century the Germans, who had long been threatening, began to break through the northern frontier. The Franks flung themselves upon Gaul; the Goths occupied Dacia and crossed the Danube, to defeat and kill an emperor. In the East, too, a new danger appeared; on the ruins of the old Seleucid power had arisen the Parthian empire, which in the 3d century was supplanted by a new, vigorous Persian empire. The warlike Persian monarchs nearly made good their threat to drive the Romans from Asia.

Early in the 5th century the Germans began to establish their states within the empire,— the Visigothic kingdom in Gaul and Spain (415 A.D.), that of the Vandals in Africa, and of the Burgundians in the Rhone valley. About the middle of the century the Angles and Saxons began to overrun Britain; a little later the Franks, who long before had crossed the Rhine, began the conquest of Gaul (486 A.D.); and in 493 A.D. the Ostrogoths conquered Italy. Before the end of the century the western branch of the empire had fallen into the hands of Germanic chiefs, who while vaguely recognizing the emperor at Constantinople as their lord were in reality sovereign kings of the countries they ruled. Here ancient history ends; the interaction between Roman and German life under Christian influence is the subject of mediæval history.

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GEORGE WILLIS BOTSFORD,
Adjunct Professor of Ancient History, Columbia University.

History, Mediæval. *Definition.*— Mediæval history may be most easily defined as the middle period between ancient and modern history. Some scholars have wished to do away with the term entirely, and to use only two divisions, ancient and modern. In fact, in Oriental history there is no mediæval period. But most students prefer to keep to the threefold division for European history. This is due largely to the fact that the mediæval period can be presented with greater unity than either ancient or modern.

Mediæval history began with the disintegration of the Roman Empire in the 5th century, the ruin of paganism, and the migrations. Without arguing the merits of the various dates which may be assigned for the end of the Middle Ages (q.v.), we shall here discuss the history to about 1500 A.D. During this period of

one thousand years, the most marked characteristic is the dominant influence of the Church. The most important peoples are the Germanic races, who emerged slowly from barbarism, and gradually assimilated some of the features of the Roman civilization. Based upon the ruins of the older rose a new civilization, which caused a radical transformation in political, social, and religious ideals.

Contrast Between Romans and Germans.— The Romans had a highly developed and very complex civilization. From their Greek subjects, they had acquired the knowledge of art, literature, science, and philosophy. Under the Roman peace, an active commerce had grown up throughout the empire, supplying to each province the products of all of the others. In law and administration the Romans had reached such excellence that we still imitate them. Moreover, Christianity had become the state religion.

The Germans were barbarians, having the virtues and vices of their savage state, and resembling, in many respects, the North American Indians. But they were a vigorous race, with a great capacity for learning. Some of them had been converted to Christianity before they entered the Roman Empire, but most of them were still pagans.

Migrations.— The Roman Empire had for centuries held the barbarians in check, by the prestige of its name, by the payment of tribute, or by the policy of exciting dissension among its enemies. This last is well summed up in the Roman proverb, *Divide et impera*, which may be paraphrased, "Cause divisions and strife among those whom you fear and thus rule over them." In the latter part of the 4th century, however, the terrors inspired by the advance of the Huns (q.v.) into Europe, the knowledge of the weakness of the Roman Empire, and their own desire for more fertile lands, caused the Visigoths (q.v.) to enter upon their great migration. Their example was followed by other German tribes, and the movement continued throughout the 5th and 6th centuries. By the year 600, all the European portion of the Western Empire, except a few positions in Italy, was held by the Germans.

During the period of the migrations, there was a great destruction of life and property. But the conquered inhabitants were neither exterminated nor driven out. The German invaders were relatively few in number, and, in many sections, they found unoccupied lands sufficient for their needs. The conquerors and the conquered lived in constant contact with one another, and the resultant civilization was partly Roman and partly German. See MIGRATIONS.

Fusion of the Two Civilizations.— The 7th and 8th centuries were the period of fusion. By the year 800, the terms *Roman* and *Barbarian* were no longer used. The inhabitants formed a single people, with a civilization much lower than the Roman but much higher than that of the Germans when the latter had entered the Empire. In this new composite civilization, the Roman influence was greater in language, mechanical arts, business arrangements, and municipal, intellectual, and ecclesiastical affairs. The German influence was greater in military matters and judicial procedure.

The fusion was practically completed by the time of Charles the Great. He realized clearly the task of the Middle Ages, and did all in his power, on the one hand to retain all that was best of the older German customs, and, on the other hand, to introduce from Italy such Roman customs as his subjects were able to adopt. He did much to foster education, which followed Roman models. By his wars, he brought under his sword all of the German peoples.

The New Empire.— In 800, Charles's services received fitting recognition in his election as emperor of the Roman Empire. The idea of a Roman empire which embraced all Christians had never been lost. After 476, when Romulus Augustulus was deposed by Odoacer, the people in the West, Germans and Romans alike, had regarded the emperor at Constantinople as the head of the Christian world. Even barbarians like Clovis (q.v.) had been proud to secure recognition and obtain a title from the emperor. The popes had looked to the emperors for support. In the last years of the 8th century, the East was ruled over by Irene (q.v.), who was both despised because she was a woman and for her crimes and heresy, so that it seemed to many that the imperial office was vacant. Consequently, Charles was crowned emperor and was considered the successor of Augustus, Trajan, and Constantine (qq.v.). Under his strong rule, the Western world was governed firmly, and the western nations were held together.

Disintegration of the Empire.— After Charles's death, his son was unequal to the task of ruling the empire. Under the combined effects of civil strife and constant invasions by the Northmen, the Mohammedans, and the Slavs (qq.v.), the central power was weakened, and the last Carolingian rulers were unable to protect their subjects. The whole frontier was exposed to attacks and the raids of the enemy even extended far into the interior. In each district the strongest man came to be regarded as the natural leader and protector. Sometimes it was a royal official, holding a fortification; sometimes it was an abbot or a bishop; at other times, a bold adventurer, who usurped authority. In the absence of a strong central government, each leader had to police his land and administer justice. Naturally, he demanded to be paid for his services, and exacted tribute from all under his control.

Because of the lack of money, the Carolingians (see CARLOVINGIANS) had always furnished to their counts and other official estates from which they obtained their living. Under the weak kings, the temporary grants of both land and office became hereditary, with or without the rulers' consent. The rulers, however, soon recognized the necessity of allowing this, and sought merely the recognition of their own overlordship and ultimate ownership of the lands. Consequently, they granted the benefices to the heirs and conferred, in addition, the immunity, or right of independent jurisdiction. Thus almost all land and power came to be held feudally. See FEUDALISM.

Feudal Anarchy.— There was constant warfare as each strong lord sought to obtain greater power or a more independent position. On the other hand, each king or suzerain tried to increase his own feudal holdings by conquest or marriage. Every vassal was anxious to avoid

all the feudal services that he could, and, at the same time, to exact as much as possible from the people subject to him. Commerce was burdened with excessive tolls in each fief and exposed to the depredations of the robber barons. Little attention was paid to maintaining roads and bridges, consequently travel was difficult as well as dangerous. As a whole, the feudal régime tended to isolate each fief and to reduce the peasantry to misery. It is significant that the term "Dark Ages," formerly applied to the whole of the Middle Ages, is often used now for the 9th and 10th centuries.

The Church.— The great cohesive and educating force was the Church. Soon after they entered the Roman Empire, each tribe of Germans had been converted to Christianity. In every barbarian kingdom the bishops were important officials. They often obtained great wealth, and ruled over vast estates. On their possessions, the serfs were treated somewhat better than on the lay fiefs. Monasteries had been founded throughout Western Europe, and often these served both as schools and as model farms. Boniface did much to bring the tribes of Germany into direct connection with Rome, and he held frequent church councils at which the clergy and nobles of a whole district came together. These councils were very important for their effect in unifying the Church and making its work more effective.

From this time the Church gained steadily in power and influence. Charles the Great did much to increase its wealth by enforcing the payment of tithes. He insisted that the clergy should be better educated themselves and should do more for the education of the people. In the 9th century the growing power of the papacy and the weakness of the kings enabled the popes to bring the bishops more directly under their own control. Thus the clergy of Western Christendom were brought into intimate association with Rome. Latin was the common language of all churchmen. Their feeling of membership in the Church was frequently stronger than any local attachment. Consequently the more able men were equally at home in every country and the Church had a greater unity than any lay power. This all-pervasive Church was the great unifying element amid the divisions of the feudal period.

Investiture Struggle.— After periods of weakness in the first half of the 10th and again in the first half of the 11th century, the Church at Rome was purified and strengthened by the support of the German emperors. About the middle of the 11th century, the strong personalities of Pope Leo IX. (q.v.) and of Hildebrand (later Gregory VII.) (q.v.) led to a great reform movement, and also to an effort to make the pope's power more effective. One feature of this movement was an attempt to secure entire control of appointment to church offices. This brought the papacy into conflict with the kings who considered that they had a right to nominate the bishops in their own kingdoms. The struggle was most acute between the German emperors and the popes, and resulted in the long investiture conflict, which was ended in 1122 by a compromise. See INVESTITURE.

Roman Empire of the German Nation.— But the investiture struggle was only a single phase in the relations between the empire and the papacy (q.v.). In order to understand this it is necessary to study the fortunes of the empire after Charles the Great. Under his successors, the emperors had gradually lost their power, so that by the end of the 9th century, the title of *emperor* had become almost a meaningless designation, either conferred by a pope on anyone of whom he wished to make use, or else usurped by any ruler who chanced to be temporarily the strongest personality in Italian affairs. This continued to be the fate of the imperial title until Otto the Great (q.v.) was summoned to Italy, because of the discord reigning among the various Italian nobles. In 963 he was crowned emperor, and became the ruler of both Germany and Italy. Under his son and grandson, Otto II. and Otto III., "the Roman Empire of the German nation" was a very effective power in controlling both the imperial lands and the papal policy. After the death of Otto III. in 1002, the German rulers paid little attention to Italian affairs until 1046, when Henry III. was summoned to Rome because of the contest which was being waged between three rivals for the papal office. For 10 years he wielded a power similar to that of the Ottos. But at his death, as the heir was a young child, the reformed and strengthened papacy was able to assert its independence. When Henry reached manhood and desired to regain his father's power, the contest began and took the shape of the already mentioned investiture struggle. After the Concordat of Worms (q.v.) there was a truce which was broken by the accession of Frederick Barbarossa (q.v.), who was determined to be emperor in fact as well as in name.

Empire and Papacy.— On the other hand, the papacy was strong and was determined to assert its paramount authority. There ensued a struggle of one hundred years between the Hohenstaufen emperors and the popes. In spite of the ability of the rulers and the brilliancy of their reigns, the popes triumphed, largely by means of the assistance of the Lombard cities, which had grown rich and powerful and claimed to be independent of the imperial control. The death of Frederick II. in 1250 really marks the end of the mediæval empire, as a strong international power, although it continued, under a changed form, to be a factor in European politics for centuries longer, and came to a close only in the 19th century.

The Crusades.— The increasing power of the popes was also marked by their desire to extend their authority over the Eastern Church as well as the Western. This was in part the cause of the crusades, which were the most important manifestation of the strength and influence of the Church. The spirit of asceticism (q.v.) had long been inculcated as the most distinguishing mark of Christianity. The consciousness of their own sins and the teachings of the Church led many to do penance. One of the favorite forms, especially for heinous crimes, was a pilgrimage to some hallowed spot. The most difficult pilgrimage and the one to which greatest sanctity attached was the journey to Jerusalem. In the 11th century, one hundred and sixteen separate pilgrimages to Jerusalem are recorded, and, in some of these expeditions, hundreds and even thousands took part. Thus attention was directed to the Holy

Land. Moreover, in spite of the disorders of the feudal régime, the population was increasing, especially in France. The people were hard-pressed to get food, and were anxious for a change of any kind. Consequently, when the Emperor Alexius appealed for aid and Pope Urban II. preached the crusade at Clermont thousands took the cross. The movement spread rapidly and affected every country in Europe. Although Jerusalem was in the possession of the Christians for little more than a century, the crusades to the Holy Land, which continued for 200 years, produced great results. In order to understand these, it is necessary now to take up the Byzantine and Muslim civilizations. See CRUSADES.

Byzantine Civilization. — Until a half-century ago, the Byzantine history was misunderstood. It was looked upon as the long death struggle of a society in which all progress had ceased, and despotism, tempered by assassination, crushed out all vitality. Gibbon styled the history "a tedious and uniform tale of weakness and misery." It is known now that this was unjust. The most striking fact about the Byzantine Empire is its "constant vitality and power of recuperation." It was threatened by invaders, but it repelled them all. At times it lost some of its most fertile provinces, but at other periods it would rise triumphantly and recover its lost possessions. Throughout the period between 700 and 1100, Constantinople was the bulwark of Europe, against which the waves of invasions rolled in vain. In addition to being a bulwark, Constantinople was, throughout the Middle Ages, the great storehouse of the Greek and Roman civilizations, where it was preserved until the European nations were sufficiently advanced to profit by it. Constantinople (q.v.) was also the most important commercial centre of the Middle Ages. The city was marvelously wealthy and excited the admiration of every traveler. Most of the crusaders passed through Constantinople and the Greek lands on their way to Jerusalem; by them the influence of its civilization was widely spread throughout the West. See BYZANTINE EMPIRE.

Muslim Civilization. — No less important was the influence of the Mohammedans. After the death of the prophet in 632, his followers had conquered with wonderful rapidity the greater part of the civilized world. From Persia and India they held all Asia to the Hellespont. Egypt and the whole north coast of Africa, Spain, and about one third of Gaul, were under their sway within a century. Their advance in civilization was equally rapid. The Arabs had wonderful acquisitive ability and were taking almost the first step in their education. In each country they learned the arts and sciences known by the inhabitants, and they carried this knowledge wherever they ruled. The Greek philosophy, which they acquired from the peoples in the lands formerly under Greek sway, the mathematical knowledge of India, the irrigation practised in Egypt, are illustrations of their acquisitions, which enabled them in the 10th and 11th centuries, to develop a civilization far in advance of any other, with the exception of the Byzantine. From Bagdad to Spain this culture was spread throughout the Mussulman world. In Syria, the crusaders were in contact with this civilization for two centuries. By their agency and by the association of Christians and Mussulmans in Spain, Sicily, and other points, much of the Muslim learning was conveyed to the Christians of Western Europe.

Changes in the 12th and 13th Centuries. Enrichment of Europe. — In addition to this fructifying intercourse with other civilizations, many elements in their own contributed to cause a rapid advance in the 12th and 13th centuries. Among these may be noted the increase in population, the cultivation of waste lands, the revival of commerce, the general progress along educational lines, and the rise of strong kingdoms. But as it is impossible to isolate each factor and to determine the part which it played, the results will be considered as a whole and the changes which took place in Western Europe after 1100 will be described.

The hundreds of thousands of crusaders had to procure large sums of money for their equipment and journey. Consequently the precious metals which had been hoarded came into circulation as money. Instruments of credit were devised and the money circulated rapidly. Contact with other civilizations gave birth to new tastes and these were gratified by means of a greatly increased commerce which extended to all parts of Europe and even to the extreme East. The merchants became numerous and prospered. Cities increased rapidly in population and new ones were founded. The Italian cities, because of their position, prospered the most of all. The merchants became an important class because of their wealth, and by the end of the 13th century became a political factor which was recognized by their inclusion in the new parliamentary bodies.

Intellectual Advance.—The investiture struggle had caused scholars to study history in order to find precedents in support of the imperial or the papal claims. The contact with other peoples broadened the intellectual horizon of the Western people. The new points of view with which they became acquainted led them to question the traditions which had ruled their lives. The new books, especially the works of Aristotle (q.v.), which fell into their hands, were studied eagerly. The new wealth gave leisure. Students flocked to the centres where teachers were to be found, and gradually universities arose. Roman law was fostered by the emperors; canon law, by the Church. Scientific knowledge, especially in medicine, was acquired from the Greek and the Arabic works. Gothic cathedrals of exquisite beauty were built in western Europe. The deeds of the crusaders furnished new material to literature. The old tales were re-worked and given a literary form.

Growth of Monastic Orders. Temporal Power of the Popes.—No less marked were the changes in the Church. At the close of the 11th century a great wave of asceticism spread over western Europe. The idea of sacrifice caused thousands to enter monasteries, and many new orders of monks were founded. These orders vied with one another in austerity and asceticism. Their reputation for sanctity and their services to the community brought to them great donations from the pious. Their knowledge enabled them to increase their wealth. But this wealth led many to enter the monasteries from unworthy motives, and thus caused a gradual

decline in their lofty morals. The wealth of the Church, as a whole, caused many, both monks and laymen, to attack it as having departed from its Christian ideals. Heretics became numerous and had to be repressed by persecutions and the inquisition. In the 13th century the mendicant orders became prominent, partly as a protest against the wealth of the Church, and partly as an agency to combat heresy. The ideal of service to others for which they stood became dominant in monasticism, and later orders were founded, almost universally, for some special service. See MONACHISM; ORDERS, RELIGIOUS.

The papacy, engaged in a struggle with the monarchs, felt the need of temporal power and strove for it. Innocent III. had monarchs as his vassals, and wielded a temporal authority greater than that of any previous pope. After the popes had triumphed over the Hohenstaufens they seemed to have achieved success. Their struggle with the French king, at the beginning of the 14th century, however, led to defeat and to the "Babylonian captivity" at Avignon. Then ensued the schism and the conciliar period when many felt that the general councils and not the popes should be supreme. Finally the papacy emerged triumphant, but with a changed ideal, laying less stress upon temporal power (q.v.) than upon control over the conscience of the individual.

Chivalry. Decadence of the Knights.—In the 12th century, the clergy and the knights formed the aristocracy. The latter, too, had their period of great splendor. The ideals of chivalry, which became prominent in the 12th century, were inculcated by the Church, and the knights were often likened to the clergy as a class specially set apart by their religious vows. These ideals were also inculcated by the new literature, which glorified not only bravery and loyalty, but also generosity and luxury. The latter led to the ruin of many of the knights. Their income, arising from feudal dues, was relatively fixed. As their tastes expanded and they expended more upon luxuries, they fell into debt. The rate of interest was ruinous and they were unable to pay. Consequently many were compelled to alienate their fiefs, the monarchs and other lords of large fiefs absorbed the lesser fiefs, and there was a tendency for the knights to become retainers of the more wealthy. Their consequence as a class declined in comparison with the growing importance of the merchants. The development of strong infantry forces finally deprived them of their pre-eminence in military matters. See CHIVALRY.

Rise of the Nations.—The contact with other peoples led to the rise of a national consciousness. In the earlier days, when each feudal castle or village was practically isolated and often at strife with its neighbors, there had been little feeling of common interests. Association with foreigners brought a sense of national feeling in opposition to the foreigners. This is very marked in the armies of the second and third crusades. This movement was coincident with, and one cause of, the growth of the strong monarchies. The merchant class was also an important element in the development of the king's powers. Commerce was heavily burdened with feudal tolls and exposed to depredations by the knights. The merchants sought privileges and protection from the kings. In return they furnished them money, which aided them in extending their power at the expense of that of their nobles. The kings came to depend largely upon the cities for support in all struggles with the nobles. By their wealth the citizens were able to rival the nobles in luxury and ostentation. The sons of the merchants frequented the universities and developed into officials of the kings. More and more the kings came to depend upon the third estate and to withdraw power from the nobles.

The French Monarchy.—The development of the monarchical power took different forms in the several countries, but took place about the same time in the leading nations. In France, the Capetian kings (see CAPET) had at first little power. They had only a small territory directly under their control, and consequently only a small income. But by fortunate marriages and by confiscations they enlarged their feudal domains. Several of the kings had long reigns and the evils of a minority or a change of dynasty were avoided. Gradually all the fiefs were brought under the control of the king, and feudal usages were made the basis for the assertion of a really monarchical power. Under Saint Louis (1226–1270) and his successors France was centralized and the kings became supreme. The prosperity of France was checked for a time by the Hundred Years' war (1328–1461). This was due in part to a failure of male heirs in the direct line, which enabled the English kings to make a claim to the throne on the ground that they were the most direct heirs. But France finally emerged triumphant and England lost all her territory in France. The kings, supported by the third estate, became practically absolute.

The English Monarchy.—In England the Norman Conquest (q.v.) made William supreme lord. Following the Norman feudal usages, he insisted upon an oath from each one of his subjects, and did not allow the intervention of the feudal nobles. In spite of the civil wars of the 12th century, Henry II. was able to retain the supreme control. The tyranny and incompetence of John led to a revolt on the part of the barons and the extortion from him of the Great Charter. (See ENGLAND—*Civil History.*) The efforts of the kings to evade the provisions of the charter caused the union of the nobles and third estate, the distinctive feature of the English constitution as contrasted with that of France or of Germany. The loss of its continental possessions really strengthened England and enabled it to develop a strong government in its own island.

The German Monarchy.—Germany was a kingdom made up of great duchies. The king was strong only when he had all these duchies under his immediate control. The imperial title which he held was usually a source of weakness, because of the necessity of maintaining his authority outside of Germany. Those kings who neglected the imperial interests in Italy and Burgundy were strongest at home. Frederick Barbarossa, Henry VI., and Frederick II. (qq.v.), who attempted to build up strong empires, were compelled, as the price of support from their German subjects, to make constant concessions. Thus they bartered away most of their German lands and royal rights. The towns

and cities, in particular, acquired privileges and practical independence in payment for their support in men and money. On the extinction of the Hohenstaufen house, Germany was divided up into many separate entities, varying in size from a duchy to a village or to a knight's fee, all claiming independence of all control except the imperial. The weak emperors of the 14th and 15th centuries were unable to maintain any effective control or order. Each emperor was intent only upon retaining his position and securing such property for his family as he could. Consequently Germany became a prey to internal dissension and division.

The Other Monarchies.—The other countries were more backward. In Spain, the Christian kings were engaged in conquering Muslim territory or else in warring with one another. These movements were going on for several centuries, and culminated just at the close of the Middle Ages. In 1492, the Moors were conquered in Granada, their last stronghold. The two most powerful kingdoms, Castile and Leon, had already been united, and 20 years later the Spanish portion of Navarre was added. In Scandinavia powerful monarchies were growing up. In the eastern portions of Europe new Christian kingdoms had arisen, especially Russia and Hungary, which were destined to play an important role in the later centuries.

The Period of the Renaissance: Discoveries.—The last period of the Middle Ages is often spoken of as the Age of the Renaissance (q.v.). The name is to a certain extent a misnomer. But it is sanctioned by general usage, and there are certain factors that may be brought together, which serve to mark the transition from the mediæval to the modern world.

The travel and commerce of the 12th and 13th centuries caused an interest in foreign lands which never abated. In particular, the taste for spices, which had become common, led to attempts to secure these more easily and more cheaply. After the loss of the Christian possessions in Syria, the importation of spices into Europe was burdened with heavy tolls by the Muslim rulers through whose territories they had to be carried. To the men of the 15th century there seemed to be two possible routes by sea to the spice islands, one by sailing around Africa, the other by sailing directly west to India. Attempting the latter led to the discovery of America; attempting the former, to the doubling of the Cape of Good Hope. The result of these discoveries was to make the nations on the ocean the leaders in commerce. The Mediterranean ceased to be the centre of the world's commerce and the Italian cities lost their pre-eminence as commercial centres.

Inventions: Compass, Printing-press, Gunpowder.—This exploration was possible only by the use of the compass (q.v.). This had been known in the West by the 12th century; in the East, centuries earlier. But it was perfected as a real aid to navigation only in the 14th century. About the middle of the 15th century came an even more important invention, that of printing (q.v.). This resulted at once in increasing enormously the number of books in existence and in cheapening their cost to one fifth or less, so that books were readily accessible to a much larger number than before. At about the same time the manufacture of gunpowder was being perfected. Compositions similar to gunpowder (q.v.) had long been known in the East, and the knowledge of the composition of "Greek fire" had been brought to the West. But it came into general use only in the 15th century, and the guns long after that were held by many to be inferior to the cross-bow. But gunpowder, before 1500, was revolutionizing the art of war and rendering the mediæval knight obsolete.

Classical Literature and Pagan Spirit.—Contemporary with these discoveries and inventions was the awakening of an interest in classical literature. In the 12th century there has been at some centres an eager study of the Latin classics, but, in the 13th, this had been superseded to a great extent by the branches considered more practical, especially law, mathematics, and science. In the 14th and 15th centuries men turned again to the classics, and Greek, which had long been neglected, became a favorite study. Along with the study of the pagan authors developed a new feeling for art, which resulted in the wonderfully natural works of the Renaissance artists. Other sides of this new activity were manifested in the more scholarly spirit of criticism and in scientific study. In fact, with the period of the Renaissance modern history had dawned.

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DANA CARLETON MUNRO,
Professor of History, University of Wisconsin.

History, Modern.—*General Characteristics.*—When History is divided merely into Ancient and Modern, the term Modern applies to history subsequent to the 4th century A.D. The *Americana*, however, keeps to the more usual triple division into Ancient, Mediæval, and Modern; and with this classification Modern History begins about the year 1500.

At that date, as for several centuries preceding it, the scene of human progress was confined to Western Europe, and the actors were the Latin and Teutonic peoples. Nations, in the proper sense, were not made; and the political map bore faint resemblance to that of to-day. There was one Latin Christendom, binding in feeble union the several geographic units. But most of the units themselves were broken into fragments under local rulers; and these fragments, sometimes of widely separated lands, were recombined, with kaleidoscopic confusion, in loose, shifting aggregates which possessed not even permanent names. Out of this feudal chaos, strong monarchies were just emerging, to organize states, in France, England, and Spain; but there was hardly a prophecy of a Germany or an Italy. Except for Poland with its Latin church and borrowed German culture, Eastern Europe was outside the pale of civilization. The barbarous northern Slavs seemed doomed to Tartar domination, and the somewhat less barbarous southern Slavs with the neighboring Magyars were enslaved by the Turk. From the devouring victorious march of the Turk even Central Europe was in imminent peril.

This dismal political picture had its counterpart in social and economic conditions. Society was hopelessly aristocratic and predominantly militant, and it was crystallized in strata. The skilled industry of the towns was managed upon the guild system; and agricultural labor, except in England and some other small districts, was carried on by serfs.

But Europe had been astir with dim impulses to change for four hundred years,—ever since the Crusades broke the torpor of the Dark Ages and prepared the way for the rise of towns and the Renaissance. Near the close of the 15th century the tendency to progress became more pronounced, and the lines of activity more varied. Louis XI. in France, the Tudors in England, Ferdinand and Isabella in Spain, prepared the way for new consolidated political societies, and for new principles of government; the invention of printing made possible the preservation and utilization of the recently rediscovered Greek learning and the rapid dissemination of new ideas; the discoveries of Columbus and Vasco da Gama set free undreamed-of energies among the lands of the Atlantic seaboard, and summoned commercial Europe to a right-about from east to west; the adoption of gunpowder in the wars between Francis I. and Charles V. marked the passing of the military superiority of the knight in armor, and undermined the citadel of aristocracy in politics; the opening of the Protestant Reformation (1520) shattered the old unity of Christendom, and, together with the Catholic Counter-Reformation, called out new energies in the fields of morals and intellect. Within two generations, the one just before and the one just after the year 1500, there stood revealed not merely a new physical hemisphere and new continents in the old one, but also a new universe of thought and feeling. Europe had passed into a new age.

The four centuries of Modern History have been a period of constant, marvelous, increasingly rapid transformation,—intellectual, political, industrial. The stage itself has widened from a corner of the smallest continent into wellnigh the whole surface of the globe. The actors have multiplied, until they promise in the near future to include all branches of the human race. The drama has become infinitely complex, with the interaction of countless streams of influence. As compared with Ancient or Mediæval History, Modern History deals with a brief time, but with vast spaces, complex relations, and accelerated progress. The separate movements that make up the bewildering maze are discussed severally in some detail, under appropriate headings, in the *Americana*. This article attempts only to marshal them in such order as to bring out the essential relations between them.

It is convenient to divide the four centuries of Modern History into the *age of monarchic states* and the *age of nation-states*. The American and French Revolutions make the transition from one to the other, and the most satisfactory dividing date is 1789.

FROM THE REFORMATION TO THE FRENCH REVOLUTION.—*Monarchic States.*—The constant warfare of the 16th, 17th, and 18th centuries is the simplest thread by which to connect the other movements of the age. Speaking broadly, the contests of the first half of the period, to 1648, are "religious wars," Catholic against Protestant, while after 1648 the struggles grow out of dynastic and commercial rivalries.

The declaration of the war which split Christendom into opposing camps for over a century came in 1520, when Luther burned the Pope's bull. The Diet of Worms at once pronounced against the rash monk the ban of the Empire; and the decree would have been enforced, and Protestantism stifled at its birth, if the young Emperor, Charles V., had had a free hand. But Charles had just become involved in strife with Francis I., over the claims of Spain and France in Italy, and he was kept busy with war against France and the Turks until 1544. For a generation, therefore, the new faith was left to spread itself unchecked over Germany and Scandinavia, while during the same period the English church cut itself off from Rome, and Presbyterian heresy made headway in France and Switzerland. For a time, indeed, Protestantism threatened to conquer even the south of Europe; but the Catholic Counter-Reformation, with equal zeal and superior skill, finally saved the Romance lands to the old faith.

Religious Wars, 1546–1648.—Meanwhile, entangled in his strife for European sovereignty, Charles could not strike at Protestants in Germany until 1546. It was then too late. In 1555, after brief struggles, the princes of the Schmalkald League forced upon him the Peace of Augsburg; and, though troubled with incessant bickerings, Germany had no further civil war for sixty years. Just that period, how-

ever, was filled with terrible religious contests in the Netherlands and France; and then the age of religious wars closed with another civil war in Germany,— the most destructive in European history. The century of strife from the opening of the Schmalkald War to the close of the Thirty Years' War (1546–1648) did not materially alter religious frontiers. Catholicism, to be sure, made some conquests with the sword, — Bohemia, South Germany, and the southern Netherlands,— but in most of these districts, as in the Latin countries of Southern Europe, the Counter-Reformation was making rapid gains before war began.

The close of the period of religious war is marked by the decay of Spain, the continued disruption of the Holy Roman Empire, and the rise of France and of the Dutch Republic. To explain these changes it is needful to dwell somewhat further upon the wars.

In 1556–7, after his failure in Germany, Charles V. resigned his crowns,— the Austrian possessions passing to his brother, and the Spanish to his son, Philip II. Despite the division, Philip was far the most powerful monarch in the world. Each year the "gold fleet" filled his coffers from the exhaustless wealth of the Americas, and in 1580 Portugal with her East India empire fell into his hands. This was the power,— supreme in Europe and sole mistress of the New Worlds east and west,— against which the petty, disunited Netherland provinces dared to rebel. Beginning as a political revolt in 1568, the struggle soon became a religious war; and it was waged for more than forty years with a relentless fury which made it a byword for ferocity even in that brutal age. The ten southern provinces finally returned to Spanish allegiance; but the northern provinces,— Dutch in blood and Protestant in religion,— fought on with desperate courage until they won independence. At the same time they preserved political and religious liberty for the world. Midway in the struggle, Elizabeth of England sent some tardy aid. Philip then turned upon England; but the destruction of his "Invincible Armada" in the splendid sea-fight in the Channel not only saved England at home but also paved the way for the English colonization of North America. The war closed in 1609. Spain had sunk into a second-rate power, never again to play an important part in European politics; but the United Provinces, through the stage of the desolating war, had grown prosperous. They drew wealth, not from the wasted land, but from the sea, plundering the new possessions of Spain in the East Indies and building there a colonial empire for themselves. For most of the century, in intellectual, commercial, and industrial activities, the Dutch held the first place in Europe.

In France the Edict of Nantes (1598) closed the wars of religion by guaranteeing toleration and handing over certain garrisoned towns to the Huguenots as security. During the next half century, under the wise administration of Henry IV. and then of Richelieu, the industry of the people restored prosperity with marvelous rapidity. Richelieu crushed the feudal nobles and recaptured from the Huguenots their garrisoned towns. In other respects, however, he kept toward the Protestants the pledges of the Edict of Nantes; and as he warred upon the Protestants within France in order to strengthen the royal power, so he aided the Protestants of Germany in the Thirty Years' War in order to make France supreme in Europe. France had long been in real peril from the Hapsburg powers of Spain and Austria, which ringed her about in hostile embrace; but the failure of Spain against Holland and Richelieu's policy of weakening Austria in the German war removed the peril, and, as Spain declined from the first place in Europe, France stepped into it.

Meantime the Thirty Years' War (1618–48) was desolating Central Europe. The princes of North Germany proved timid and incapable; and the cause of Protestantism was saved only by foreign intervention, by Denmark, by Sweden, and finally by Catholic France. At the close of the struggle, the first European Congress reorganized Europe. By the Peace of Westphalia, France received most of Alsace and some other Rhine districts. The independence of Switzerland and of the United Provinces was formally recognized. Sweden, already reaching down both west and east shores of the Baltic, secured much of the south shore also, with command of the mouths of the German Oder, Elbe, and Weser. On the other hand, the Empire lost more than territory. The political rearrangements within that state reduced the imperial Diet to the level of a useless debating society and put an end to whatever had persisted of national unity. From this time until it vanished, a century and a half later, the Holy Roman Empire was a meaningless survival, cumbering the earth, and the Hapsburg "Emperors" derived their only real importance from their position as hereditary archdukes of Austria. To most of Germany the war had brought blasting ruin. Half the population and two thirds the movable property were swept away. Land tilled for centuries became waste, and men became savages. Not till the middle of the nineteenth century did large districts again contain as many homesteads and cattle as in 1618; while the low position of the German peasantry, until 1850, was due in great measure to this war.

American Colonization.—Before the religious wars closed, the continent of Europe had ceased to be the sole scene of important historical development. American colonization was well advanced, and political liberty had received a remarkable development both in England and in English colonies. These topics demand attention before the student enters upon the consideration of the next period of European wars.

Spain made her first settlement upon the American continent at the Pearl Coast in 1513. Then sweeping to north and south, she took swift possession of all South America except Brazil, all Central America, and of the Floridas and Californias, far up both coasts of North America, while plans were afoot to plant her flag over the rest of that continent. But the ruin of the Armada, together with Spain's decay at home, came in time to leave room for other colonization. France seized upon the mouths of the Mississippi and the St. Lawrence, the apparent gateways to the continent; and English colonies stretched themselves in patches along the fringe of the North Atlantic coast. The Dutch spent their colonizing energies main-

ly in the Orient; and, despite some ambitious beginnings, Sweden soon grew too weak to be a serious factor in North America. Thus that continent was left in dispute between Spain, France, and England. The contest was to be interwoven with the European wars of the last half of the seventeenth century and of the eighteenth century, and the outcome was big with consequence to the world. All European countries except England governed their colonies on despotic plans. The English colonists took to the New World institutions and principles of freedom, and soon gave them a wider development there than had been possible even in the old home. Besides the rights of free speech and jury trial and *habeas corpus*, each English colony had from the first, or very quickly inaugurated, a representative legislature with full parliamentary privileges and with control over taxation. In several colonies, local government also was conducted on extreme democratic principles. Not until two hundred years later did any of these free principles appear in the colonies of any other people,— and then only because of the success of the English colonies.

England in the Seventeenth Century.— In England itself the seventeenth century saw an important development in free government. Through the Stuart period, from 1603 to 1688, England was engaged in a critical struggle between the royal claims of "Divine Right" government and the rising spirit of popular government. Except for brief intervals the conflict was parliamentary, not military, but it was constant and stubborn. Much of the time it was confused with ecclesiastical questions, which, to the men of the time, often seemed the chief issue; and it was fortunate, indeed, that the stern heroism of Puritanism became engaged on the side of political liberty. During this century, too, England was the last remaining battle ground in Europe for free government. In the other large states,— in Spain, France, Austria, in the Scandinavian lands, even in the petty principalities of Italy and Germany, — despotism was triumphant. In England, popular principles not merely maintained themselves against the Stuart attack; they came out of the conflict with increased vitality. The great experiment of a Puritan Commonwealth failed; but after the Stuart Restoration it became apparent that the body of the monarchists themselves were now thoroughly devoted to parliamentary government, and the attempt of the later Stuarts to set up a personal absolutism called forth the "Glorious Revolution" of 1688, which established the supremacy of Parliament over the king.

Dynastic and Commercial Struggles, 1648–1783.— We now return to the general development of Europe after 1648. On the continent the period from the Peace of Westphalia to the French Revolution (1648–1789) is marked (1) by absolutism within the several states and (2) by dynastic interests in their foreign relations,— with incessant selfish war, as the result. The famous phrase ascribed to Louis XIV. of France, —"I am the State,"— might have been used appropriately by any monarch of the time outside of England. A few great rulers dominate the period. Indeed the stage is largely filled by three monarchs,— Louis XIV. (1643–1715), Peter the Great (1689–1725), and Frederick the Great (1740–86). The influence of Peter was restricted for the most part to Russia; but the other two belong to all Europe, and the period divides itself naturally into the Age of Louis XIV. and the Age of Frederick II. The chief aim of statesmen was to prevent any one country from becoming too strong for the safety of its neighbors. The Peace of Westphalia had transferred political predominance from the Hapsburgs to the Bourbons. Thus, during the first half of the period France threatened the "balance of power," and league after league of other powers was organized against her. International morality, however, was low; and commonly rulers were willing to let a strong power rob a weaker one if they could find "compensation" by robbing some other state themselves. In the last wars of Louis XIV., just before and after 1700 (known in American history as King William's War and Queen Anne's War), the dynastic interests of European ruling families became merged in a titanic, century-long struggle between France and England for world dominion,— though neither country was yet fully conscious of the import of the strife.

In Europe, France was no longer in peril, as she had been in the period preceding Richelieu; and Louis the Fourteenth's half-century of war was merely a struggle to enlarge his dominions. For a generation the victories of Turenne dazzled Europe; and France annexed some important strips of territory on the east, at the expense of Spain and of the decaying Empire. But in the closing period, when the Allies also had found great generals, in the English Marlborough and the Austrian Prince Eugene, even success in the field deserted Louis; and to a comprehensive view his failure was profound. Exhausted France was crushed by taxation to pay the interest of the war debt; while, in attacks upon petty provinces in Europe, she had wasted energies and opportunities that might have made her supreme in Asia and America. Within, the economic reforms of the great Colbert were abandoned; and the revocation of the Edict of Nantes (1685) drove into exile more than two hundred thousand of the best citizens of France. The effect corresponded in a measure to the effect upon Spain of the expulsion of the Moriscoes somewhat earlier. The Huguenots had comprised the skilled artisans and the enterprising merchant classes; and their flight added to the terrible economic demoralization and deprived France of all chance at industrial leadership.

To men of the time, however, the failure was partially disguised by the glamor that surrounded the court of the *Grand Monarque*. French literature, brilliant and sparkling, was in its first splendid period; and French intellectual leadership survived for more than a century. Until after 1800, the court of Louis XIV. remained the model for every court in Europe; and French thought, French fashions, and the French language were the common property of all polite society.

The Treaty of Utrecht (1713), while it left France still one of the three greatest powers, marks her recession from predominance. Spain resigned her territories and claims in Italy and on the Rhine, and, except for her decaying

colonies, withdrew finally within her own peninsula. England gained Newfoundland and Nova Scotia from France, and in Europe she secured command of the Mediterranean by the conquest of Gibraltar and Minorca. By the same treaty and by the rearrangements that immediately followed, the old Spanish Netherlands, the Duchy of Milan, and the Kingdom of Naples and Sicily fell to Austria. The Duke of Savoy (one of the faithful allies against France) acquired Sardinia, with the title of a kingdom for his enlarged state. A little before, in 1701, the Elector of Brandenburg had secured the title of King of Prussia. Thus, out of the wars of Louis, at the beginning of the eighteenth century, arose the two kingdoms, Prussia and Sardinia, which in the latter part of the nineteenth century were to make modern Germany and modern Italy against the will of modern France.

About 1700, other important changes took place in the map of Europe. For three centuries, Austria had been one of the chief bulwarks of Christendom against Mohammedanism. In 1683 Vienna had been besieged by the Turks, and had been saved only by the arrival of the gallant Sobieski with his Polish chivalry. But thereafter Austria took the offensive. She won back Hungary, and then, step by step, extended her dominions down the Danube valley and the Illyrian coast. In the latter part of the reign of Louis XIV., the Austrian Hapsburgs, turning away from the Rhine, definitely adopted a Danubian policy and sought to aggrandize themselves by seizing Slav territory from Turkey.

This new policy of Austria gave Louis XIV. a freer hand on the Rhine than he otherwise would have had, and so helped on the decline of Holland. In 1640, Dutch vessels carried the commerce of the world,—even the greater part of that between England and her colonies. Soon after that date, however, England attacked the Dutch commercial supremacy by navigation laws, and at last by war. Fearful of French conquest, and deserted or timidly defended by Austria, Holland had no choice but to ally herself to her commercial rival. After 1689 in particular (when William of Orange became King of England), Holland followed the lead of England in politics, while that country drew to herself the Dutch carrying trade.

In the north of Europe the former great powers, Sweden and Poland, were declining before the rise of Russia and Prussia. Peter the Great (1689–1725) consolidated the government in Russia, introduced a veneer of Western civilization, and started his country on its deliberate march toward distant seas, west, south, and east. Peter himself secured the western "window" by seizing from Sweden the southeastern Baltic provinces. In the middle of the century, the Empress Elizabeth (1741–62) robbed Sweden of the rest of the Baltic coast up through southern Finland. The northern half of Finland remained Sweden's until Alexander I. seized it in the Napoleonic wars; but toward the close of the eighteenth century, under Catherine II., Russia began her advance along the Black Sea at the expense of Turkey. Under the same ruler occurred the Russian gains in the partitions of Poland,—a story which can be understood only in connection with the rise of Prussia.

For three centuries the Hohenzollern Margraves of Brandenburg had been patiently adding scrap by scrap to their realms. Soon after 1600 these dominions lay mainly in three widely separated groups,—Cleves on the Rhine, Brandenburg on the Elbe, and East Prussia beyond the Vistula. The object of Hohenzollern politics was to consolidate these provinces by acquiring intermediate territory. Toward the close of the Thirty Years' War, Frederick William, the Great Elector, made important headway in this respect and accomplished still more for his country after the close of that struggle by persistently maintaining peace and fostering industry. It was his son who in 1701 secured the title of King. The second king of Prussia built up a magnificent army and reared a son who was to use it magnificently. Frederick II. ascended the throne in 1740 and began his long reign by an unjust but profitable war. The Hapsburg realms had just fallen to a woman, and, disregarding solemn treaties, Frederick took unscrupulous advantage of the supposed weakness of the Archduchess, Maria Theresa, to seize from Austria the rich province of Silesia. The heterogeneous Hapsburg realms seemed about to fall to pieces; and Spain, France, Savoy, and Bavaria hurried to join Prussia in dismembering the carcass. But England and Holland threw themselves into the struggle on the Austrian side, and the Treaty of Aix la Chapelle (1748) closed the War of the Austrian Succession without further territorial changes. Frederick kept Silesia, reaching far down into the heart of Germany, and Prussia stood forth as one of the great powers.

The significance of the contest, however, lay in its wide extension into India and America. Indeed, colonial war between England and Spain had already begun before Frederick appeared on the stage, and France must soon have joined Spain in any event. In the New Worlds, too, the Peace restored the former boundaries; but the war marks a clear consciousness in England and France that the two were rivals for vast realms outside Europe. The family interests of monarchs as a cause for war were giving place to the commercial interests of English and Dutch merchants as opposed to those of French and Spanish merchants, while back of these selfish motives lay the mighty question, big with consequence to the world, whether French or English political ideas should hold the New World.

In 1756, Austria fortified herself by alliance with Russia, Sweden, and even her old enemy France, and prepared to destroy Prussia. Frederick's supreme military genius saved his country for the moment, and the next year England came to his aid. During the brief interval between the European wars, England and France had practically remained at war in America; and now that France had joined Austria, England was constrained to support Prussia. In all the period from 1689 to 1815, no matter what the origin of the wars, England and France soon became the chief factors; and though they were at one time or another on every side of every question, they were never on the same side at the same time.

This Seven Years' War (1756–1763), or Great French War, as it is commonly known in

America, was literally a world-wide struggle. Red men fought by the Great Lakes of North America, and black men fought in Senegal, while Englishmen and Frenchmen grappled in India as well as in Germany, and their fleets engaged on every sea. The showy battles took place in Germany, and on the whole the European conflict determined the wider results. Pitt, with vision fixed upon a coming British empire, declared that in Germany he would conquer America from France. This he did. England furnished the funds, and her navy swept the seas. Frederick, supported by British subsidies, furnished the generalship and most of the troops for the German battlefields. The striking figures in the struggle are (1) Pitt, the English imperialist and the directing genius of the war; (2) Frederick, the military genius, who won Pitt's victories in Europe; (3) Wolfe, who won French America from the great Montcalm; and (4) Clive, the East India Company's clerk, who laid the basis for England's supremacy in India.

Changes in the World-Map; the American Revolution.— The Treaty of Paris (1763) left Europe without change; but in India France lost all except a few unfortified trading posts, while in America England received Florida from Spain, and Canada and the eastern half of the Mississippi valley from France. France ceded to Spain the western half of the Mississippi valley, in compensation for the losses Spain had incurred as her ally; and, except for her West India islands, she ceased to be an American power. Spain still held South America and half North America; but her huge bulk was decaying day by day. Holland, too, with widespread empire, was plainly in decline. England, having dispossessed France in both Asia and America, stood forth as the leading world-power.

The American Revolution, a few years later, did not lessen this pre-eminence; but it had other results of supreme significance. The war came because the American colonies had really become a nation, and because the English government unwisely insisted upon managing American affairs after the Americans were quite able to take care of themselves. English interference in economic matters had long been irksome, and the danger of interference in ecclesiastical matters was feared. England had just relieved the colonies from fear of French conquest. External bonds were gone, and internal ties were dissolving. Then George III. and his ministers supplied the necessary jar to effect separation by trying to raise revenue in America by Acts of Parliament. Astute patriots rallied the majority of the Americans by an old English shibboleth; and after a bitter eight-years conflict (1775–83), the thirteen English colonies became the first free American nation.

The Revolution "split the English race and doubled its influence." It paved the way for a more enlightened economic science, since, contrary to all expectations, the trade of free America from the first proved more valuable to England than that of colonial America had been. It reacted upon England, so that, when the great wars were over, both that country and its remaining colonies made new advances in political liberty. It set up the standard of independence for the states of Spanish America in both continents. But its supreme importance lay in the birth into the family of nations of the United States itself, though the full significance of the new nation hardly began to impress Europe for more than two generations.

England's European enemies had seized the opportunity to attack her in a war of revenge. England came out of the contest with glory little tarnished. She had been fighting, not America alone, but France, Spain, and Holland, as well; and though she had lost the best part of her old American empire she was not without compensating gains. She seized Dutch colonies at will; she strengthened her grasp upon India; she won back the undisputed sovereignty of the ocean by shattering the navy of France; she rebuffed all assailants from the rock of Gibraltar, the key to the Mediterranean; and in some measure she made good even her American loss by the acquisition of Australia just afterward.

The Partitions of Poland.— To return to continental Europe in the closing half of the Age of Frederick the Great:— one more territorial change calls for attention. Poland had fallen into anarchy under its elective, figurehead king and its oligarchic nobles. This anarchy gave the neighboring powers excuse for plunder. Catherine II. determined to seize a large part of the country. Frederick II. persuaded his old enemy, Austria, to join him in compelling Russia to share her booty. The First Partition of Poland (1772) pared off a deep rind. The Second and Third Partitions, which "assassinated the kingdom," had not even the pretext of misgovernment in Poland, for the Poles had earnestly taken up the work of reform. These final divisions took place in 1793 and 1795, after the death of Frederick, amid the wars of the French Revolution. Prussia gained large extent of territory, with valuable sea coast; and, most important of all, the additions brought the principal Prussian provinces,— formerly scattered,— into a compact body. But Russia gained far the greatest part of the territory, and she now bordered Germany on the east, as France had come to do earlier on the west, after the destruction of the Burgundy of Charles the Bold. The wise policy of the Germans, early and late, would have been to support the buffer states against the greed of Russia and France. Failure to do so has left Germany exposed ever since to direct attack by powerful enemies, and has compelled her to build up artificial frontiers of fortresses and bayonets, and to accept an undue militant character for all her civilization.

The Beneficent Despots of the Eighteenth Century.— In foreign relations, the Age of Frederick the Great saw little improvement over that of Louis. In the government within the several states, however, there was a beneficent and significant change. Frederick of Prussia, Catherine of Russia, Charles III. of Spain, Leopold of Tuscany, Ferdinand of Naples, Joseph II. of Austria, all belonged to a new class of "crowned philosophers" and "benevolent despots" who sat upon the thrones of Europe in the latter half of the eighteenth century. In Sweden and Portugal, also, great ministers sought to impose a liberal policy upon the monarchs, as

Turgot succeeded in doing for a while, even in France. A remarkable school of French writers,— Diderot, Voltaire, Rousseau,— had created a new, enlightened sentiment in the ruling classes, and a new sense of responsibility. Government was no more *by* the people than before, but despots did try to govern *for* the people, not for themselves. Sovereigns spoke of themselves no longer as privileged proprietors, but, in Frederick's phrase, as "the first servants of their states." All these rulers planned far reaching reforms,— the amelioration or abolition of serfdom, the correction of abuses in the church, the building up of popular education. In Prussia, for a time, much was accomplished. The condition of the peasantry was improved; the administration was rendered economical and efficient; and wealth and comfort began to increase by bounds. But these happy results were secured only by the tireless energy of one of the world's greatest geniuses. On the whole the liberal monarchs made lamentable failures. One man could not lift the weight of a nation. It remained to see what the people could do for themselves. The age of enlightened despots was the prelude to the French Revolution.

The Age of Nation States.— *The French Revolution, 1789–99.*—In the latter part of the Middle Ages, Italy had given the world an intellectual revolution; Germany began Modern History with a religious revolution; and France now introduced the last great division of the Modern period by a political and social revolution. Pre-eminently among political revolutions, the French Revolution deserves the name. The English Revolution of 1688 swept away temporary interference with ancient principles of English politics; the American Revolution made the Americans politically independent, but did not directly change the character of their society; the French Revolution cut loose from the past, and started France, with all the world, upon new lines of growth.

But if it destroyed the old, it also built the new. The work of destruction was needlessly horrible and bloody; but as a whole the Revolution was a vast and fruitful reform. The really significant thing is not the temporary mob-rule and bloodshed; the significant thing is the great national awakening which swept away an absurd society, founded on ancient violence and warped by time, to replace it with a simpler social system, based more nearly on equal rights.

The chief institutions of France were: (1) a monarchy, centralized, despotic, and irresponsible; but in weak hands, incumbered by complex survivals of ancient local institutions, and hampered by its respect for the good opinion of the privileged classes; (2) an aristocracy, wealthy, privileged, corrupt, skeptical; and (3) an established church, wealthy and often corrupt. Below these spread the masses, a necessary but ugly substructure. Over the continent, similar conditions held sway. In France the nobles had fewer duties, the peasantry had more completely risen out of serfdom, and more of a middle class had grown up, than in the other large countries of the continent. Feudal society was more decayed, and industrial society more advanced. The great European revolution broke through at the weakest spot.

The fundamental cause of the Revolution was the unjust privileges of the favored classes and the crushing burdens of the masses. The evil was no greater than for centuries, but the consciousness of it was greater. The masses began to demand reform; and the privileged classes had begun to distrust their rights.

The Revolution is usually dated from the meeting of the States-General in 1789. The king had summoned that body, hoping to induce the privileged orders to give up their exemptions from taxation, and so relieve the bankrupt treasury. The Third Estate, representing the middle class, and the liberal nobles and clergy had assembled with the determination to secure far-reaching reforms and to establish a "constitution." A sharp contest, with a brief period of anarchy, left power in the hands of these liberal elements, where, despite some attempts at counter-revolution and some danger of mob predominance, it remained for two years. The Constitution fashioned during this period provided for a weak kingship and abolished nobility and all special privileges before the law; but it carefully entrenched middle-class supremacy against democracy by graded property qualifications and a complex system of indirect elections.

Further changes were inevitable; but, if France had been left to herself, they might have come about as quietly as these first ones. Instead, foreign war gave the movement a new character. War was inevitable. Emigrant nobles gathered their forces on the Rhine under the protection of German princes. The Emperor, Leopold, brother-in-law of Louis of France, called upon the sovereigns of Europe to recognize the cause of Louis as "the cause of kings," and demanded from France such changes in her government as should protect Europe against the spread of revolution. This presumptuous dictation in their internal affairs roused a tempest of righteous wrath in the French nation; and in 1792 war began between "the cause of kings" and "the cause of peoples." For twenty-three years Europe was engaged in strife, upon a greater scale than ever before in history.

France was girdled with foes. The Empire, Prussia, and Sardinia, were at once in arms. Naples and Spain joined the coalition. Sweden and Russia both offered to do so, if needed. Ere long England and Holland were added to the enemies who expected to partition France. Vast armies invaded France; and the French forces were demoralized by treachery of officers and by fear of royalist plots. If France was to be saved, it could not be done by half-measures, nor with a king in secret alliance with the enemy. Control fell to extremists; and, while the mighty Danton roused and organized the national energies, the frenzied mob, unhindered, answered the victories and boastings of the invaders by the attack on the Tuileries and the Massacres. In September, the Convention established the French Republic with extreme democratic features and with manhood suffrage. Then revolution within revolution transferred power to more and more radical factions. The defeated Girondists raised the provinces against the capital; and for a time Paris and a score of central departments faced the remaining three fourths of France and

united Europe. Out of this crisis, in 1703, grew the great Committee of Public Safety, which ruled France for a year with despotic power. The Revolution now became constructive, and never has the French genius for organization shown itself more triumphantly. The Committee deliberately adopted a policy of "Terror" to crush plots and dissension and to secure united action. Revolt was stamped out. A million soldiers were sent to the front. The invaders were rolled back in rout, and the ragged but devoted French armies swarmed victoriously across all the frontiers, to sow civil liberty over Europe with fire and sword. France was not again in serious danger from foreign foes until the fall of Napoleon, twenty years later.

Meantime, while the grim, crime-stained men of the Committee in war and tumult were organizing order within and victory abroad, the Convention was laying anew the foundations of French society and advancing the progress of the human race. It adopted the projects of Cambarcères for the codification of French law, and the plans of Condorcet for a system of national education; it accepted Argobast's metric system of weights and measures; it abolished slavery in the French colonies, created provision for the public debt, instituted the first Normal School, the Polytechnic School, the Conservatory, the Institute of France, the National Library, and began the improvement of prisons and hospitals, and the reform of youthful criminals. Meantime the peasants had become free landholders, and the whole laboring class was rising rapidly in standard of living.

In 1794 the Jacobins split into factions, and these turned the "Terror" upon one another. The following year a conservative reaction gave the Republic a new constitution, which restored property qualifications and indirect voting. But the new plural executive (the Directory) proved incompetent and corrupt, and kept itself in power only by a series of *coups d' état*. It was assailed by conspiracy, radical and royalist; and France breathed more easily, when, in 1799, Bonaparte overthrew it with his troops and set up a firm military despotism, veiled by plebiscites.

Napoleonic Period, 1800–15.—For fifteen years, as First Consul (1800), Consul for Life (1802), and Emperor of the French (1804–14), Napoleon was sole master of France. He preserved the principle of civil equality and all the economic gains of the Revolution, but political liberty for a time was lost. True, his rule was a denial of the old doctrine of Divine Right: each new usurpation received the sanction of a popular vote, and he boasted that he was chief by will of the people. But every form of constitutional opposition was crushed or muzzled. The legislative chambers existed only to speak when and as he chose; free speech, free press, and all security for personal liberty were suppressed by a system of spies and secret police and by arbitrary imprisonment of suspects; local administration was centralized more highly than even under the old monarchy, "nor did there exist anywhere independent of him authority to light or repair the streets of the meanest village in France."

This all-pervading absolutism was directed by the penetrating intelligence and indomitable energy of the world's most "terrible worker"; and it conferred upon France great and rapid benefits. Order, precision, symmetry were introduced into every branch of the administration. The interrupted work of the Convention was resumed. Education was organized; law was simplified and codified; the church was again brought into alliance with the state; industry was fostered, and magnificent public works were carried out. But in all this, Napoleon was merely the last and greatest of the beneficent despots. And in the outcome, his rule fixed more firmly than before in the mind of the nation the dangerous willingness to depend upon an all-directing central power; so that in our own day, after many revolutions, the supremely difficult task of the Third Republic has been to create the spirit of local self-government.

No doubt, in 1800, when Napoleon came into power, he sincerely desired peace, in order to reconstruct France. By the brilliant victories of Marengo and Hohenlinden he dissolved the hostile coalition, and a series of treaties, closing with the Treaty of Amiens (1802), gave Europe a breathing spell. But soon Napoleon again desired war. His victories in Italy, as a general of the Directory, had first brought him to the world's notice, and only military glory could keep France from murmuring at his rule. Moreover, he aspired frankly to European empire. On the other hand, the nations felt that there could be no lasting peace with him except by complete submission to his will. In 1803, England and France renewed their strife, and between these powers there was to be no more truce until Napoleon's fall, eleven years later. In that time Napoleon fought also three wars with Austria, two with Prussia, two with Russia, a long war with Spain, and various minor conflicts. From 1792 to 1802, the unceasing European wars belong to the Revolutionary movement. From 1803 to 1815, they are properly Napoleonic wars, due primarily to the ambition of a great military genius. In the first series, Austria was the chief opponent of the Revolution; in the second series, England was the relentless foe of Napoleon.

Napoleon's insight readily divined his true enemy; but Nelson's great sea fight put an end to all possibility of directly invading England. On the continent, however, victory followed victory. After Austerlitz (1805), Austria gave up her remaining Italian and Illyrian territory, and many of her possessions in Germany. After Jena (1807), humiliated Prussia was reduced half in size, thrust beyond the Elbe, and bound to France by a shameful treaty. Less decisive conflict with Russia was followed by the diplomatic victory of Tilsit (1807). Emperor and Tsar entered into friendly alliance. France was to have a free hand in Western Europe; Russia was to be permitted to aggrandize herself at the expense of Sweden, Turkey, and Asia; and the two were to join in ruining England by enforcing Napoleon's "continental system."

The refusal of Portugal to obey Napoleon's command for the confiscation of English commerce led to the seizure of that state. Then followed a like seizure of Spain, out of which grew the long Peninsular War, which, as Napoleon confessed afterward at St. Helena, was

really the canker that destroyed him. At the time, however, it seemed trivial, and for five years after Tilsit Napoleon was master of the continent. At its greatest extent the huge bulk of France filled the space from the ocean to the Rhine, including not only France as we know it, but also Belgium, half of Switzerland, and large strips of Germany, while from this central body two outward-curving arms reached toward the east, one along the North Sea to the Danish peninsula, and the other down the coast of Italy past Rome. The rest of Italy and half the rest of Germany were under Napoleon's protection, ruled as vassal states by his brothers and generals. Denmark and Switzerland were his willing allies, and Prussia and Austria were unwilling ones. Sweden and Russia, though nominally his equals, were allowed that dignity only because they upheld his policy. Only the extremities of the continent,— the islands of Sicily, Sardinia, and England, and the mountainous Spanish peninsula,— kept their independence, at the cost of wasting war.

The period was filled with important rearrangements for Europe, territorial, political, and social. Many of these were designed in selfishness; but nearly all were to bear good fruit. In particular, the Germany and Italy of to-day were made possible by Napoleon's fearless clearing away of old institutions, and by the vigorous impulse he gave to the new forces of political unity and social reform.

In Germany, even the territorial rearrangements paved the way for later national unity. Not only the twelve hundred anarchic territories of the "knights," but also the three hundred petty, scattered, despotic principalities, ecclesiastical states, and oligarchic city-republics (with a few exceptions) were absorbed in larger neighbors; so that the multitudinous, ill-governed states of the vanished "Empire" were consolidated into less than forty. Most of these reorganized states, outside Austria and Prussia, were further combined in the Confederation of the Rhine; and in this Confederation, as well as in the German and Italian territory annexed to France, and in the various vassal states over Europe, serfdom and feudalism were abolished and civil equality and the Code Napoleon were introduced. The administration of justice was made cheap and simple, and the old clumsy and corrupt methods of government gave way to order and efficiency.

Most important of all, similar reforms were adopted in Prussia, not from French pressure, but by the influence of the Prussian minister, Stein, who sought to make his country strong enough to throw off the French yoke and to regenerate Germany. Napoleon's insolence had at last forced part of Germany into a new national patriotism; and that patriotism began to arm itself by borrowing weapons from the arsenal of the Revolution.

Napoleon's "continental system," if embarrassing to England, was ruinous to Europe. Moreover, Tsar Alexander began to suspect Napoleon of intriguing against him in Finland and Turkey; and in 1811 he refused longer to follow Napoleon's commercial policy. Napoleon declared war. The destruction of his Grand Army amid Russian snows was the signal for the rising of the peoples of Central Europe in the Wars of Liberation. Napoleon, like a desperate gamester, refused all terms, and finally was crushed and deposed. The Bourbon dynasty was restored to the throne of France, and the powers met in the Congress of Vienna (1814–15) to reconstruct the map of Europe.

The Congress of Vienna.— In its desires, that Congress stood for reaction. Says Fyffe, "It complacently set to work to turn back the hands of time to the historic hour at which they stood when the Bastille fell." It ignored peoples, and considered only princes. Its work, therefore, had to be slowly undone through the next half-century.

Still, its power for restoration was less than its wish; and even its most selfish work contained seeds of progress. Nobody thought of restoring the old ecclesiastical princes, nor of undoing the consolidation of Germany. That country was left in thirty-eight states, and Italy in twelve. Austria, which had lost territory in Central Europe, received its compensation in Italy, so that its despotic energies were more than ever drawn away into Italian and Danubian questions. Renovated Prussia, in return for Slav lands, which it ceded for the Tsar's new Kingdom of Poland, received German territory,— half of Saxony, the Pomeranian sea coast, and German provinces on the Rhine taken from France. Thus, reaching down into the heart of Germany, and with distant isolated districts to defend on the Rhine and on the Niemen, Prussia stood forth the natural champion of Germany against Slav and Gaul. In like manner, Sardinia's gain of Genoa was one more step in the consolidation of Italy. In return for the vast national debt incurred in supporting coalitions against Napoleon, England added still further to her colonial supremacy by holding South Africa, Cyprus, Malta, and other important stations. Despite its brief welcome to Napoleon at his return from Elba, France was wisely left with the boundaries she had when the Revolutionary wars began. The most serious disappointment to the liberals was the failure to secure a national union in Germany. Reactionary Austria secured instead the Germanic Confederacy — a loose league under Austrian presidency, with a Diet which was merely a meeting of ambassadors,— "a polite and ceremonious means of doing nothing."

It was worth much to Europe merely to recognize that it had common interests which could be arranged by a peaceful congress. Even this gathering of despots was an advance from eighteenth century politics toward a better international organization. Some of its work, moreover, was distinctly progressive, such as the declaration against the African Slave Trade, the opening to commerce of the rivers flowing between or through different countries, and especially the neutralization of Switzerland under the protection of the powers.

From 1815 to the Revolutions of 1820.— For more than thirty years after the Congress of Vienna, reaction held sway. The restored princes, who "had learned nothing and forgotten nothing," strove to ignore the progress from 1789 to 1815. In Sardinia, serfdom was restored; in Spain and the Papal States, the Inquisition and other mediæval institutions; in some places, even street lamps were abolished along with other hateful French reforms. Five states,— Russia, Austria, Prussia, England, and

France,— determined the policy of Europe. The first three were divine-right despotisms; and though the Tsar and the King of Prussia played for a time at liberalism, the first disorders enabled Austria to draw them over to her own frankly reactionary program. At first, France and England were not much better than these Eastern powers. Louis XVIII. had found it necessary to give France a charter; but in that document itself the theory of divine right was preserved, until the revolutionary changes of 1830. That theory could have no place in England; but even there the government was for many years in the hands of an extreme Tory party. The evil genius of the whole period was the subtle Austrian statesman, Metternich, with his motto, "Government is no more a matter for debate than religion is." The one good thing to be said for Metternich's long supremacy is that he permitted no great war; and this was because he felt it necessary to hold the powers in friendly alliance, so as better to arrest progress within the lines drawn at the Congress of Vienna.

However, beneath the tide of reaction, the principles of the Revolution survived. The two positive forces in politics for the 19th century were to be democracy and nationality. The league of princes compelled them to work underground; but before the middle of the century they emerged in three series of revolutions — in 1820, 1830, and 1848.

The revolutions of 1820 started in Spain, to re-establish the Constitution of 1812, which had been adopted first during the war for Independence. Completely successful there for the time, the movement spread swiftly over the southern peninsulas — to Portugal and to the states of North and South Italy, while it stimulated the Greek rising against the Turks. Metternich found a weapon of repression ready. After Waterloo the four great allies, Russia, Prussia, Austria, and England, had agreed to preserve their union against revolutionary France by holding occasional congresses. Metternich now summoned these powers to the Congress of Troppau. Here the despotic masters of Russia, Austria, and Prussia signed an agreement to unite in putting down revolution against any established government. England protested and withdrew from the alliance; but her place was taken by France, and the united despots, popularly known as the "Holy Alliance," proceeded to carry out the Troppau programme. With overwhelming armies they crushed constitutionalism in Naples and Piedmont, and a little later, in Spain. England's fleet preserved the little sea-coast country of Portugal from attack; and the Tsar's sympathy for his Greek coreligionists held Metternich from aiding Turkey. Portugal and Greece were the only European lands to reap good from the widespread risings of this period.

American Progress.— Greater gain there was, however, outside Europe. The "Holy Alliance," successful in Spain, wished to restore monarchic control over revolted Spanish America. Here they failed. When Napoleon seized Spain (1808), the Spanish colonies, nominally loyal to the old Spanish dynasty, began to taste the sweets of economic and political freedom. They were powerfully influenced, too, by the success of the United States; and soon they began, one after another, to avow independence not only of Napoleon, but also of the mother country. The United States had recognized their independence. England had not done this; but now she interposed her sea-power to shield them against the proposed attack by the "Holy Alliance." England, indeed, urged the United States to join in a formal alliance to protect Spanish America. The United States chose to act separately, but it did act along the same line: in 1823 President Monroe's message announced that this country would oppose any attempt of the despotic powers to extend their political system to America. Thus was born a group of new nations. For more than fifty years, it is true, the best of the new states manifested anarchic tendencies; but before the close of the nineteenth century some of them began to make steady and promising progress in government and society. Their constitutions have been modeled generally upon that of the United States.

Before returning to Europe, brief attention should be given to the progress of the United States itself in the generation following the French Revolution. The Constitution of 1787 saved the thirteen States of that time from falling apart into jangling, insignificant units, and gave the world an advanced type of federal government. The Louisiana Purchase (1803) doubled the territory of the country and confirmed its destiny as the home of a mighty continental nation. During the closing Napoleonic struggles, the contemptuous disregard of England for the rights of neutrals, together with the treacheries of Napoleon, involved America in war with England; but, beyond this, except for the enunciation of the Monroe Doctrine, the United States, busied with its marvelous growth at home, had kept free from foreign complications. At the moment of the European revolutions of 1820, the great American Republic was entering on the forty years of anti-slavery debate which preceded the Civil War.

Revolutions of 1830.—The year 1830 is one of the notable dates in the 19th century. In America the victory of Jackson had just marked a fresh advance in popular government. In England the First Reform Bill began its two-year struggle in Parliament. On the continent of Europe, revolution struck a new blow at the system of Metternich. This time the movement started in France, where the July Revolution replaced the divine-right Bourbon monarchy with the constitutional, bourgeois monarchy of the Orleanists. Explosions followed over Europe. The Belgians rose against their Dutch masters; the Poles against Russia; Italian risings seemed for a moment to have some chance in the papal states and the duchies; and, while Russia and Austria were busied in Poland and Italy, liberal gains were secured in several German states. But soon Metternich, his hands free once more, set himself patiently to restore the old order in Germany. France, it is true, was lost to the "Holy Alliance," and joined England in defending liberal Belgium against despotic intervention. But in the final result, France and Belgium were the only gainers from this period. It was to take the third great "year of revolutions," to sweep away Metternich's shattered system.

To appreciate in any measure the wonderful progress of the remaining two thirds of the 19th century, it is needful to grasp the conditions of the world of 1830, or, we may say, of 1837, when the Victorian era began. It was still a small, despotic world, far more remote from the great, progressive world of 1900 than from the world of 1600. Civilization held only two patches on the globe,— western Europe and eastern North America. In the latter, the real frontier of the United States reached less than one third the way across the continent, and politics and society were dominated by the slave power. Europe knew "Germany" only as a pious aspiration of revolutionaries, and "Italy" as a "geographical expression." Metternich stood guard over central Europe. On the east hung Russia, an inert mass, in the chains of her millions of serfs. Under the contemptible Orleans monarchy, France was taking breath between spasmodic revolutions. England herself had only begun to stir under the long oligarchic rule of her landlord class. The rest of the globe hardly counted; a fringe of Australia held a convict camp; eastern Canada was a group of jealous, petty provinces, learning to agitate in disorderly fashion for self-government; Spanish America, prostrate in anarchy, gave as yet little hope of the coming renaissance; Japan was to sleep a generation longer; while the two largest continents were undisturbed in their native barbarism, except for England's grasp upon the hem of India and South Africa.

England in the 19th Century.—In Europe, England was to lead the van of progress; and in England, almost alone in Europe, reform was to come without revolution. But the England of 1830 was still mediæval. During the great French wars from 1690 to 1815, except for the one development of ministerial government, England had retrograded politically and socially. Her society was marked by extreme inequalities between rich and poor, intensified by cruel class legislation; her government, superficially representative, had really fallen into the hands of a selfish landlord class; her boasted local self-government was intensely aristocratic: her established church was aristocratic and unspiritual. In the last half-century had come an industrial revolution — the growth of the factory system — with marvelous increase of population and growth of city life, calling imperatively for new adjustments; but the great Tory party met all calls for reform with sullen denunciation and repressive legislation which made free speech a crime.

Under the system of rotten and pocket boroughs, more than half the House of Commons were the appointees of less than 200 landlords, while most of the rest represented small fantastic constituencies. Thus, reform necessarily began with Parliament itself. This parliamentary reform was accomplished by three great measures: that of 1832 placed power in the hands of an intelligent middle class, the landed and mercantile interests; 35 years later, the Second Reform Bill (1867) gave power to the artisan class of the towns; and the bill of 1884 once more doubled the electorate and left England a democracy.

The Reform Bill of 1832 was followed at once by social reform, in response to the swelling tide of humanitarianism in literature and society. Legislation swept away negro slavery in the colonies, and the hideous white slavery of women and children in English factories and mines; reformed the barbarous and fantastic criminal code; abolished the worst abuses of the pauperizing poor-law; began the protection of workmen in factories against carelessness or wilful neglect of capitalists; gave women legal rights; adjusted taxation more equibly; swept away the corn laws and introduced the free-trade era; removed the press gang, and brought in the penny post; enlarged the self-government of the colonies; and established a wonderfully efficient system of democratic self-government in cities at home. Subsequent political reform, despite the Irish difficulties after 1870, added to the rate of social reform. In particular should be noticed the complex industrial legislation, and, for dependencies where the nature of the population forbids self-government, the adoption of efficient, unselfish colonial administration, in which England has set an example for all world powers. Even India and Egypt, with their tremendous difficulties, have been touched with new life; while the great provinces of the English-speaking colonies, Canada and Australia, have organized themselves into two mighty federal states (1867 and 1901). In the rural units of England, too, the local government bills of 1888 and 1894 established true democracy.

Revolutions of '48.—Meantime, on the Continent, the next great progress after 1830 came with the revolutions of '48. A general explosion had been preparing; but again the signal was given by France. The Orleans monarchy had become reactionary; and the socialistic February revolution set up the Second Republic. March saw Metternich himself a fugitive, escaping from Vienna in a laundry cart, while thrones were tottering everywhere between Russia and Turkey on one side and England on the other. Even England trembled with a Chartist movement and the threat of an Irish rebellion. The kings of Holland, Spain, Denmark, and Sweden made constitutional concessions. In Germany and Italy there were complex movements, working (1) for constitutional liberty and social reform within the several states; (2) for the union of the fragments of the German race into a nation; and (3) for the independence of Italians, Slavs, and Hungarians, held in subjection by Austria.

The third movement resulted in wars, out of which Austria finally emerged triumphant; and her victorious army was a ready tool to restore absolutism at home. In Germany the undisciplined Liberals had wasted opportunity, Austria dispersed the Frankfort National Assembly, and, after humiliating unready Prussia at Olmütz, restored the old confederation (1850). A year later (1851) the *coup d'état* of Louis Napoleon closed the revolution in France and prepared the way for the Second Empire of the next year.

But there had been great gains. Feudalism and serfdom were gone forever, even from Austria. Sardinia, Prussia, and the minor German states kept their new constitutions. Switzerland had become a true federal republic upon the American type. Sardinia, by her sacrifices, and Prussia, in spite of the past mistakes of her timid government, were clearly marked out as

the champions of Italy and Germany against Austria. Victor Emanuel of Sardinia recognized his mission to unite and free Italy; and Prussia, so recently shamed, had statesmen who would see that next time she should be ready.

Europe from 1850 to 1880.—The next 25 years (1850–75) saw not only the advance toward democracy in England, the victory of nationality and the abolition of slavery in the United States, the formation of the federal Canadian Dominion, on the American model, and the awakening of Japan under American constraint, but also a new federal German Empire, a united, constitutional Italy, a stable French republic, a constitutional Spain, and a constitutional, federal Austria-Hungary. The period was one of "blood and iron." Napoleon III., who had drawn England into the Crimean war (1854) to humiliate Russia, was himself drawn by the statesmanship of Cavour into the Austrian war of 1859 to help free Italy. Within a year after the resulting campaigns in Italy had closed, the American Civil War began; and before it ended, Bismarck had entered upon his trilogy of wars. In 1864 he robbed Denmark of the Schleswig-Holstein duchies, with the great harbor of Kiel for Prussia's projected navy, and so made trial of the new army he was at once to use (1866) in driving Austria out of Germany by the Six Weeks' War. The North German Confederation, then formed, was expanded into the German Empire by the Franco-Prussian war (1870–1), into which Bismarck next tricked French vanity and the despairing ambition of the decaying French government. These struggles completed also the unity of Italy. In 1866 Italy recovered Venetia from Austria, and in 1870, when France could no longer interfere, it at last marched its troops into its ancient capital, Rome. Even for conquered countries, during this period, did reform grow out of war. The Crimean catastrophe struck the chains from Russia's serfs; the shock of defeat in '59 and '66 woke Austria to constitutional progress; only when Germany shivered the sham of the Second Empire did France enter upon true republican life; and it was in the ashes of her old social system that our own South found regeneration.

Out of the Russian-Turkish war of 1877–8 a new group of Balkan nations was born, mainly Slav in blood, with at least the forms of constitutional government. But since 1871 political progress for the most part has been peaceful. The various monarchies of Europe, except Russia and Turkey, had already all adopted constitutions modeled upon the English government, though in none of them were the ministries so truly dependent upon popular will as in England. Indeed, in some states the formal constitutional monarchy really merges into a practical despotism. Progress in politics since 1871 has been of two kinds: (1) a growth in ministerial responsibility, and (2) rapid extension of the franchise toward a manhood basis. Actual administration, in most European countries, is still highly aristocratic; but in the matter of ultimate control democracy is generally triumphant, and it is training itself everywhere, by compulsory school systems, for the closer management of affairs.

International Relations Since 1880. Europe in Africa and Asia.—International relations since 1880 require brief statement. France longing to recover her lost provinces from Germany in a war of revenge, drew close to Russia. Bismarck offended Russia by supporting Austria in the Balkans. Italy was angered by the French seizure of Tunis in 1880. Thus new combinations of the powers appeared. In 1881, Germany, Austria, and Italy (all old enemies) leagued in the Triple Alliance; while a little later, France and Russia formally adopted a dual alliance. The Continent was thrown into two hostile camps, and has rested ever since under an armed peace. France became "the tail to the Russian kite." England, unwilling to join the Triple Alliance, as Bismarck wished, has been left in a position her statesmen have chosen to characterize as one of splendid isolation.

In the '90s, all these arrangements were threatened by the active appearance, in the field of international politics, of two non-European powers. The Chinese war of 1894 revealed Japan as a modern and powerful state; and the Spanish-American War (1898) made it apparent that the United States had abandoned its exclusively American policy. Moreover, since about 1880, European politics had been merging more completely than ever before in world politics. The questions at issue ceased to be Rhenish or Danubian, and became African and Asiatic. The 19th century, indeed, had been one of expansion of civilized powers, but that expansion had hardly been conscious of its own importance. The United States had quietly filled its borders from ocean to ocean with a homogeneous population. Russia had spread across northern Asia to the Pacific, and was reaching down in the Trans-Caspian region toward the Persian Gulf. And England had continued annexation of the keys to empire in waste spaces of the earth. These three were the world-powers. Far behind came France, with some important possessions in North Africa and some ancient claims in southeast Asia. Until 1884 Germany had no thought of colonial empire.

About 1880 a new, conscious greed for colonial territory seized Europe. Africa, some Pacific islands, and the helpless Asiatic empires of Persia, Turkey, Siam, and China were the only unappropriated lands. There followed a swift, peaceful division of Africa. In 1880, only patches here and there on the coast were European; in 1891, except for the native states of Abyssinia, Liberia, and Morocco, the continent was mapped out between European claimants. The three important African powers are England, France, and Germany, though Belgium, Spain, Portugal, and Italy are also represented. England is far in the lead. Her ambition has been to unite her two main possessions, in the Nile Valley and in South Africa, by acquiring intermediate territory; but the Congo Free State and German East Africa were thrust between too soon. France comes second in extent of territory; but, except for Algeria and Madagascar, her districts are less valuable than those of England or Germany. France would have liked to join her holdings on the east and west of the continent; but she found English territory thrust in between. German ambition was frustrated in similar manner. The three powers seem to have mutually stale-mated one another's attempts to dominate Africa.

The occupation of Asia by European states has proceeded more slowly, but has moved with increasing rapidity in recent years. England, Russia, Japan, and France are the chief powers concerned, though Germany has shown an active disposition to take a hand in any partition, and though the commercial interests of the United States make it certain that that country will be an important factor in any further changes.

In 1894, Japan and China engaged in war over the control of Korea. With amazing rapidity, Japan overcame her bulky antagonist; but Russia, backed by France and Germany, stepped in to rob her of the fruits of her victory. Japan, owning not even one modern ship of war, was forced to yield — to spend all energies for the next 10 years in preparing for further conflict. Russia secured from China the right to extend her Siberian railroad through Manchuria, and in 1898 she also obtained the powerful fortress of Port Arthur. Germany and England then compelled China to grant them important districts, which, like the Russian acquisitions, seemed to command the heart of China and to doom that power to partition. In 1900 the Chinese resentment against "western barbarians" culminated in the Boxer massacres. The powers sent armies to rescue their beleaguered embassies at Peking; but, largely through the policy of the United States, no territorial indemnities were demanded. During the campaign, however, Russia occupied Manchuria, and, despite repeated solemn promises, it soon became plain that she meant to keep it. The powers apparently acquiesced; but when Russia in 1903 encroached also upon Korea, Japan foresaw danger to her own independence, and, in 1904, she began war. The struggle has been tremendous, almost beyond parallel; but Japanese victory has been swift and overwhelming, and has changed the whole face of world politics. Russian aggression in the East has been checked for a long period. See MANCHURIA; PORTSMOUTH, TREATY OF.

Summary.—The three mighty agents in the 19th century transformation have been democracy in politics and industry, humane sentiment in morals, and scientific progress. The first of these has been the main theme of the latter part of this article. The gentler spirit of recent society, likewise touched upon, has abolished slavery, ameliorated law, and brought about organized, zealous, and intelligent effort to lessen misery and crime. But perhaps the most marvelous phase of the "Wonderful Century" is the scientific advance. Since the primitive inventions of making fire, of the bow, of domesticating animals, of smelting iron, and of the alphabet, all the inventions of man up to the year 1800 probably count for less than those since that year. In civilized lands, life has been lengthened over a fourth, and the population of the civilized world has trebled. This larger amount of life has been lifted to a higher level. Wealth is more abundant; and the laboring masses, though still getting too little of it, get far more than formerly. The area of civilized life has been wonderfully expanded, but steam and electricity bind the most scattered portions together more closely than adjacent villages were joined in the near past. And this new solidarity is not merely in material interests: it has its intellectual and moral side. There is a growing unity of sympathy and opinion.

The picture, of course, has its dark side. Crowded populations live and work under conditions of misery and disease and often of sin. Civilized nations show callous disregard for the rights of weaker or barbarous people. And over the civilized world itself there still broods the danger of annihilating war, more terrible because of the inventions of this scientific age.

Happily this survey may close with a chronicle of a great step toward removing this last danger. The Hague Conference of 1899, called in the interests of peace, did not find it possible to make any advance toward disarmament, but it did provide for a permanent international tribunal for arbitration between such nations as may choose to avail themselves of it. It is of supreme consequence that machinery is ready so that two nations at difference may escape war without loss of dignity, if they both desire. Even more significant and hopeful, however, is a long series of arbitration treaties between nations, two and two, beginning with the Anglo-French treaty of 1903. Despite the terrible Russo-Japanese war, the first years of the 20th century have seen remarkable progress toward the federation of the world.

Bibliography.—Within the space at command, no detailed bibliography is possible. Since the dawn of the scientific study of history, writers have shunned the attempt to cover the complex field of modern history except in co-operative "series." Of such series the most important in English are 'The Cambridge Modern History,' edited by Ward (1903, 12 vols., of which only 5 have appeared by 1905); and 'Periods of European History,' edited by Hassall (1890–2, 8 vols., of which the last 5 belong to our period). Andrews' 'Historical Development of Modern Europe' (1896), Fyffe's 'Modern Europe to 1878' (1884), and Seignobos' 'Europe Since 1814' (1899) deal with the 19th century. Cunningham's 'Western Civilization' (1900), and McVey's 'Modern Industrialism' (1904) treat special phases. For further references the reader may consult the special bibliographies at the close of the articles on leading countries and movements. West's 'Modern History' (a high-school manual, 1904) in an appendix gives a classified bibliography of 150 standard English works.

WILLIS MASON WEST,
Professor of History, University of Minnesota.

History of Algebra. See ALGEBRA, HISTORY OF THE ELEMENTS OF.

History of Arithmetic. See ARITHMETIC, HISTORY OF.

History of Geometry. See GEOMETRY, HISTORY OF THE ELEMENTS OF.

History of Philosophy. See PHILOSOPHY, HISTORY OF.

History of Trigonometry. See TRIGONOMETRY, HISTORY OF THE ELEMENTS OF.

Hitchcock, hĭch'kŏk, **Charles Henry,** American geologist: b. Amherst, Mass., 23 Aug. 1836. He was son of Edward Hitchcock,

geologist (q.v.). He was graduated from Amherst College in 1856, was assistant State geologist of Vermont in 1857–61, State geologist of Maine 1861–2, and of New Hampshire 1868–78. In 1868 he was appointed professor of geology in Dartmouth College. In connection with his survey of New Hampshire, he maintained, during the winter of 1870, a meteorological station on Mount Washington, the earliest high-mountain observatory in the United States. He became known as a compiler of geological maps, and for his investigations regarding the geology of the crystalline schists, ichnology, and glacial geology. The location of the terminal glacier in the United States was first suggested by him. He was a founder of the Geological Society of America, and in 1883 president of the American Association for the Advancement of Science. His publications include: 'Elementary Geology' (1861, with E. Hitchcock); 'Mt. Washington in Winter' (1871); and a 'Report on the Geology of New Hampshire' (1873–8), with folio atlas, his most valuable work.

Hitchcock, Edward, American Congregational clergyman and geologist: b. Deerfield, Mass., 24 May 1793; d. Amherst, Mass., 27 Feb. 1864. He was principal of the academy in his native place 1815–18; pastor of the Congregational Church in Conway, Mass., 1821–5; professor of chemistry and natural history in Amherst College 1825–45, and president of Amherst College and professor of natural theology and geology 1845–54. He was appointed State geologist of Massachusetts in 1830, of the First District of New York in 1836, and of Vermont in 1857. In 1850 he was commissioned by the government of his native State to examine the agricultural schools in Europe. His life was in a great measure identified with the history of Amherst College. Connected with it almost from the beginning, in his own presidency he procured for it buildings, apparatus, and funds to the amount of $100,000, doubled the number of students, and established it on a solid pecuniary as well as literary and scientific basis. His earliest scientific publications were the 'Geology of the Connecticut Valley' (1823), and a 'Catalogue of the Plants within Twenty Miles of Amherst' (1829). Later works were: 'Lectures on Diet, Regimen, and Employment' (1831); 'Lectures on the Peculiar Phenomena of the Four Seasons' (1850); 'Reports on the Geology of Massachusetts' (1833–35–38–41); 'Illustrations of Surface Geology' (1857); 'Elementary Geology,' which passed through 25 editions in America, and one third of that number in England; 'Religion of Geology and its Connected Sciences' (1851); and 'Reminiscences of Amherst College' (1863). Dr. Hitchcock suggested as well as executed the geological survey of Massachusetts, the first not only in the long series of scientific surveys in the United States, but the first survey of an entire State under the authority of government in the world. He was the first to give a scientific exposition of the fossil footprints of the Connecticut Valley, and with him ichnology as a science began.

Hitchcock, Ethan Allen, American soldier: b. Vergennes, Vt., 18 May 1798; d. Sparta, Ga., 5 Aug. 1870. He was a grandson of Ethan Allen (q.v.), and was graduated at West Point in 1817, entering the corps of artillery as a third lieutenant. In 1829 he became the military commandant of the corps of cadets, in which office he continued until 1833. He served in Florida against the Indians, and in the war with Mexico, where he received two brevets, one as colonel and another as brigadier-general. In 1855 he printed for private circulation a pamphlet in support of his opinion that genuine alchemy was not an art for making gold, but that the alchemists were students of man, whose perfection was symbolized by their "philosopher's stone." He subsequently published: 'Remarks upon Alchemy and the Alchemists' (1857); 'Swedenborg a Hermetic Philosopher' (1858); 'Notes on the Vita Nuova of Dante' (1866).

Hitchcock, Ethan Allen, American politician: b. Mobile, Ala., 19 Sept. 1835. He received a secondary education, was in mercantile business at St. Louis, Mo., in 1855–60, then went to China to enter a commission house, of which firm he became a partner in 1866. In 1872 he retired from business, in 1874 returned to the United States, and in 1874–97 was president of several manufacturing, mining, and railway companies. He was appointed envoy extraordinary and minister plenipotentiary to Russia in 1897, and in February 1898 ambassador extraordinary and minister plenipotentiary, the first ambassador accredited from the United States to the court of Russia. In 1898 he was nominated and confirmed as secretary of the interior, and 20 Feb. 1899 entered upon his duties.

Hitchcock, James Ripley Wellman, American art critic: b. Fitchburg, Mass., 3 July 1857. He was graduated at Harvard in 1877, and was art critic of the New York *Tribune* 1882–90. He has written: 'The Western Art Movement' (1885); 'A Study of George Inness' (1885); 'Madonnas by Old Masters' (1888), the text to photogravures; 'The Future of Etching'; 'Some American Painters in Water Colors'; 'Etching in America'; 'Notable Etchings by American Artists'; etc.

Hitchcock, Roswell Dwight, American Congregational clergyman: b. East Machias, Maine, 15 Aug. 1817; d. Somerset, Mass., 16 June 1887. Graduated from Amherst College in 1836 and from the Andover Theological Seminary in 1838, he also studied at Halle and Berlin (1847), in 1845–52 was pastor of the First Congregational Church at Exeter, N. H., and in 1852–5 professor of revealed religion in Bowdoin College. In 1855 he became professor of church history at the Union Theological Seminary, of which institution he was elected president in 1880. He became president of the Palestine Exploration Society in 1871, and vice-president of the American Geological Society in 1880. An editor of the 'American Theological Review'; he wrote: 'The Life, Character, and Writings of Edward Robinson' (1863); 'Complete Analysis of the Holy Bible' (1869); and 'Socialism' (1879). With Eddy and Madge, he compiled 'Carmina Sanctorum' (1885); and 'Eternal Atonement,' a volume of sermons, appeared in 1888.

Hittell, Theodore Henry, American historian: b. Marietta, Pa., 5 April 1830. In 1852

he was admitted to the bar at Cincinnati, in 1855 removed to California, in 1855–61 was connected with the *Bulletin and Times* of San Francisco and from 1862 practised law. He was State senator in 1880–2. He wrote a 'History of California,' his chief work; and compiled 'The General Laws of California,' known as 'Hittell's Digest,' and 'Hittell's Codes and Statutes of California.'

Hittites, hit'its, the name of several peoples mentioned in the Old Testament, and in Egyptian and Assyrian inscriptions. In the Old Testament the name is applied to three more or less distinct groups, namely, the "children of Heth" from whom Abraham purchased a burying-place; a people or group of peoples which inhabited Palestine before the Hebrews and resisted their invasion; a kingdom in northeastern Syria, with which Solomon formed marriage alliances. The first group dwelt around Hebron in southern Palestine, and the Hittites mentioned in connection with David, of whom the chief was Uriah, may be their descendants. The second group of Hittites dwelt among the mountains of central Palestine, and the third group, united in some sort of empire, had their seat still farther north. Of this Hittite empire we learn more from the Egyptian and Assyrian records than from the Old Testament. The Heta, according to the hieroglyphic inscriptions, offered a vigorous resistance in northern Syria to the Egyptian king Thutmosis III. (18th dyn.: c. 1560 B.C.), and to his successors of the 19th dynasty, Sethos I., Rameses II. and III., c. 1350–1200 B.C. Carchemish, Kadesh, and Hamath were among their chief cities. The cuneiform inscriptions contain notices of a people called Hatti who frequently fought with the Assyrians from the time of Tiglath-pilesar I. (c. 1100 B.C.) till that of Sargon II. (721–704 B.C.), after which they are no more heard of. The Hittite monuments and inscriptions which have been found in Carchemish, Hamath and neighboring places, as well as throughout Asia Minor, appear to belong to the Assyrian period.

Hittorf, Jacques Ignace, French architect: b. Cologne 1792; d. 1867. He studied his profession in Paris and was employed on many public buildings and places, doing work on the Bois de Boulogne, the Champs-Elysées and the Church of Saint Vincent de Paul. Among his publications may be mentioned 'Architecture Antique de la Sicile'; 'Architecture Moderne de la Sicile' and 'Architecture polychrome chey les Grees.'

Hitzig, Ferdinand, German theologian: b. Hauingen, Baden, 23 June 1807; d. Heidelberg, 22 Jan. 1875. He was educated at Heidelberg, Halle and Göttingen. He went to Zurich in 1833 as professor of theology, where he remained until 1861, when he returned to Heidelberg. He was quite a voluminous writer on the Old Testament, composing commentaries on the Minor Prophets (1838); Jeremiah (1841); Ezekiel (1847); Ecclesiastes (1847); Daniel (1850); Song of Solomon (1855). He made a translation of the Psalms in 1835.

Hive-bee. See HONEY-BEE; BEE-CULTURE.

Hives. See URTICARIA.

Hoactzin, hō-ăkt'zĭn or -ăk'zĭn, a singular South American bird (*Opisthocomus cristatus*) of the size of a pheasant. It is brown streaked with white, and the head has a movable crest. It is interesting principally from the extraordinary way in which the fledglings, as soon as they leave the nest (in a tree), scramble about the branches by aid of their wings used like hands, by reason of the fact that they have a temporary claw on both the index and pollex. The food of these birds is mainly leaves and fruit; and a strong musky odor is given off by the adults, so that in British Guiana they are called "stinking pheasants."

Hoadley, hōd'lĭ, **George,** American lawyer: b. New Haven, Conn., 31 July 1826; d. Watkins, N. Y., 27 Aug. 1902. He was graduated at Hudson College, Ohio, in 1844; studied law at Harvard, was admitted to the bar in 1847 and joined a law firm in Cincinnati of which Salmon P. Chase (q.v.) was the leading member. He was appointed judge of the superior court of Cincinnati in 1859, and re-elected in 1864. He took a leading part among the "Barnburners" (q.v.), was a War Democrat, and during the War joined the Republican party. He defeated Foraker in a contest for the governorship of Ohio in 1883, but failed of re-election in a struggle against the same candidate.

Hoadly, Benjamin, English Anglican prelate: b. Westerham, Kent, 14 Nov. 1676; d. Chelsea 17 April 1761. He was educated at Cambridge; took orders in 1700, and after being settled in London distinguished himself in controversy with Bishop Atterbury and others. A staunch Low-Churchman, he was appointed bishop of Bangor in 1715. A sermon preached before the king of 1717 gave rise to the "Bangorian Controversy" regarding the divine authority of the king and the church. He was translated to the see of Hereford in 1721, to Salisbury in 1723, and Winchester in 1734.

Hoang-ho. See HWANG OR HOANG-HO.

Hoar, Ebenezer Rockwood, American jurist: b. Concord, Mass., 21 Feb. 1816; d. there 31 Jan. 1895. He was the son of Samuel Hoar (q.v.), was graduated at Harvard (1835), and subsequently admitted to the bar. He rose to be judge of the court of common pleas (1849), judge of the State supreme court (1859), and attorney-general of the United States (1869), and was a member of the Joint High Commission that framed the Treaty of Washington (1873–5).

Hoar, George Frisbie, American statesman: b. Concord, Mass., 29 Aug. 1826; d. Worcester, Mass., 30 Sept. 1904. Senator Hoar's paternal and maternal inheritance was very remarkable. His grandfather was an officer in the Revolutionary army and his father, Samuel Hoar, was one of the ablest lawyers and statesmen of his time, a member of Congress from Massachusetts, and a man of great learning and force of character. Senator Hoar's mother was a daughter of Roger Sherman, a signer of the Declaration of Independence. He was graduated from Harvard in 1846, studied law there, and began his law practice in Worcester, Mass. The young man was early attracted to politics and identified himself with the Free Soil party, and his purpose in 1895 — so characteristic of his whole career — is thus stated by himself: "All of us Free Soilers were drawn into politics by a great issue. It

was to prevent slavery being extended into the new territory between the Mississippi and the Pacific. We were all ardent advocates of freedom. The party and the movement were new, and we were stirred by high ideals. Among the young men who went into the new movement at that time were my brother, Ebenezer Hoar, Erastus Hopkins, Anson Burlingame, Whittier, Lowell, Longfellow, and many others that became well known. There were no offices to gain. There was simply a cause to work for. In the campaign of 1850 the Free Soilers did not carry a single State, only a few Congressional districts.» He was a member of the Republican party from the first, and in 1852 was elected to the Massachusetts house of representatives; in 1857 to the State senate. In the intervals of service he practised law. In 1860 he was city solicitor. He presided over the Republican conventions in Massachusetts in 1871, 1877, 1882 and 1885; was a delegate to his party's national conventions in 1876, 1880 (the chairman in that year), 1884, 1888, 1892 and 1896. He served in the national House of Representatives for four successive Congresses, 1869–77, elected as a representative of the Worcester district; in 1877 he was elected to the Senate, and was re-elected in 1883, 1889, 1895, and 1901, serving his country continuously as a national legislator since 1869, having represented Massachusetts for a longer period in the national Congress than any other representative from that State. In 1876, he was one of the managers on behalf of the House in the Belknap impeachment trial, and was also a member of the Electoral Commission (q.v.), which decided the Hayes-Tilden contest for the Presidency, the other Republican members of that famous body being Senators George T. Edmunds, O. P. Morton and Frederick T. Frelinghuysen, and Representative James A. Garfield. In the Senate he was chairman of the judiciary committee, and of the committee on privileges and elections, and a member of other important committees. He was known as the old man eloquent of the Senate, having served in that body for 37 years and taken part in all the great questions that have been before the country during that time. He was a determined opponent of the retention of the Philippines, and independent enough to state his views fearlessly in the support of his own theory that the United States should leave the islands to the control of the Filipinos and prevent interference from foreign nations, but his honesty and sincerity were unquestioned and he always retained the confidence of his party and the respect of all. He was a thorough American and believed in the future of his country and placed its welfare above all personal considerations. «The lesson which I have learned in life, which has been impressed upon me daily and more deeply as I grow old,» he said in his autobiography, «is the lesson of Good Will and Good Hope. I believe that to-day is better than yesterday, and that to-morrow will be better than to-day. I believe that, in spite of many errors and wrongs, and even crimes, my countrymen of all classes desire what is good, and not what is evil.»

Senator Hoar was an idealist, and was not to be turned aside, even by his loyal love of party, from following his sincere convictions. He demanded justice for the negroes and the Indians, openly declared his sympathy for Cuban and Filipino, and as firmly opposed religious intolerance in Massachusetts because his actions were controlled by reasons which he considered were founded in righteousness and truth, and therefore not subject to change.

Senator Hoar was a man of considerable scholarship and took great delight in literary and historical studies. He was a member of several historical and scientific societies, and took much interest in their work. He was president of the American Historical Society, president of the American Antiquarian Society, regent of the Smithsonian Institution in 1880, and trustee of the Peabody Museum of Archæology. He received the degree of LL.D. from the College of William and Mary, Amherst, Yale and Harvard. In 1903 he published 'Autobiography of Seventy Years,' which first appeared in 'Scribner's Magazine' as a serial. The same year, in a speech in his home city of Worcester, Senator Hoar, as if in anticipation of his approaching dissolution, thus summed up the creed of his career:

«If my life has been worth anything, it has been because I have insisted, to the best of my ability, that these three things — love of God, love of country, and manhood — are the essential and fundamental things, and that race, color, and creed are unessential and accidental.»

Although 78 years of age, he was in good health until the death of his beloved wife in 1903; their devotion had led many to predict that neither would long survive the other. Senator Hoar was taken seriously ill in June 1904, but lingered until 30 September, when he died at Worcester, Mass.

His death was the occasion of a remarkable display of panegyric in the press of both Republican and Democratic parties. It possessed the peculiar quality of reconciliation, one party regretting what the other considered his noblest quality. The only flaws in his judgment, said the Republican press, were his disagreements with the party leaders on the Philippine and Panama issues; but to the Democratic press his noble loyalty to the right on these occasions was convincing proof of his lofty statesmanship. The Democratic press regretted his inability to see any good in their party, while to Republican journals this virtue redeemed his errors of judgment on the matters of party policy.

One journal said: «As long as the confidence and affection of all the people are given to such a man, it is foolish and false to assume that the old standards are departing and the old ideals becoming broken. The people still know a man when they see him. Still they respect and honor the statesman who loves the republic better than he does himself, who never falters in his service, to whose fingers gold does not cling, and whose never-forgotten ideal is the people's welfare. While they honor such qualities above all others, pure and able statesmen will continue to come to their service,» sentiments which were summarized in Ex-President Cleveland's statement that «Senator Hoar's ability, his high-mindedness, and his freedom from political trickery, furnish an example of a useful life which may well be imitated by all those entrusted by their countrymen with public duties.»

George Edwin Rines,
Editorial Staff 'Encyclopedia Americana.'

Hoar, Samuel, American lawyer and legislator: b. Lincoln, Mass., 1778; d. 1856. He was graduated at Harvard in 1802 and three years later entered upon a highly successful career as a lawyer. He served two terms as a State senator and was chosen by the Massachusetts legislature to challenge the constitutionality of certain laws in South Carolina relating to the imprisonment of free negroes. He was subsequently excluded from South Carolina courts by the State legislature.

Hoarhound. See HOREHOUND.

Ho'bart, Garret Augustus, American lawyer and politician: b. Long Branch, N. J., 1844; d. Paterson, N. J., 2 Nov. 1899. He was gradated at Rutgers College, New Jersey, in 1863, and admitted to the bar in 1866. At Paterson, where he made his home till his death, he enjoyed a successful law practice. He became successively city attorney, prosecuting attorney for Passaic County, a member of the State Assembly 1873–8, and of the State Senate 1879–85. During his several terms he was speaker of the Assembly and president of the Senate. In 1896 he was nominated at St. Louis for vice-president on the ticket with William McKinley, whose intimate friend he was, and was elected to that office.

Hobart, George Vere, American journalist, playwright, and author: b. Cape Breton, N. S., 16 Jan. 1867. He was educated in Nova Scotia, later coming to the United States as a telegraph operator for the United Press. He became editor of the Cumberland Sunday 'Scimitar,' later writing for the 'Herald,' *Evening News* and 'American' of Baltimore. Since then he has been writing for the Hearst newspapers the humorous sketches, 'John Henry' and 'Dinkelspiel.' He has written 'Many Moods and Many Meters' (1899), and 'Li'l Verses for Li'l Fellers' (1903), both poems; the 'Dinkelspiel' series (1900); the 'John Henry' books (1901–4), and the plays, 'After Office Hours,' 'Miss Print,' 'Hodge, Podge & Co.,' 'Sally in Our Alley,' etc.

Hobart, John Henry, American Protestant Episcopal bishop: b. Philadelphia 14 Sept. 1775; d. Auburn, N. Y., 10 Sept. 1830. He was educated at the College of Philadelphia (now the University of Pennsylvania), and the College of New Jersey (now Princeton), and after trying commercial life in his brother-in-law's counting house, went back to Princeton as a tutor for two years, and was ordained deacon in 1798 and priest in 1801. After brief periods of pastoral service in Pennsylvania, New Jersey, and Long Island, he became assistant in Trinity Parish, New York, where he remained until his elevation to the episcopate, combining with his other duties a prominent share in the legislative councils of the church, as deputy to the General Conventions of 1801 and 1804, and secretary to the House of Deputies in the latter year. In 1811 he was consecrated as bishop-coadjutor in the diocese of New York, and upon the death of Bishop Moore in 1816, succeeded him both in the full charge of the diocese and in the rectorship of Trinity Church. He also gave provisional episcopal care at different times to New Jersey and Connecticut. He was very active in promoting the establishment of the General Theological Seminary, and upon its location in New York became professor of pastoral theology. Hobart College also owed much to him, a debt recognized by the taking of his name, when, in 1852, the original title of Geneva College was changed to Hobart Free College. He wrote or edited a number of theological works, some of which, especially his 'Companion for the Festivals and Fasts' (1805), reached several editions. His 'Apology for Apostolic Order' (1802) is still used as a text-book.

Hobart, the capital of Tasmania, and up to 1881 called HOBART TOWN, is situated at the foot of Mount Wellington (4,166 feet high), on the Derwent River, 12 miles from its outlet in Storm Bay on the south coast. It has handsome public buildings, including government house, the government offices, parliament houses, Episcopal and Catholic cathedrals. There are important domestic manufactures, and in connection with its considerable shipping interests, a fine harbor with modern accommodations. Hobart is connected by rail with Launceston. Pop. (1903) 31,400.

Hobart College, a Protestant Episcopal institution, located at Geneva, N. Y. In 1825 it was chartered as Geneva College; but in 1852 the name was changed to Hobart Free College, and in 1860 to Hobart College. Bishop Hobart (q.v.) had aided the school by advice and by money. An endowment from Trinity Church, New York, had greatly assisted the institution. The college offers scholarships and prizes to worthy students, and the departments are all well sustained. The courses lead to the degrees of A.B., B.S., and Ph.B. There are about 44,000 volumes in the library. In 1904–5 the school had 17 professors and instructors and 105 students. The graduates number nearly 1,500. LANGDON C. STEWARDSON,
Registrar.

Hobart Pasha, AUGUSTUS CHARLES HOBART-HAMPDEN, third son of the Earl of Buckinghamshire, English sailor: b. Waltham-on-the-Wolds, Leicestershire, 1 April 1822; d. Milan, Italy, 19 June 1886. He entered the English navy as midshipman 1836 and retired as captain at the conclusion of the Crimean War in 1863. During the American Civil War he took the name of "CAPTAIN ROBERTS" and was given command of a blockade runner, an account of which is to be found in his 'Sketches of My Life' published posthumously. In 1867 he entered the Sultan's service, reorganized the Turkish navy, and fought the Russians on the Black Sea in the War of 1877–8. He was made Pasha (1869) and marshal of the Turkish Empire (1881).

Hobbema, Meindert, mīn'dĕrt hŏb'ĕ-mā, Dutch landscape painter: b. Amsterdam, 1638; d. there 7 Dec. 1709. He was considered, next to J. Ruysdaal, the best of the Dutch landscape-painters, and as a colorist reckoned even superior to Ruysdaal. The figures in his landscapes are painted mostly by Berchem, Van de Velde, Lingelbach, and J. Van Loo. His paintings consist chiefly of forest scenes, ruins, villages, etc. Some of the most celebrated works of this master are to be found in public or pri-

vate galleries in France, Germany and Holland. His greatest painting is 'A View in Holland,' with figures painted by Adrien van de Velde.

Hobbes, John Oliver. See CRAIGIE, PEARL MARY TERESA.

Hobbes, Thomas, English moral and political writer and philosopher: b. within the borough of Malmesbury, Wiltshire, 5 April 1588; d. Hardwicke, Derbyshire, 4 Dec. 1679. He was educated at Oxford, and resided several years in the Devonshire family as secretary to Lord Hardwicke. During this period Hobbes became acquainted with Lord Bacon (some of whose works he translated into Latin), Lord Herbert of Cherbury, and Ben Jonson. In 1642 first appeared his treatise 'De Cive.' His writings on mathematics are not important, yet he was employed to teach Prince Charles (afterwards Charles II.) the elements of mathematical philosophy. In 1650 was published a small treatise by Hobbes, entitled 'Human Nature'; and another, 'De Corpore Politico, or Elements of Law, Moral and Politick.' But the most remarkable of his works is his 'Leviathan, or the Matter, Form, and Power of a Commonwealth, ecclesiastical and civil' (1651). This greatly alarmed the ecclesiastics of those days, and drew on the author much literary hostility. In 1654 he published a 'Letter about Liberty and Necessity.' In 1658 appeared his 'Dissertation on Man,' which completed his philosophical system, a work containing some singular notions relative to the moral and intellectual faculties of the human species. After the Restoration Hobbes was favorably received by the king, who settled on him a pension of £100 a year out of his privy purse. In 1666 his 'Leviathan' was censured in Parliament, and a bill was introduced into the House of Commons to provide for the punishment of atheism and profaneness, which gave him great uneasiness. On this occasion, it is supposed, he composed his work, entitled a 'Historical Narration concerning Heresy and the Punishment thereof,' to show that he was not legally chargeable with heresy in writing and publishing his 'Leviathan.' His 'Decameron Physiologicum, or Ten Dialogues of Natural Philosophy,' was published in 1678; as was also a 'Dialogue between a Philosopher and a Student of the Common Law of England,' and in 1679 he consigned to the care of a bookseller his 'Behemoth, or a History of the Civil Wars from 1640 to 1660,' which did not appear till after his death. The first collected edition of his Latin works was published at Amsterdam in two vols. 4to, in 1668. His complete works, in Latin and English, were first published in the edition of Sir William Molesworth (1839–45).

Few authors have encountered more opposition than the philosopher of Malmesbury. Both with respect to religion and government he ascribes great weight to the will of the civil magistrate. And his sentiments on this point, together with his doctrine that a state of nature must be a state of perpetual hostility, in which brute force must supersede law and every other principle of action, have perhaps been most generally objected to. Yet his claim of obedience to existing authorities is qualified by the assertion that it is no longer due than while they can afford protection to the subject. He says expressly, '*Obligatio civium erga eum qui summam habet potestatem, tandem nec diutius permanere intelligitur, quam manet potentia cives protegendi.*' The philosophy of Hobbes, so depreciated among his contemporaries, was more or less adopted by Locke, Hartley, Hume, and Priestley.

Hob'ble-bush, a viburnum (*V. aluifolium*) of the southern interior of the United States, whose branches often stretch along the ground and root at the other end, tripping up the unwary; hence it has such other names as warfaring-tree, tanglefoot and devil's-shoestrings. See VIBURNUM.

Hobkirk's (hŏb'kĕrks) **Hill, Battle of,** in the Revolution, 25 April 1781. After Guilford Court-house (q.v.), Greene marched toward the British position at Camden under Rawdon, and encamped at Hobkirk's Hill, about 1½ miles north. He had 940 men in line, prudently encamping in order of battle; and some militia just arrived who took no part in the battle. His trains and artillery had not come up, and a renegade drummer boy informing Rawdon of this, the latter took 960 men, and making a detour to the right through the woods in front of Greene, drove in Greene's pickets with so sudden an onslaught that the Americans had barely time to form. Greene ordered the First Maryland to charge bayonets and William Washington to take the British in the rear with his cavalry, while Ford and Campbell executed flanking movements on Rawdon's wings. But Ford was killed, one of the First Maryland's captains was shot, the men fell into disorder, and Col. Gunby ordered the regiment to form on the rear companies instead of moving the latter forward; the retiring men were seized with a panic, the famous veterans broke, and though soon re-formed, the position was dangerous and Greene had to retreat. Gunby was court-martialed, but acquitted of anything but grave misjudgment. Greene's loss was 135, besides missing militia; Rawdon's 220 (his own figure) or 258 (Tarleton's).

Hoboken, hō'bō-kĕn, N. J., city in Hudson County; on the Hudson River. It is the terminus of the Delaware, L. & W. R.R. It is opposite New York city, north of and adjoining Jersey City, and has on the north and west the Palisades. Its area is about one square mile. It has electric railway connections with a number of the cities and towns of the State, and by direct ferries with the business district of New York. The principal streets run north and south, nearly parallel with the river. Its long waterfront gives it excellent shipping facilities; and here are located the docks of the ocean steamship lines; the North German Lloyd, the Thingvalla, the Netherlands-American, and the Hamburg-American. The land upon which Hoboken is located as well as much of that adjoining, once formed a part of the territory of New Netherlands. It was early known as Hobocan Hacking, which means "the land of the tobacco-pipe." The tobacco-pipes which were made by the Indians from the stone found in the vicinity gave rise to the name. In 1630 Michael Pauw, of Holland, purchased from the New Netherlands Company a tract of land a part of which is the site of the present city of Hoboken. The land around was soon cultivated and as New Amsterdam grew in numbers and importance, the gardens across the river became

more valuable. John Stevens (q.v.), in 1804, purchased the land upon which the city now stands, and began the town. At this time and for some years after the Elysian Fields of Hoboken were much used as pleasure grounds by New Yorkers. At first Hoboken was a part of the town of North Bergen, but on 28 March 1855 it was incorporated as a city. The disastrous fire at the wharves of the North German Lloyd Steamship Company, which occurred in 1900, destroyed considerable of the city property and three steamers. The estimated number of lives lost was 200. The chief manufactures of Hoboken are iron products, leather, silk, lead-pencils, caskets, wall-paper, beer, shipbuilding and repairing, and chemicals. It has extensive coal yards, and large lumber and brick yards. The drainage of the lowlands is now (1903) under consideration, and by this means a large tract of land will be reclaimed and the sanitary conditions of the city improved. The city is the seat of the Stevens Institute of Technology (q.v.), and of the Sacred Heart Academy. It has Saint Mary's hospital, public and parish schools, and several fine church buildings. The government is vested in a mayor, who holds office two years, and a city council. The mayor appoints the school, library, fire, and health commissioners, also the assessors. The police commissioners are appointed by the mayor and approved by the council. The council elects the inspectors, the city clerk and his assistants. Pop. (1890) 43,648; (1900) 59,364; (1905) about 65,000.

Hob'son, John Atkinson, English social economist: b. Derby, England, 6 July 1858. He was graduated at Oxford University, and from 1887 to 1897 taught English literature and economics for the University Extension Delegacy, and the London Society for the Extension of University teaching. He is one of the foremost of economic writers in England and, as a socialist, advocates the monopolistic control of industries by government, whether municipal, or national. Among his works are 'The Physiology of Industry: Being an Exposure of Certain Fallacies in Existing Theories of Economics' (with A. F. Mummery, 1889); 'The Evolution of Modern Capitalism' (1894); 'The Social Problem: Life and Work' (1901); and 'Imperialism' (1902).

Hobson, Richmond Pearson, American naval constructor: b. Greensboro, Ala., 17 Aug. 1870. He was graduated at Annapolis Naval Academy in 1889 and took a post-graduate course at the Ecole Nationale Supérieure des Mines, and the Ecole d'Application du Gènie Maritime in Paris. During the war with Spain he was present at the bombardment of Matanzas and distinguished himself by his heroism in sinking a collier across the entrance to Santiago Harbor, on the night of 3 July 1898, for the purpose of preventing the exit of Cervera's fleet. He resigned from the navy in 1903.

Hobson's Choice, a proverbial expression, denoting "without an alternative." It is said to have had its origin in the practice of Hobson, a carrier at Cambridge, England, in Milton's time, who let horses to the students, and obliged his customers to take the horses in rotation, that they might be worked equally. Milton wrote two epitaphs upon him.

Hoche, Lazare, lä-zär ōsh, French soldier: b. Montreuil 25 June 1768; d. Wetzler 19 Sept. 1797. He took service in the French guards when 16 years old, and at the revolution joined the popular party. He greatly distinguished himself at the siege of Thionville and the defence of Dunkirk, and shortly afterwards, when scarcely 25 years of age, received the command of the army on the Moselle. In 1793 he drove the Austrians out of Alsace, and soon after was arrested by the Jacobins and imprisoned at Paris. In 1794 he was released, and appointed commander of the army destined to quell the rising in the west, and afterwards to that in La Vendée. In 1796 he conceived the plan of attacking Britain, and making a descent on Ireland, but expired suddenly while in camp with his army of invasion.

Hockey, a game of ball known as hurley in Ireland and shinty in Scotland, dating in its present form from about 1883, when a definite code of rules was drawn up by the Wimbledon Club. According to standard rules the game is played between two teams of 11 players each, on a ground 100 yards long by 50 to 60 yards wide. A goal is erected at each end of the field, and consists of two uprights 12 feet apart supporting a horizontal bar 7 feet from the ground. In front of each goal a line 12 feet long is drawn parallel to the goal-line and 15 yards from it; and from each end of this line, with the corresponding goal-post as centre, a segment of a circle is drawn outwards to meet the goal-line. Thus, a kind of semicircle flattened at the top is drawn in front of each goal, and no goal is scored unless the ball is hit from within this line or striking-circle. The ball used is an ordinary cricket ball painted white; and each player is provided with a stick, curved at the end, without any metal fittings, and not too thick to be passed through a ring two inches in diameter. The players are arranged on the field as in Association football, namely, goal-keeper, two backs, three half-backs, five forwards. The game is started by one player of each side bullying the ball in the centre of the ground, that is, by first striking the ground with his stick and then striking his opponent's stick three times, after which either may strike the ball. When the ball is driven between the goal-posts under the bar by a stroke from within the striking-circle, a goal is scored, and the game is won by the side with a majority of goals scored. The ball may be caught or stopped with any port of the body, but it must not be carried, kicked, or knocked on except with the stick; it must be played from right to left only. The goal-keeper is allowed to kick the ball away in defending his goal. Ends are changed at half-time.

Hock'ing, Joseph, English nonconformist clergyman and novelist: b. St. Stephens, Cornwall, 1859. He was educated at Owens College, Manchester, and entered the nonconformist ministry in 1884. Among his many published books are: 'Story of Andrew Fairfax' (1903); 'The Scarlet Woman' (1899); 'The Purple Robe' (1900); 'The Madness of David Baring' (1900); 'Greater Love' (1901); 'Lest We Forget' (1901). He is a brother of S. K. Hocking (q.v.).

Hocking, Silas Kitto, English Methodist clergyman and novelist: b. St. Stephen's, Corn-

wall, 24 March 1850. He was ordained a minister in the Methodist Free Church in 1870, and after holding pastorates in Liverpool, Manchester, and elsewhere, resigned from the ministry in 1896. He is a prolific writer and several of his books have been much read in America. Among them may be named 'Alec Green' (1878); 'For Light and Liberty' (1890); 'One in Charity' (1893); 'A Son of Reuben' (1894); 'God's Outcast' (1898); 'The Awakening of Anthony Weir' (1901) 'Gripped' (1902).

Hocking River, a stream which has its rise in Fairfield County, Ohio, and flows southeast into the Ohio River. The whole length is about 80 miles; it is navigable for about 70 miles. Along the shore, in the upper part of the course, is the Hocking Canal.

Hocking Valley Railway Company, The. The Mineral Railroad Company was incorporated 14th April 1864, to build a railroad from Columbus to Athens, Ohio, but beyond making preliminary surveys and securing some rights of way, nothing was done toward the construction of the line. Mr. M. M. Greene, who was operating salt works at Salina (now Beaumont), Ohio, in the Hocking Valley, seven miles north of Athens, in 1867, took up the project, and on 26 June of that year, by decree of the Franklin County Common Pleas Court, the name was changed from Mineral Railroad Company to Columbus & Hocking Valley Railroad Company. In 1868 the line was opened for traffic from Columbus to Lancaster, and in 1869 was completed as far as Nelsonville, where it reached the coal field.

Construction was finished 25 July 1870, to Athens with a branch from Logan to Straitsville, in the coal district. The annual report of the president for the year 1870 stated: "That the company owned 12 locomotives, eight passenger cars, three baggage cars, 279 coal, 60 box, and 26 flat cars, in addition to which, private parties furnished 403 coal cars, and that with all this equipment, together with 150 other cars furnished by connecting lines, the company was unable to supply the demand for coal and would have to provide more coal cars." The gross earnings of the line for 1870 amounted to $372,229.

In the year 1871, the gross earnings increased to $548,942 and the president's report for that year stated that a valuable trade for coal had been commenced through Cleveland to points on the Lakes. The report further stated that the heavy traffic made it necessary to renew some of the rails, and that, in order to have a test between iron and steel, 50 tons of steel rails were purchased as an experiment and laid in sidings in Columbus yard under the heaviest wear of any part of the road.

The coal business of the line developed rapidly, the gross earnings for the year 1872 being $854,892. The company trebled its number of coal cars and began to feel the need of proper outlets for traffic to points beyond Columbus, connecting lines being either unable or unwilling to furnish cars for the business offered their lines. It was thereupon determined to undertake the construction of a line to supply the great demand of the Lakes and the Northwest for Hocking Valley coal, and Toledo was selected as the most appropriate port. Accordingly on 28 May 1872, the Columbus & Toledo Railroad Company was incorporated by M. M. Greene, P. W. Huntington, B. E. Smith, W. G. Deshler, James A. Wilcox, and John L. Gill, and a preliminary survey was at once made.

The line was permanently located from Columbus to Toledo on 15 Oct. 1873. The financial panic of 1874, however, made it necessary to defer for nearly a year the construction, which was commenced 17 Aug. 1875; on 15 Oct. 1876, the line from Columbus to Marion was opened for traffic, and on 10 Jan. 1877, the first regular train ran through to Toledo, where the company had acquired valuable frontage on the Maumee river for the construction of docks.

The Columbus & Hocking Valley and Columbus & Toledo Railroad companies entered into a contract 22 Feb. 1877, providing for the joint management of the two lines and for the joint use of terminal property and facilities in Columbus.

During the year 1877, extensive docks were constructed at Toledo, and connecting lines at Toledo furnished an outlet to points in Michigan and Canada. In the meantime, the Columbus & Hocking Valley Railroad had continued to prosper. In 1877, the Monday Creek and Snow Fork branches in the coal field were partially constructed and opened and seven iron furnaces were in blast in the coal region.

The Ohio & West Virginia Railway was incorporated 21 May 1878, to build from Logan, in the Hocking Valley, to Gallipolis, on the Ohio river, and some little grading was done upon this line, but no further progress was made until one year later, 21 May 1879, when Hocking Valley interests took up the project, amended the charter to extend from Gallipolis to Pomeroy, and commenced construction. The line was opened for traffic 15 Oct. 1880, from Logan to Gallipolis, and 1 Jan. 1881, to Pomeroy.

The Columbus & Hocking Valley, and Columbus & Toledo Railroad companies, and The Ohio & West Virginia Railway Company were consolidated 20 Aug. 1881, under the name of the Columbus, Hocking Valley & Toledo Railway Company.

In 1895, the Wellston & Jackson Belt Railway was built by the Hocking Valley Company from McArthur Junction to Jackson, through the Jackson County coal field, affording a valuable feeder to the line, and was opened for traffic to Wellston 1 Dec. 1895, and to Jackson 10 Feb. 1896.

During the past few years radical improvements have been made in the capacity of the line for handling traffic; 40 ton coal cars to the number of nearly 6,000 have been added to the equipment, mogul freight engines have been superseded by consolidation engines of greater capacity, making a large increase in the loading of freight trains; improved machinery for handling coal and iron ore has been placed on the company's docks at Toledo, and the yards, sidings, and station facilities of the line have been increased to take care of the constantly growing traffic.

Of the five seams of bituminous coal mined in the State of Ohio, four are to be found on the line of the Hocking Valley Railway, and through its connection with the Kanawha & Michigan Railway at Athens it also receives shipments of coal and coke from the Kanawha

& New River districts of West Virginia. Through its control of dock facilities at various points on the Great Lakes it has been enabled to transport coal for shipment by lake to the amount of nearly 2,000,000 tons during the navigation season of the year 1904.

The Hocking Valley is the longest line of railway entirely within the limits of the State of Ohio, and occupies a central position from the Ohio river to Lake Erie, passing through the capital, with branches in the populous regions of the coal fields. In 1905 the total mileage of the Hocking Valley Railway was 344.7, made up as follows: Toledo to Pomeroy, 256.8 miles; Athens branch, 26.9 miles; Jackson branch, 17.3 miles; other branches, 43.7 miles. For the year ending 30 June 1905, the gross earnings were $6,013,214. The operating expenses were $4,067,901, thus showing net earnings of $1,945,313, which with other income of $382,230 shows the total net income of the company for that year, $2,327,543.

F. B. Sheldon,
Assistant to President.

Hodder, Alfred, American author: b. Celina, Ohio, 18 Sept. 1866. In 1886–9 he read law in the office of Senator Teller, in 1889 was admitted to the bar at Denver, Colo., studied in the Harvard graduate school in 1890–1, and was Morgan fellow there 1891–2. He was for a time lecturer in English literature and drama at Bryn Mawr College, contributed extensively to the New York 'Nation,' and published 'The Powers that Prey' (with Josiah Flynt, 1900), a collection of stories of the criminal classes, and 'The Specious Present' (1901), a metaphysical treatise.

Hodge, Archibald Alexander, American Presbyterian divine: b. Princeton, N. J., 18 July 1823; d. Princeton 11 Nov. 1886. He was the son of Charles Hodge (q.v.) and was graduated at Princeton College 1841, where he became assistant professor. In 1847 after graduation in the Theological Seminary of the same place he went to Allahabad, India, as a missionary. He stayed in Asia for three years and returning home held pastoral charges in Maryland, Virginia, and Pennsylvania until 1877, when he became his father's assistant at Princeton Seminary, succeeding in 1878 to the chair of didactic and exegetical theology made vacant by his father's death. Among his works the most important are 'Outlines of Theology' (1879); 'The Atonement' (1886).

Hodge, Charles, American Presbyterian theologian: b. Philadelphia 28 Dec. 1797; d. Princeton, N. J., 19 June 1878. He was educated in Princeton College, graduating in 1815. In 1816–19 he studied in the theological seminary at Princeton, in 1820 was appointed instructor there, and two years later made professor of Oriental and biblical literature. In 1840 he was transferred to the chair of didactic and exegetical theology in the seminary, and 12 years afterwards appointed to the additional chair of polemical theology. In 1825 he founded the 'Biblical Repertory,' afterwards was renamed 'Biblical Repertory and Princeton Review,' and merged in 1872 in the 'Presbyterian Quarterly and American Theological Review.' From the foundation till 1872 he was editor of and chief contributor to the 'Review,' and two of his works, 'Princeton Theological Essays' (1846–7); and 'Essays and Reviews' (1857), were compiled from his numerous articles in that periodical. Other works are: 'Commentary on the Epistle to the Romans' (1855; enlarged, 1866); 'Constitutional History of the Presbyterian Church in the United States' (1840–41); 'The Way of Life' (1842); 'Systematic Theology' (1871–2), a comprehensive treatise giving an exposition of Calvinistic theology; and 'What is Darwinism?' (1874).

Hodge, Frederick Webb, American ethnologist: b. Plymouth, England, 28 Oct. 1864. He was brought to this country at the age of seven years, and was educated at Washington, D. C. In 1884 he received appointment to the United States Geological Survey, in 1886 became secretary of the Southern Archæological Expedition, and in 1889, was appointed to the Bureau of Ethnology, Smithsonian Institution. He has written various papers on the Indians of the southwest.

Hodge, John Aspinwall, American Presbyterian theologian: b. Philadelphia, Pa., 12 Aug. 1831. He was graduated from the University of Pennsylvania (1851) and from Princeton Theological Seminary (1856). After 35 years of pastoral work he was appointed in 1893 professor of biblical instruction and church polity in Lincoln University. Among his works are 'What is Presbyterian Law?' (1882); 'Theology of the Shorter Catechism' (1888); 'The Ruling Elder at Work' (1897).

Hodges, George, American Episcopal clergyman: b. Rome, N. Y., 6 Oct. 1856. He was graduated from Hamilton College, Clinton, N. Y., in 1877, and from the Berkeley Divinity School, Middletown, Conn., in 1881. He was assistant rector of Calvary Church, Pittsburg, Pa., 1881–9, and rector 1889–94, in the year last named becoming dean of the Episcopal Theological School in Cambridge, Mass. He has published among other works: 'Christianity Between Sundays' (1892); 'The Heresy of Cain' (1894); 'In the Present World' (1896); 'Faith and Social Service' (1896); 'The Battles of Peace' (1897); 'The Path of Life' (1897); 'William Penn' (1900). He is one of the most prominent members of the Low Broad Church School in the Episcopal Church.

Hodgetts, hŏj'ĕts, **Edward Arthur Brayley,** English journalist: b. Berlin, Germany, 12 June 1859. He has been connected with several influential London journals in the capacity of correspondent and was foreign editor of the New York *World* in 1894. Among his published books are 'Liquid Fuel' (1890); 'Round About Armenia' (1896); 'A Russian Wild Flower' (1897); and a translation of 'The Swiss Family Robinson' (1897).

Hodgkin, hŏj'kĭn, **Thomas,** English historian and banker: b. Tottenham, Middlesex, 29 July 1831. He has been for many years the senior partner in a banking firm at Newcastle-on-Tyne, but since 1874 has given his time to historical writing. He has published 'Italy and her Invaders,' a work of much importance, of which eight volumes have already appeared (1880–99); 'Dynasty of Theodosius' (1889); 'Life of George Fox' (1896); 'Life of Charles the Great' (1897); etc.

Hodgkin's Disease. See PSEUDOLEUCÆMIA.

Hodgkinson, hŏj'kĭn-sŏn, **Eaton,** English engineer: b. Anderton, Cheshire, 1789; d. 1861. After a somewhat desultory education, and the pursuit of independent investigations in mechanics he was appointed in 1847 professor of the mechanical principles of engineering at University College, London. He was one of the royal commission appointed in 1847 to inquire into the application of iron in railroad building. His principal experiments led him to the determination of the "neutral line" in the section of fracture, an important step in the progress of engineering science. Among his many writings is 'Researches on the Strength and Other Properties of Cast Iron' (1846).

Hodgson, hŏj'sŏn, **Shadworth Hollway,** English metaphysician: b. Boston, Lincolnshire, 25 Dec. 1832. He was educated at Rugby and Oxford and is the author of 'Time and Space' (1865); 'Principles of Reform in the Suffrage' (1866); 'The Theory of Practice' (1870); 'The Philosophy of Reflection' (1878); 'The Metaphysic of Experience' (1898); etc.

Hodograph, hŏd'ō-grăf, the term for a velocity diagram which facilitates the study of kinematics. It signifies the curve along which the extremities of lines drawn from a fixed point pass and exhibit in direction and magnitude the velocities of a moving object at the different points of its orbit or path.

Hoe, Richard Marsh, American inventor: b. New York 12 Sept. 1812; d. Florence, Italy, 7 June 1886. He was the son of Robert Hoe (q.v.). In 1846 with his brother Peter S. he perfected a rotary printing-press which was called "Hoe's lightning press." Subsequently the two brothers invented the Hoe web-perfecting press. These were especially adapted to newspaper printing and made a revolution in that art. The sons of Richard M. Hoe and of Peter S. Hoe conducted the business after the death of the brothers, and added various improvements to the original Hoe printing-press. The factory in New York in 1903 was said to be the largest printing-press works in the world.

Hoe, Robert, American inventor: b. Leicestershire, England, 1784; d. 1833. He came to the United States in 1803, was for a time a joiner, and later entered partnership with his brothers-in-law, Matthew and Peter Smith, for the sale of a hand printing-press, the invention of the latter. He took over the business in 1823. The original Hoe printing-press was designed and built by him.

Hoe, Robert, American manufacturer: b. 1839. He is a nephew of Richard M. Hoe (q.v.). He became the head of the Hoe firm, and maintained its high position among establishments of its class. A founder of the Grolier Club of New York, he was also its first president. He published an edition (1880) of Maberley's 'Print Collector.'

Hoe'ber, Arthur, American artist: b. New York 23 July 1854. He studied under Beckwith in New York and under Gérôme at the Ecole des Beaux Arts, exhibited for the first time at the Salon in 1882, and is a contributor to most American exhibitions. He is art critic to the *Commercial Advertiser.* Among his writings are 'Treasures of the Metropolitan Museum of Art'; and 'Painting in the 19th Century in France, Belgium, Spain and Italy.'

Hoey, Frances Sarah Johnston, Irish novelist: b. near Dublin 1830. She was married to A. M. Stewart in 1846, and to John Cashel Hoey in 1858. Among her books, which have circulated in America as well as in England, are: 'A House of Cards'; 'A Golden Sorrow'; 'No Sign'; 'A Stern Chase'; 'His Match and More.'

Hofer, hō'fĕr, **Andreas,** Tyrolese patriot: b. Sankt Leonhard 22 Nov. 1767; d. Mantua 20 Feb. 1810. He was landlord of the inn "Am Sand" at Sankt Leonhard, and hence often known as "Sandwirt." In 1796 he led a rifle company against the French on Lake Garda, and after the Peace of Lunéville was prominent in the organization of the Tyrol militia. In 1809 he led in an insurrection of the Tyrolese for shaking off the yoke of Bavaria, to which their country had been transferred by the Treaty of Presburg. In a short time, with intermittent assistance from the Austrians, he defeated the French and Bavarian troops, and nearly the whole country was liberated. Hofer then carried on the military and civil administration, till the Peace of Vienna was proclaimed. Misled by false reports he commenced hostilities anew, and thus forfeited the protection of the amnesty. He remained concealed for some time, but was at last betrayed to the French, and carried to Mantua, where he was tried by a court-martial and shot. His family was indemnified for the loss of their property by the Emperor of Austria in 1819, and his son ennobled. The career of Hofer furnished material for tragedies by Immermann and Auerbach. Consult the studies by Heigel (1874) and Stampfer (1891).

Hoff, hŏf, **William Bainbridge,** American naval officer: b. Philadelphia, 1846; d. Washington, D. C., 23 May 1903. He entered the naval service in 1860, and in 1863 was graduated from the Naval Academy. He took part in several naval campaigns during the Civil War, and at the torpedo school and on the United States steamship Dale he gave his attention to the instruction of seamen in gunnery. In 1893 he was marine commissioner to Great Britain for the World's Fair at Chicago, and was retired in 1897. He was the author of 'Elementary Naval Tactics'; and 'Avoidance of Collisions at Sea.'

Hoffman, hŏf'măn, **Charles Fenno,** American poet and novelist: b. New York 1806; d. Harrisburg, Pa., 7 June 1884. He entered Columbia College, and studied law at Albany, being called to the bar in 1827. In 1830 he became joint-editor of a New York journal, and three years later started the 'Knickerbocker Magazine.' For many years he edited the 'American Monthly Magazine,' also. In 1849 his mind began to give way, and from that time till his death he was an inmate of Harrisburg lunatic asylum. His first separate publication was 'A Winter in the West' (1835), followed in 1837 by 'Wild Scenes in Forest and Prairie,' and in 1840 by the novel 'Greyslaer: a Romance of the Mohawk,' which met with immediate and remarkable success. An earlier novel, 'Vanderlyn,' appeared in the 'American Monthly Magazine' during 1837. Several of his songs have

gained great popularity. His published volumes of verse include: 'The Vigil of Faith' (1842); 'The Echo' (1844); 'Lays of the Hudson, and other Poems' (1846); 'Love's Calendar, and other Poems' (1848).

Hoffman, Eugene Augustus, American Episcopal clergyman: b. New York *21* March 1829; d. near Plattsburg, N. Y., 17 June 1902. He was educated at Rutgers and Harvard colleges and at the General Theological Seminary. He held successive rectorships at Elizabeth, N. J., Burlington, N. J., Brooklyn, N. Y., and Philadelphia, and in 1879 was appointed dean of the General Theological Seminary, New York, and with others of his family, heavily endowed that institution. Dean Hoffman built Christ Church and rectory at Elizabeth, N. J., and also churches at Woodbridge and Milburn, N. J. He was the author of 'Free Churches' (1858); and 'The Eucharistic Week' (1859 and 1893).

Hoffman, Murray, American jurist: b. New York 29 Sept. 1791; d. Flushing, L. I., 7 May 1878. He graduated from Columbia College in 1809; was admitted to the bar, became assistant vice-chancellor of the superior court of New York in 1839, serving till 1843, and was elected judge in 1853, holding that position for eight years. He wrote: 'Office and Duties of Masters in Chancery and Practice in the Master's Office' (1824); 'A Treatise on the Practice in the Court of Chancery,' in three volumes (1834–40); 'Reports of Cases, Court of Chancery' (1839–40); several treatises on Church Law and numerous other works.

Hoffman, Richard, American pianist and composer: b. Manchester, England, 24 May 1831. He came to New York in his 16th year. He received early instruction from Rubinstein, Liszt, Thalberg, Döbler and Meyer. After his arrival in America he made a tour of the country as a soloist, and later accompanied Jenny Lind on her tours; he also played with Gottschalk and Von Bülow in New York in 1875. Later he became an important figure in American musical life. He has composed music for the piano, songs, anthems, ballads and church music.

Hoffman, William M., American inventor: b. Buffalo, N. Y., 1853. He received only a limited education and began to earn his living when nine years of age. He prospered until he was 20, when misfortune overtook him and he became a fireman on the Erie Railroad. The clumsiness in the action of the piston rod which runs to the driving-wheels of an engine, involving such a waste of power, attracted his attention and decided him to build an engine in which there should be no such starting and stopping, but in which the power should create a direct rotary movement. He studied for eight years the technical branches of engineering, and at the end of this period became chief engineer of a large tannery in Buffalo. He there invented a new set of "fleshing" and "putting out" machinery for use in a tannery, and sold the invention to obtain funds with which to experiment on his engine. He went to Detroit in 1886 and organized a company to produce his engines. He spent the first funds in experiments, and built five models, all of which refused to stir when connected up, nor were they in any way operative. In the winter of 1898–9 he went to Buffalo, there producing No. 6, which was a partial success. It was of a type in which the piston revolved in the cylinder, and showed a great advance over his previous models in control and speed and in sustaining varying loads. The internal friction made in this "annular cylinder" type was too great, and he set out to lessen it or do away with it altogether. Hoffman worked day and night, and when exhausted would ride on a trolley car all over the city till his brain became clear again, then would go back to work. It was on one of these rides that he thought out the principle which, with a few perfections, achieved the long-sought end. Hoffman thought that if the piston would not revolve inside the cylinder, the cylinder might revolve around the piston, and he immediately designed an engine in which the cylinder revolved around the eccentric abutment by introducing radial wings extending from the shell toward and against the stationary eccentric core. This engine, though proved by actual test of 18 months to be a success, was such a disappointment to Hoffman that he mortgaged all his property and returned the money which he had borrowed from financiers in August 1902 to further his investigations. Hoffman's son Bertram and Randl Riehl then joined him, and together, in July 1904 they brought out a 28 h.p. engine which was put into operation in the basement of the Ellicott Square Building in Buffalo and which has proved a success. He then made a twelfth and last design in a 300 h.p. compound engine, which is the largest of its type ever built and which, it is claimed, shows an economy of 33 per cent and a saving in floor space of 80 per cent as compared with the highest type of reciprocating engine, while the friction load has been reduced to 1.1 per cent. All of Hoffman's patents have now been merged into one company, of which he is president.

Hoffmann, August Heinrich, ow'goost hīn'-rih höf'män, usually known as HOFFMANN VON FALLERSLEBEN, German poet and philologist: b. Fallersleben, Hanover, *2* April 1798; d. Corvei 19 Jan. 1874. He studied at Göttingen and Bonn, was appointed in 1823 custodian of the university library at Breslau, and in 1830 became extraordinary, in 1835 ordinary professor of the German language and literature in the university of that city. He resigned his librarianship at Breslau in 1838, and in 1842 was removed from his chair without a pension because of the liberal political views represented in his 'Unpolitsche Lieder' (1840–1). He led a wandering life till 1845, when he obtained the right of domicile in Mecklenburg. In 1848 he was granted a pension by the Prussian government, and from 1860 he was librarian to the Duke of Ratibor. Of his original writings the best known are his songs, not a few of which, especially that beginning 'Deutschland, Deutschland über Alles' (1841), have long received emphatic popular approval. For several of them he composed tunes. They were published in several volumes, among these being: 'Gedichte' (1827); 'Alemannische Lieder' (1827); 'Hundert Schullieder' (1848); 'Deutsches Volksgesangbuch' (1848); 'Soldatenlieder' (1851); 'Kinderwelt in Liedern,' and 'Alte und Neue Kinderlieder' (1873). A complete edition of his 'Kinderlieder' was prepared by von Donop in

1877. 'Mein Leben' (1868; abridged edition continued to his death, by Gerstenberg, 1892-4), is autobiographical. Consult also the 'Life' by Wagner (1869).

Hoffmann, Heinrich, German painter: b. Frankfort-on-the-Main, 18 Oct. 1814. Beginning life as a room decorator, in 1843, he adopted landscape painting as his profession and studied under Jacob Becker with that end. Long wanderings and careful studies of nature in the Taunus Mountains, in Obenwald, and the Black Forest, as well as in the valleys of the Rhine and Mosel, were followed by extensive travels in Switzerland and the Tyrol. The results of this preparatory training appeared in his first large canvas in which the old romantic spirit was blent with an independent and realistic presentation of nature which at once attracted public attention. He has produced numberless Alpine and forest landscapes, moonlight and street scenes, most of which are in private collections at Frankfort.

Hofmann, August Wilhelm, von, German chemist: b. Giessen 8 April 1818; d. Berlin 5 May 1892. He studied law, obtained the degree of doctor of philosophy, became assistant under Liebig in the Giessen Laboratory, and in 1845 became professor of chemistry in the University of Bonn. The same year he was appointed superintendent of the new Royal College of Chemistry in London, and in 1853 became professor of chemistry in the Royal School of Mines, though still remaining at the head of the College of Chemistry. In 1861 he was elected president of the London Chemical Society, and in 1863 was appointed to the chair of chemistry in the University of Berlin, where he remained till his death. In 1864 he built a laboratory at Bonn and became its director, and in 1868 founded the German Chemical Society. He was judge of several industrial expositions and was a member of many scientific societies, and for his valuable services was ennobled in 1888. A statue of him is in the National Gallery of Berlin. He wrote: 'A Handbook of Organic Analysis' (1853); 'Introduction to Modern Chemistry' (1865); 'Zur Errinnerung an vorangegangene Freunde' (1889); etc.

Hofmann, Heinrich, German painter: b. Darmstadt 19 March 1824. In his native town he began his studies as a copper-plate engraver, but subsequently under Schadow and Hildebrande turned his attention to painting, to which henceforth he devoted his life. After extensive travels in Europe, which included a residence of four years in Italy, he settled at Dresden as professor of painting in the Academy there. The most famous of his pictures are: 'The Burial of Christ'; 'King Enzio in Prison'; 'The Betrayal of Christ,' in the Darmstadt Gallery; 'The Finding of Christ in the Temple,' in the Dresden Gallery; 'Christ Preaching on the Lake,' in the Berlin National Gallery; 'Venus and Cupid'; 'Romeo and Juliet'; 'Othello and Desdemona'; and 'Christ in Gethsemane.' All the creations of Hofmann testify to his sense of refined beauty and are rather remarkable for harmonious coloring and delicacy than for originality of design or composition, as he clings to the tradition of the classic period in the ideal character of his conceptions. His works are popular and have been engraved and photographed more extensively perhaps than those of any contemporary German painter of his order.

Hofmann, Josef, yō'sĕf, Polish pianist: b. Cracow 20 Jan. 1877. He studied with his father, a professor in the Warsaw Conservatory and director of the Warsaw opera, appeared as a pianist in public at the age of six, became known as one of the most notable of musical prodigies, visited the United States in 1887-8, and was there prevented from playing through the action of the Society for the Prevention of Cruelty to Children. After a period of study, two years of which were spent as a pupil of Rubinstein, he made his début as a virtuoso at Dresden in 1894. His recitals in New York in 1901 showed him to be one of the leading modern pianists. His compositions include some interesting works for the pianoforte.

Hog-feeding. See NUTRITION OF FARM ANIMALS.

Ho'gan, John Joseph, American Roman Catholic bishop: b. Bruff, County Limerick, Ireland, 10 May 1829. He came to St. Louis, Mo., in 1848, studied at the Roman Catholic theological seminary there, was ordained priest in 1852, and built and became pastor of St. Michael's Church of St. Louis. In 1868 he was consecrated bishop of St. Joseph, Mo., and in 1880 was transferred to the see of Kansas City.

Hogarth, hō'gärth, **David George,** English archæologist: b. Barton-on-Humber, Lincolnshire, 23 May 1862. He was educated at Oxford and has since conducted excavations at Paphos, Alexandria, Fayum and elsewhere in the East. He was director of the British School at Athens 1897–1900 and has published: 'Devia Cypria' (1890); 'Modern and Ancient Roads in Asia Minor' (1892); 'A Wandering Scholar in the Levant' (1896); 'Philip and Alexander of Macedon' (1897); 'The Nearer East' (1902).

Hogarth, William, English painter and engraver: b. London 10 Nov. 1697; d. there 25 Oct. 1764. He studied art at Sir James Thornhill's school, James Street, Covent Garden. About 1720 he set up for himself, and designed plates for booksellers, the chief of which are the illustrations to Gray's edition of 'Hudibras' (1726). He had ample employment for what are called "conversation pieces," that is, groups of family portraits, united by some common occupation or interest, but never cared greatly for this branch of art. In March 1729 he married clandestinely the daughter of Sir James Thornhill, and shortly afterward began to display his extraordinary faculty for depicting the vices and follies of his time. In 1730–1 he painted 'A Harlot's Progress,' a series of six pictures, like many of his other works, engraved by himself. It was published in April 1732. The 'Harlot's Progress' was followed by other satiric delineations, such as 'A Midnight Modern Conversation' (1734), 'Southwark Fair' (1735), 'A Rake's Progress' (1735), 'The Distressed Poet' (1736), 'The Four Times of the Day,' and the 'Strolling Actresses Dressing in a Barn' (1738). With less success he also produced the large canvases still in St. Bartholomew's Hospital — the 'Pool of Bethesda' and the 'Good Samaritan,' both executed in 1736; and also painted several portraits. The series of graphic satires was, however, continued

by the 'Enraged Musician' (1741) and the famous 'Marriage à la Mode' (his masterpiece), six pictures now in the National Gallery, and engraved by various hands in 1745. 'Industry and Idleness,' 12 plates, followed these in 1747; 'Calais Gate' (1749) came next, and in 1750 the fine plate known familiarly as the 'March to Finchley.' The minor plates of 'Beer Street' and 'Gin Lane' and the set called 'The Progress of Cruelty' belong to 1751. In 1752 Hogarth published his 'Analysis of Beauty,' a treatise containing many shrewd remarks, but confused and illiterate in its style, and the cause of much ridicule. After this he produced (with the aid of Grignion and others) the four prints of the 'Election Series' (1755–8), the 'Cockpit' (1759), etc. In 1762–3 he became involved in a miserable quarrel with Wilkes and Churchill, the result of which, on his side, was the well-known portraits of Wilkes, and of Churchill as a bear ('The Bruiser').

Most of Hogarth's pictures, which now enjoy a much higher repute for technique than formerly, are preserved in public or private collections in Britain. He was entirely uninfluenced by foreign art. His powers of invention and combination were extraordinary; and as a humorist and social satirist with the pencil he has never been surpassed. There can be no doubt also that he genuinely desired to assist by his work in the reformation of manners. Consult the biographies by Sala (1866) and Dobson (1879).

Hoge, hōg, **Moses Drury,** American Presbyterian clergyman; b. Hampden-Sidney, Va., 17 Sept. 1819; d. Richmond, Va., 1899. He was graduated at Hampden-Sidney College and Seminary and was pastor of the Second Presbyterian Church in Richmond, Va. (1845–85). He ran the blockade in a ship from Charleston during the Civil War and secured from England a large number of copies of the Holy Scriptures for distribution among the Confederate soldiers, the British and Foreign Bible Society making a special grant at his request. After the war he was instrumental, especially during the session in 1874 of the Southern Presbyterian Church, in reconciling differences with the Northern Presbyterian Church.

Hogg, James, Scottish poet, familiarly known as "The Ettrick Shepherd"; b. Ettrick, Selkirkshire, 25 Jan. 1770; d. Altrive, on the Yarrow, 21 Nov. 1835. After receiving a very scanty education, he began to earn his bread by daily labor as a shepherd. His early rhymings brought him under the notice of Sir Walter Scott, by whose advice he published a volume of ballads called 'The Mountain Bard.' He then went to Edinburgh, where he published the 'Forest Minstrel' (1810), and started a weekly periodical entitled 'The Spy.' The appearance of the 'Queen's Wake' in 1813, with its charming ballad of Kilmeny, established Hogg's reputation as a poet. In 1815 he published 'Pilgrims of the Sun,' followed by 'Mador of the Moor'; the 'Poetic Mirror' (a collection of imitations of living poets); 'Queen Hynde,' and 'Dramatic Tales,' as well as by 'The Brownie of Bodsbeck,' etc. From 1817 he held the farm of Altrive from the Duke of Buccleuch at a merely nominal rent; but his farming schemes never throve, and he was generally in narrow circumstances.

Hogg, James Stephens, American politician and lawyer: b. near Rusk, Tex., 24 March 1851; d. Houston, Tex., 3 March 1906. He took up the practice of law, and was justice of the peace in Wood County 1873–5, and county attorney 1878–80. In 1880 he was district attorney in the 7th judicial district of Texas; in 1886 became attorney-general of the State and from 1890 to 1895 was governor. He was one of the Democratic governors who objected to the use of United States troops by President Cleveland at the time of the Pullman strike in 1894. After serving as governor he returned to the practice of law, and remained active in politics, being prominent as a public speaker.

Hog'nose, a North American colubrine serpent (*Heterodon platyrhinus*), so-called because of its upturned pig-like snout. It is usually about two feet long, gray marked with brown bars, but sometimes is so dark that the whole surface appears blackish; and dwells and seeks its prey mainly in the woods and thickets. When alarmed — and it is extremely timid — it hisses violently (whence other rustic names such as "blowing-adder"), and expands and flattens the head and neck by inhaling air and stretching out the ribs, giving itself a most ugly aspect. If these tactics do not succeed in terrifying the enemy sufficiently, the snake begins a series of astonishing contortions and twistings which end in the animal throwing itself upon its back and seeming dead until a chance of escape offers. Two or three other species are known in the South and West, all of which are regarded as poisonous by most country people, but are really quite harmless.

Hogs, or **Swine,** hoofed quadrupeds of the family *Suidæ*, including several genera and many species and domesticated races. The males are called "boars," the females "sows," the young "pigs," and the flesh "pork." The hogs proper, both wild and tame, belong to the genus *Sus*, represented in the wilderness of the Old World by the wild boar (*S. scrofa*), which is, or was, known throughout southern and central Europe, Algeria, Asia Minor, and southwestern Asia; and by the Indian boar (*S. cristatus*) of India and Indo-China. The wild boar stands from 30 to 40 inches high at the shoulder and will weigh on the average about 250 pounds. His snout is longer, his ears shorter than those of the domestic hog. He roots up the ground in a different manner, ploughing it in furrows; his tusks are larger, some of them being 10 inches in length, bent circularly, and exceedingly sharp at the points. The young wild boar, for the first three years of his life, follows the sow, the whole litter living in a herd together, and although the adults are plain iron gray (the male exceedingly large and shaggy) the young are striped and spotted. Old boars range the forest alone and unsupported, dreading no single creature, not even man himself. Hunting this animal has always been a favorite amusement, and in Europe is usually pursued on foot by the aid of large dogs, the hunters armed with strong pikes termed *boarspears*. A chase seldom terminates without the maiming or destruction of some of the dogs, and tests the courage of the men, for a charge from an enraged or wounded

boar is a formidable thing. In India the chase is pursued on horseback, the rider using a long spear. Hence the sport is known as "pig-sticking," and it involves much risk and danger, and the death of many horses ripped open by the boar's tusks. In addition to these, a small wild pig inhabits western equatorial Africa; there are two lesser species in India, one not much bigger than a hare; and several in the islands stretching from Sumatra to Japan.

Domestic Races.— Swine everywhere have seemed easily tamable and susceptible to domestication, breeding fertilely in confinement and easily adapting themselves to new environments. Since prehistoric times, therefore, the animal has been raised by man in many parts of the world to supply food. The process of domestication seems to have gone farther toward producing a good pork-making animal in the Orient than in Europe until the revival of agriculture there following the decay of the feudal system. In Great Britain there was early introduced eastern blood called Chinese stock, and it is from the union of these two strains — one derived from the European wild boar and the other from some or many Oriental species — that European and American farmyard swine are descended. The foremost breed, in general popularity, is the Berkshire, which originated in the English County of Berks, but is now universal. The Berkshire hog is of large size, yields pork of great fatness and excellent flavor, grows rapidly and is hardy. It is usually black in color. An American breed, developed first in Ohio, and known as Poland-China, is very similar to the Berkshire, and has been perfected until it has become the principal pork-producing hog of the Mississippi Valley. The English white breeds are led by the Yorkshire, which reaches a larger size than any other kind; and from which has been developed an American strain, called Chester Whites, after the county in eastern Pennsylvania where it originated. New Jersey has a local breed called Durocs, or Jersey red hogs, which have the advantage of great hardiness. For these breeds regular stock-registers have long been maintained. Various other well-known strains of swine in Great Britain and America are the Tamworth, Victoria, Essex, etc. The domestic hog has run wild in various parts of the world. In many of the South Sea islands, and in parts of South America, they have practically returned to a feral condition, and are public game. In the southern part of the United States large numbers of pigs, nominally under ownership, range the woods, picking up their own food of herbage, roots and mast; these become gaunt, thin, high-backed, bristly and develop great running powers, cunning (the intelligence of the whole race is comparatively high), and savagery of disposition; they are locally known as "razor backs."

For the proper care and treatment of hogs raised for their pork see NUTRITION OF FARM ANIMALS.

Domestication has changed the form and proportions of the body, the color, etc.; thus the skull is higher and broader in proportion to its length, and it is more upright in the occipital region. The sow brings forth from the 16th to the 20th week after conception, and has usually two litters in a year. Her offspring are very numerous, a litter consisting of from 10 to even 20; but she can bring up no more than she has teats, which are 12 in number. The natural term of the life of these animals is from 15 to 30 years, and they continue to increase in size and strength until they are from four to five years of age. As might be supposed from their habits, they are much infested by vermin of different kinds, and are also liable to many disorders, particularly those arising from gluttony. Notwithstanding repugnant qualities the hog is of incalculable benefit to mankind. Its flesh is pleasant, substantial and nutritious. Pork takes salt better than almost any other meat, and may be cured and preserved in many ways. The fat (lard) is one of the most important culinary articles; the bristles are used in large quantities in the manufacture of brushes, while the skin is in demand among saddlers, trunk-makers, and manufacturers of small articles of leather, calling for great durability with flexibility and a handsome appearance.

The family includes various wild species more or less closely related to the typical swine, such as the babirussa, peccaries, river-hogs, wart-hogs, etc., elsewhere described.

The principal English works on swine are Long's 'The Book of the Pig' (1889), and Spencer's 'Pigs, Breed and Management' (1897). American works of note are Coburn's 'Swine Husbandry' (1889); Harris' 'On the Pig' (1896), and pamphlets issued by the Department of Agriculture. See NUTRITION OF FARM ANIMALS; PORK; PACKING INDUSTRY.

Hogs'head, a liquid measure formerly in use in England. Its capacity varied in different cases. For beer it was 54 gallons, for rum 45 to 50 gallons, for brandy 45 to 60 gallons, and for different kinds of wine it varied from 46 to 93 gallons. In the United States the measure is still in use, being equivalent to 63 American gallons or 52.485 imperial gallons; for tobacco it varies from 750 pounds in some States to 1,200 pounds in others.

Hohenlinden, hō-ĕn-lĭn'dĕn, Germany, a village of Bavaria, 20 miles east of Munich, celebrated for the victory gained by the French under Moreau over the Austrians under the Archduke John, 3 Dec. 1800. The French took nearly 80 pieces of cannon, 200 caissons, and more than 10,000 prisoners, with three generals officers.

Hohenlohe-Schillingsfürst, hō-ĕn-lō'ĕ shĭl'-lĭngs-fürst, **Chlodwig Karl Victor,** PRINCE VON, German chancellor; b. Rotenburg-an-der-Fulda March 1819; d. Ragatz, Switzerland, 6 July 1901. He took courses in law and political science at Heidelberg, Göttingen and Bonn. He entered public life and became in 1866 prime minister of Bavaria. In 1874 he was German ambassador at France and in 1885 became governor-general of Alsace-Lorraine. In 1894 he was appointed chancellor and resigned in 1900.

Hohenstaufen, House of, a German dynasty reigning from 1138 to 1254. After the death of the Emperor Henry V. (1125), his two nephews, Frederick II., duke of Swabia, and Conrad, duke of Franconia, aspired to the German crown; but were opposed by the directors of the election, the Archbishop of Mayence and the papal legate; and Lothaire of Saxony was elected. This circumstance, with the demand made by the new emperor of the

restitution of all the possessions acquired by the lords of Hohenstaufen during the preceding reign, produced a fierce war between the emperor and the two brothers. Lothaire preserved himself by a union with Henry the Proud, duke of Bavaria, to whom he gave his daughter and the Duchy of Saxony. The Peace of Mühlhausen (1135), between Lothaire and Conrad, put an end to this Ten Years' war. Conrad renounced his title of King of Italy which he had taken, but received the first rank among the dukes, and both he and his brother regained all their lands. After Lothaire's death (1137) Conrad, duke of Franconia, of the house of Hohenstaufen, was raised to the throne of Germany, with the title of Conrad III.

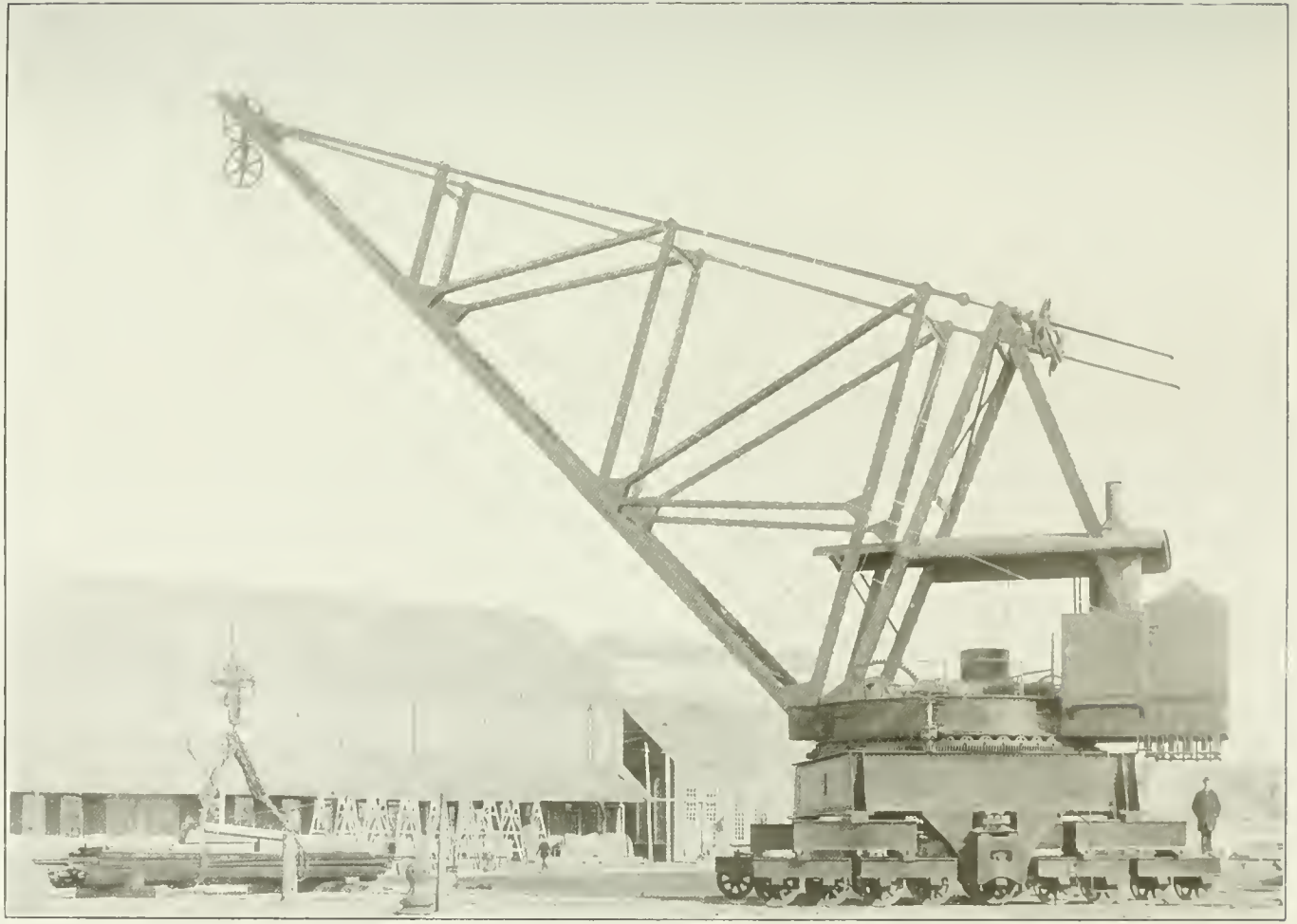
After the death of Conrad III. (1152) the confidence which was felt in the Hohenstaufen family caused the choice to fall on his nephew, Frederick III. of Swabia, called Barbarossa (the Red-beard), who was followed by Henry VI. (1190), and he again by Otto IV. (1197) and Frederick II. (1215–50), all belonging to the same house. After the death of Frederick II. his son Conrad was acknowledged as his successor, with the title of Conrad IV., by most of the states of the empire; but Innocent IV. laid him under an interdict, and declared him to be deprived of all his lands. The conflict between Conrad and the Pope lasted until the latter's death in 1254. The fame of the house of Hohenstaufen is based upon the political greatness to which the Fredericks in particular attained; their success in reducing to order all the states of the empire; the encouragement which they gave to commerce and trade, and their efforts to promote the sciences and arts.

Hohenzollern, hō'ĕn-tsŏl-lĕrn, Germany, a province of Prussia, formed in 1849 by the union of the two principalities of Hohenzollern-Hechingen and Hohenzollern-Sigmaringen. It consists of a narrow irregular strip of country encircled by Würtemberg and Baden. Area 441 square miles; pop. (1900) 66,783. The princely family of Hohenzollern dates from Thassilo, Count of Zollern, who died about 800 A.D., after having founded a castle near Hechingen, on the Zollern hill in the Swabian Alb. The fine Hohenzollern castle of 14th century architecture, built in the latter half of the 19th century, occupies the site of the ancient family-seat. There have been several lines and branches of the Hohenzollerns, the first separation taking place about 1165, when Frederick IV. founded the elder or Swabian and Conrad III. the younger or Franconian line. The elder line was subdivided, in 1576, into the branches of Hechingen and Sigmaringen. Frederick VI., the representative of the younger line, in 1415 received from the Emperor Sigismund the investiture of the electorate of Brandenburg, thus founding the reigning dynasty of Prussia. The two branches of the elder line continued unbroken till 1849, when the reigning princes ceded their respective rights and principalities to the king of Prussia, who in 1871 became emperor of Germany. The main branch of the Hohenzollerns is now represented by the imperial family of Germany. See GERMANY.

Hoisting Apparatus, mechanical devices for lifting and moving laterally heavy weights. They are known under various names and include cranes, derricks, overhead trolleys, crane-derricks, etc. The smaller are operated by hand power, the larger by steam or electric power. By their aid the heaviest weights may be readily lifted to any desired height and "slewed" into any desired position. Their use dates from the most ancient times, and they are now in constant and general use all over the world.

Derrick.— This is the simplest form of a machine for hoisting. The name is derived from a family by that title who adapted its form from the early English style of gallows, and the name has now come into common use. In form the derrick is like the letter V, one side being fixed immovably by guy ropes, the other hinged to the bottom of this fixed upright, so that it can be raised or lowered at will. This movable jib is somewhat shorter than the upright and the whole apparatus is on a platform which can turn laterally in a circle. Through the top of the jib is run a pulley block, a rope passing through this and down to the base of the upright, where it is wound about a cylinder, or winch. This, when revolved by hand or other power, winds up the rope or cable, thus raising the weight attached to the other end of the rope. The jib is lowered or raised to get the proper angle for picking up the article to be lifted. This simple form of hoister is in constant use by builders in constructing modern high buildings. By its use, heavy or light weights can be quickly lifted from the ground to the top of even 30-story structures. Derricks are commonly made of wooden spars, unless the work to be done is very heavy or the jib exceedingly long. In such case, a tubular iron spar is used. Hoisting engines of such power and facility of control are now made that they enable the operator to move the jib up or down or sideways easily and quickly. The "stiff-leg" derrick has its upright firmly braced by timbers running from the top to the ground, but this form is not common except in stone quarries or in some work where the derrick is stationary. The more common form is the guy-rope derrick, where strong wire cables extend from the top of the upright to the ground. With this arrangement, the hoisting machine can be moved and located in a fresh position easily. Derricks that will lift and swing to position weights of from 5 to 50 tons are now made in this country. In the contemplated work on the Panama Canal, derricks capable of moving 100-ton loads of stone and rock are to be built, with a radius of over 100 feet for the jib.

Crane.— Thus named because the arm or boom resembles the neck of the crane, which raises and lowers its neck to lift objects from the ground. It differs from the derrick in not having any mast or upright, usually. In the common form of crane the whole apparatus is centered upon a heavy platform which is itself on wheels. The engine which operates the winch also slews the boom in a circle, and, in some cases, moves the whole outfit along the rails upon which the wheeled platform rests. At the base of the boom, on the platform, is an inverted "V" horse, to which are attached the pulley blocks through which run the ropes for raising and lowering objects to be lifted. In large foundries, ship-yards and like places, the locomotive crane runs upon a track which usu-



FORTY TON LOCOMOTIVE CRANE.

IN USE BY THE U. S. GOVERNMENT AT PORT ROYAL, S. C.

ally extends the length of the yard or shop, or perhaps clear around it. Under its own steam, the ponderous machine runs along this track to the object it is desired to move. Steam power then slews the machine laterally so that the end of the jib or boom is over the object, when the latter is attached to the rope running over the end of the jib, the winch turned by the engine and the object lifted into the air. A second rope over another winch then raises the jib to the desired height and the machine runs back over the track to the point desired, where the object is deposited. The utmost expertness and delicacy of handling is acquired by the operator of this steam locomotive crane, which will thus grasp and carry where desired objects weighing often 50 tons or more. The common size is the one capable of lifting five tons only, though there are at Port Royal, in the United States navy yards, several large cranes which just as easily lift 50 tons. This latter machine has a boom 85 feet long and will travel under its own steam along the track 50 feet per minute. It will hoist a 40-ton load seven feet per minute and slew, or turn, a complete revolution in two minutes. The smaller cranes are much used on flat cars as wrecking apparatus for railroads, in excavating and dredging and in heavy construction work. Scores were used in digging the subway for New York city. A small 5-ton locomotive crane costs about $7,500. This style of hoisting apparatus is peculiarly the product of American genius and machines made in America are found in all large contracts for bridge building, railroad construction and like work in every corner of the world. A new machine for placer mining installed in New Mexico in the summer of 1903 adopts this form of crane, using the water over and over for sluicing the sand. It also operates a clam-shell shovel. In more difficult digging the "orange peel" form of shovel is used, the crane raising a ton or more of earth in the shovel and depositing it where desired.

Overhead Trolleys.—In the yard of a shipbuilding company at New London, Conn., has been installed a system of overhead hoisters which combine the advantages of both the derrick and the crane advantageously. The two enormous steamships, Minnesota and Dakota, were constructed by its aid solely. The two ships were built side by side and one trolley system served for both. By this method there are three steel spars, each 120 feet long, each supporting a steel cross-yard 174 feet long. These masts are braced by immense steel guy ropes or cables. The distance between the masts is 300 feet and the tops of the yards, or jibs, are 84 feet from the ground. The working field of the trolleys is a rectangle 600 feet long and 174 feet wide. Along the jibs a track made of wire rope is laid, on which a carriage is swung, suitably centred and controlled. On the main mast, just below the yard, is the house containing the operator and engine. This one man controls the trolley carriages on all the jibs, the raising or lowering and slewing of the jibs and masts and the return of the trolley carriages to the point desired. All is done swiftly and accurately, each carriage being capable of carrying 5,000 pounds. This system can operate four of these trolleys when desired.

Crane-derrick.— This is a combination of the crane and the derrick, as its name indicates. It resembles a figure 4 in construction. The mast can be slewed, but the yard or jib is a fixture and cannot be raised or lowered. Near the juncture of the jib and mast is the house in which sits the operator and where the engine is located. Along the under side of the jib is suspended a wire cable track on which runs a grappler carriage. The jib is usually very long, at least 60 feet, and the grappler runs to the end of this or to such point as is desired to be attached to the object to be lifted. This form of hoister is much used in bridge building and in places where a long reach of jib is desired.

At least 25,000 hoisting machines of these various types are made annually in the United States, one fifth of which are exported. About $25,000,000 is the annual expenditure for this class of machines, aside from the cost of hoisting engines, ropes, wire cable and the other appurtenances of the trade. The largest locomotive cranes cost $50,000 and the small wooden derrick $300 to $1,000. The industry has grown to enormous proportions and new improvements in methods of hoisting are constantly being made for special purposes. PUTNAM DREW.

Hokusai, hō-koo-sä'ē. See JAPANESE ART.

Holacan'thus. See BUTTERFLY-FISH.

Holbach, Paul Heinrich Dietrich, powl hīn'rĭH dēt'rĭH hōl'bäH (Fr. ōl-bäk), BARON VON, German philosophical writer: b. Heidelsheim, in the Palatinate, 1723; d. Paris 21 June 1789. He was educated in Paris, where he passed the greater part of his life. He was the centre of a circle of men of wit, but of free thinking principles, using his great fortune, says Rousseau, generously, and appearing to advantage in the learned society which he gathered round his table. He was the author of a great number of works, most of which were anonymous or pseudonymous. The principal work attributed to him, which appeared in 1770 under the name of M. Mirabaud, and excited much attention in the learned world, is the 'Système de la Nature ou les Lois du Monde physique et moral.' He afterward published 'Système social, or Principes naturels de la Morale et de la Politique'— a development of the previous work, showing the application of the principles promulgated in it to morals and politics; 'Bons Sens, or Idées naturelles opposées aux Idées surnaturelles'; 'Eléments de la Morale universelle'; etc. According to Holbach matter is the only form of existence, and everything is the effect of a blind necessity.

Holbein, Hans, hänts hōl'- or hōl'bīn, the Elder, German painter: b. Augsburg 1460; d. Alsace 1524. His art training began under the influence of Martin Schongauer, but he quickly launched out into a new style, which left ancient precedents behind. He developed a dramatic energy, a clear and lifelike coloring and pre-eminent distinction of expression which rendered him the acknowledged head of a new school. His figures took the attitude of life. The pictures over the altar in the Cathedral at Augsburg, painted in 1493, are good specimens of his best work; in them are portrayed incidents in the life of Virgin Mary. To the same class belong the remains of an altarpiece in the Dominican Church at Frankfort-on-Main, representing scenes of the Passion (1501); 16 paintings of the Passion in the Munich Gallery; the

portrait of the artist with his two sons, in the gallery at Augsburg. His later pictures show traces of the influence exercised by the Italian renaissance, and those painted about 1512 and later are vastly superior to his early work. Among them is his 'Fount of Life' (1519), now in the royal gallery at Lisbon; the altarpiece 'St. Sebastian' (1515), at Augsburg; the altarpiece 'St. Katharine,' in the same gallery; etc. In such works the bold and devotional conception, delicacy and directness of expression, ease of drawing and splendor of coloring, are beyond praise. Excellent also are some of his preliminary sketches and outlines, and in Basle, Berlin, and Copenhagen are collections of his pencil sketches, the most remarkable of which is that at Berlin. Consult: Woltmann, 'Holbein und seine Zeit' (1866).

Holbein, Hans, the Younger, German painter: b. Augsburg 1497; d. London Nov. 1543. He probably received instruction in painting from his father, and about 1515 went to Basle, where he engaged in illustrating books. At Basle he also painted his earliest portraits, and in 1517 went to Lucerne. Here he painted the house of Jacob von Hertenstein, designed windows, and executed other works. Returning to Basle in 1519, he became a burgher in the following year, and during a seven years' residence in that city he executed many works of great importance. In 1526 he went to England. Letters from his friend Erasmus, whose famous 'Praise of Folly' he had illustrated, procured him the patronage of the chancellor, Sir Thomas More, who employed him to delineate the portraits of most of his own personal friends about the court, and introduced him to the notice of Henry VIII., who was a liberal encourager of the fine arts. Among the portraits produced by him during this period are those of More, Archbishop Warham, Bishop Fisher, and several other distinguished persons. From 1528 till 1532 he was again in Basle, but in the latter year he returned to England, where he was destined to spend nearly all the remainder of his life. Holbein painted most of the principal English nobility, whose portraits place him among the world's greatest portrait-painters. Some of his earlier productions, especially his 'Dance of Death,' are also celebrated. In 1538 he completed and published this series. Among the pictures of Holbein's last period are 'The Ambassadors' (1533), and portraits of Hans of Antwerp (1532), English Lady and Gentlemen (1534), Sir Richard Southwell (1538), Duke of Norfolk (1539), Thomas Cromwell, Lady Jane Seymour, Henry VIII. (1542, unfinished), and others. Comparatively few of Holbein's pictures are still extant in England, great numbers of them having been destroyed by Puritan fanatics, or sold and dispersed over Europe. Many of them also perished in the great fire in London in 1666. Holbein also excelled in wood-engraving, and before his visit to England had produced a large number of wood-cuts. He was one of the earliest to paint portraits in miniature. See Woltmann, 'Holbein und seine Zeit' (1874); Wornum, 'Life and Works of Holbein' (1867); Knackfuss, 'Holbein der Jüngere' (1896).

Holberg, Ludwig, lood'vĭg hōl'bĕrg, Baron, Danish author: b. Bergen, Norway, 3 Dec. 1684; d. Copenhagen, 28 Jan. 1754. He studied at Copenhagen, Oxford and Paris, and after paying a six months' visit to Rome returned to Copenhagen in the end of 1716. In 1718 he was appointed to an ordinary professorship in the university of that city, where after this date he chiefly resided till his death. In 1735 he was unanimously elected rector, and in 1737 treasurer of the university, and in 1747 was raised to the rank of baron. Holberg's numerous productions in various departments of literature as well as the important and salutary influence which he exercised upon his countrymen, place him in the front rank of the literary men of his age. He was extremely versatile — now devoted to history, now to poetry, and now to the drama; but during his whole life he was a sworn enemy to pedantry, theological disputatiousness, and scholastic metaphysics. His works may be divided into four classes — poems, stage pieces, philosophical treatises, and historical works. His poems are chiefly of a satirical nature. The most celebrated among them is 'Peder Paars,' a comic heroic poem in 14 cantos, still regarded throughout the Scandinavian countries as a masterpiece, and the hero of which has become the national comic impersonation in Denmark. It has been translated into several languages. Almost equally famous is his 'Nicholas Klimm's Subterraneous Travels,' a satirical romance in prose, originally written in Latin, but translated into seven modern European languages shortly after it appeared, into Danish first by Baggesen (1789). His numerous stage pieces are either comedies or farces, and nearly all characterized by true comic power. Among his philosophical writings the most important is his 'Moral Reflections' (1744). His historical works include: 'The Political, Ecclesiastical, and Geographical Condition of the Danish Monarchy,' a work of great value as a source of reference; 'A General History of the Jews,' and 'A History of Famous Men and Famous Women' (1739–45).

Hol'brook, John Edwards, American naturalist: b. Beaufort, S. C., 30 Dec. 1794; d. Norfolk, Mass., 8 Sept. 1871. He was graduated from Brown in 1815, from the medical school of the University of Pennsylvania in 1818, began practice at Charleston, S. C., in 1822, and in 1824 was appointed to the chair of anatomy in the Medical College of South Carolina, a post he held for over 30 years. In the Civil War he was head of the South Carolina examining board of surgeons. His 'American Herpetology, or a Description of Reptiles Inhabiting the United States' (1842), won for him recognition among European scientists. He published but 10 numbers of his 'Ichthyology of South Carolina' (1854 *et seq.*), when the Civil War compelled its discontinuance.

Hol'comb, Silas Alexander, American jurist: b. in Gibson County, Indiana, 25 Aug. 1858. He received a common school training, studied law in Nebraska, and in 1891 was made judge of the 12th judicial district. He was governor of Nebraska from 1894 to 1898, having been elected by fusion of the Populist and Democratic voters. He has been justice of the supreme court of Nebraska from 1900.

Hol'combe, Chester, American diplomatist and author: b. Winfield, N. Y., 16 Oct. 1844. He was graduated at Union College in 1861; and served as interpreter and secretary to the United States Legation in China, 1871–85. Becoming an authority on the Chinese and Chinese

affairs, in 1896 he acted for the Chinese government in its financial embarrassments. He has published: 'Travels in Western China' (1875); 'The Practical Effect of Confucianism upon the Chinese Nation' (1882); 'The Real Chinaman' (1895); 'The Real Chinese Question' (1899).

Holden, hōl'dĕn, **Albert J.,** American musician: b. Boston 1841. He studied music in New York, and since 1855 has been organist at the Church of the Divine Paternity and at the Church of the Puritans. He has composed more than 300 anthems, hymns and other church music, but his compositions are not confined to sacred music; they include songs, ballads, and choruses; he has also edited and compiled numerous collections.

Holden, Albert W., English painter: b. London 6 July 1848. He studied drawing and antiquities at the British Museum, and gained a studentship at the Royal Academy of Arts, where he afterward exhibited. He has painted historical and humorous genre pictures, and has a high reputation as a portrait painter. Since 1887 he has been professor of fine arts, King's College, London. Among the well known works he has exhibited are: 'A Bank Holiday' (1883); 'Naughty Polly' (1898); 'The Annunciation' (1896); etc.

Holden, Edward Singleton, American astronomer: b. St. Louis, Mo., 5 Nov. 1846. He was graduated at Washington University in 1866, and at the United States Military Academy in 1870; was professor of mathematics at the Naval Academy in 1873–81; and director of the Washburn Observatory (Madison, Wis.) in 1881–5. In 1885–7 he was president of the University of California, and in 1888–98 director of the Lick Observatory, on Mount Hamilton, San José, Cal. It was in connection with the Lick Observatory that his most important work was done, and his services to astronomy found recognition in America and from European states. Among his publications are: 'Index Catalogue of Nebulæ' (1877); 'Life of Sir William Herschel' (1881); 'Astronomy' (with S. Newcomb, 1892); 'Mountain Observatories' (1896); 'Essays in Astronomy' (1900).

Holden, Sir **Isaac,** English inventor: b. Hurlet, near Paisley, 7 May 1807; d. Reighley, Yorkshire, 13 Aug. 1897. While a worker in a cotton mill in Paisley he fitted himself for the post of a teacher. While conducting an experiment he discovered the lucifer match, but he secured no patent on the invention, the financial benefit of which fell to others. Subsequently he was manager, then owner of a wool-combing establishment, and by his mechanical improvements made significant changes in that industry. His shops at Bradford, with branches at Croix and Rheims, eventually became the largest of the kind in the world. He was several times elected to Parliament in the Liberal interest.

Holder, hōl'dĕr, **Charles Frederick,** American naturalist: b. Lynn, Mass., 5 Aug. 1851. He studied at the United States Naval Academy, but resigned in 1871; in 1871–5 was assistant curator of the American Museum of Natural History, from that time turned his attention to lecturing and literary work, and became known as a leading writer on popular science. At Pasadena, Cal., whither he removed in 1885, he became president of the board of education, professor of zoology in Throop University, and honorary curator of the university museum. Among his publications are: 'Elements of Zoology' (1885); 'Living Lights' (1887); 'Louis Agassiz, his Life' (1892); 'Along the Florida Reef' (1892); 'Stories of Animal Life' (1900); 'Half-Hours with Nature' (1901).

Holds'worth, Annie E., English novelist: b. Jamaica. She was married to Eugene Lee-Hamilton, the poet, in 1898. She has been co-editor of 'The Woman's Signal,' with Lady Henry Somerset, and is the author of the popular novels: 'Joanna Traill, Spinster'; 'The Years that the Locust Hath Eaten'; 'Spindles and Oars'; 'The Gods Arrive' (1897); etc.

Hole, Samuel Reynolds, English Anglican clergyman: b. 5 Dec. 1819; d. Rochester, Eng., 27 Aug. 1904. He was educated at Oxford, took orders, was ordained in 1845 and was vicar of Caunton, 1845–87. From 1887 he was dean of Rochester Cathedral. He visited the United States on a lecture tour in 1896, where his humorous, anecdotical lectures were very popular. He was a recognized authority on rose culture and wrote: 'A Book about Roses,' which has reached its 15th edition; 'The Memories of Dean Hole'; 'More Memories'; 'Addresses to Working Men'; 'A Little Tour in America'; 'Our Gardens' (1899); 'Then and Now' (1901); etc.

Hole, William, English painter: b. Salisbury 7 Nov. 1846. He was destined for the profession of engineering but after a journey to Italy turned his attention to art. He studied at the Edinburgh school of art, and in 1889 was elected member of the Royal Scottish Academy. His versatility is shown by the excellence of his work in portrait, genre and fresco, while as an engraver he has made many famous plates after such masters as Millet, Constable and Millais. Among his best known paintings are: 'The End of Forty-Five' (1879); and 'News of Flodden' (1886).

Holguin, ōl-gēn', Cuba, city in the province of Santiago de Cuba; about 25 miles by rail south by west of Gibara, its port; and 70 miles northwest of the city of Santiago de Cuba. Fertile agricultural lands are in the vicinity, also on the southwest is a hilly section bordering on the interior mountain range. A noted cave is in the vicinity. The trade is chiefly in sugar-cane and tobacco. Pop. 6,500.

Hol'ibut. See Halibut.

Hol'iday, any day set apart as a religious or national festival. (See Festivals.) Certain days are fixed by law as bank-holidays for England and Scotland, and it is enacted that all business transactions which would have been valid on any such holiday shall be held as valid if performed on the day following. Thus, when a bill of exchange becomes due, or notice of dishonor falls to be given, on a bank-holiday, the bill is payable, or the notice stands good on the following day. The days fixed for England are Easter Monday, the Monday in Whitsun Week, the first Monday in August, and the 26th of December if a week-day. These are in addition to Christmas Day, Good Friday, and other holidays previously established. The days fixed as bank-holidays for Scotland are New Year's

Day, Good Friday, the first Monday of May, the first Monday of August, and Christmas Day; and if either New Year's Day or Christmas Day falls on a Sunday, the Monday after is held as a holiday. The same act empowers the sovereign to appoint by proclamation a special day to be observed as a bank-holiday, and to alter by order in council any of the days settled by the act.

In the United States there is no national holiday, not even 4 July. The 53d Congress passed an act making Labor Day a public holiday in the District of Columbia, and various States have followed with a similar act. The proclamation of the President designating a day of Thanksgiving only makes it a legal holiday in the District of Columbia and in the Territories. New Year's Day is a legal holiday in all the States except Massachusetts, Mississippi, and New Hampshire. Lincoln's Birthday (12 Feb.) is a legal holiday in Connecticut, Illinois, Minnesota, New Jersey, New York, North Dakota, Pennsylvania, Washington, and Wyoming. Washington's Birthday (22 Feb.) is a legal holiday in all the States except Mississippi. Decoration Day (30 May) in all the States except Alabama, Florida, Georgia, Idaho, Louisiana, Mississippi, North Carolina, South Carolina, and Texas. Independence Day (4 July) in all the States and Territories. Labor Day (in general, the first Monday in September) in all the States except Arizona, Mississippi, Nevada, and North Dakota. Election Day and Christmas Day are generally observed as legal holidays in all the States and Territories. There are various States holidays, such as Patriot's Day (19 April) in Massachusetts, Pioneer's Day (16 Aug.) in Utah, All Saints' Day (1 Nov.) in Louisiana, Admission Day (9 Sept.) in California, and Confederate Memorial Day (10 May) in North and South Carolina. Every Saturday after 12 o'clock noon is a legal holiday in New York, New Jersey, Pennsylvania, Maryland, Tennessee, Virginia, in the city of New Orleans and in Newcastle County, Delaware.

Holinshed, hŏl'ĭnz-hĕd, **Raphael** or **Ralph,** an English chronicler: d. about 1580. He is only known by his 'Chronicles of Englande, Scotlande, and Irelande,' the first edition of which, known as the "Shakespeare edition," because it is the one the poet is supposed to have used in collecting material for his historical plays, was published in London in 1577. In the preparation of this work Holinshed was assisted by several of the most learned men of the day.

Holl, Frank, English portrait and genre painter; son of Francis Holl, an eminent engraver: b. London 4 July 1845; d. there 31 July 1888. He was a very successful student at the Royal Academy, and exhibited constantly from his student days. Among his best-known pictures are: 'Faces in the Fire'; 'Fern-Gatherers'; 'No Tidings from the Sea'; 'Leaving Home'; and the 'Gifts of the Fairies.' In the later portion of his career he devoted himself to portraiture, in which he greatly excelled, and painted many of the celebrities of the day.

Holland, Edmund Milton, American actor: b. New York 7 Sept. 1848. He began his professional career at Barnum's Museum in 1866, was later for 13 years a member of Lester Wallack's company, and as a member of the Madison Square company from 1882 created the parts of Captain Redwood in 'Jim the Penman,' Colonel Moberley in 'Alabama,' and the title-role in 'Colonel Carter of Cartersville.' In 1895–7 he starred with his brother Joseph, and later (1901) appeared as Eben Holden in the dramatization of Irving Bacheller's book of that name.

Holland, Frederic May, American author: b. Boston 2 May 1836. He was graduated from Harvard in 1859, entered the ministry of the Unitarian Church in 1862, but resigned in 1874. His publications include: 'The Reign of the Stoics' (1879); 'Frederick Douglass, the Colored Orator' (1895); and 'Liberty in the Nineteenth Century' (1899).

Holland, Henry Richard Vassall Fox, 3d Lord, English statesman: b. Wiltshire 21 Nov. 1773; d. 22 Oct. 1840. He succeeded to the peerage by the death of his father when less than one year old. In 1798 he took his place in the House of Lords, and as the nephew of Charles James Fox was at once acknowledged as a Whig leader. In 1806 he was commissioner for settling disputes with the United States; was lord privy seal in 1806–7; and chancellor of the duchy of Lancaster. He made Holland House the resort of the wit, talent, and beauty of his day. He was the author of: 'Life of Lope de Vega' (1806); 'Three Comedies from the Spanish' (1807); 'Foreign Reminiscences' (1850); 'Memoirs of the Whig Party' (1852).

Holland, John P., American inventor: b. 1841. As one of the most successful designers in the interesting field of submarine navigation, Holland is well known. His first boat was built in 1875; a second was launched in 1877, and a third in 1881. After a series of severe tests, the Holland boat was ordered by the United States government for the navy in 1900. In 1903 eight of the submarines were put in commission. These have a speed varying from 8.87 to 8 knots, a horse-power of 160 (with one exception), and a displacement in general of 122.55 tons. For some time the inventor was interested in the Holland Submarine Boat Company, but from this he has now retired to devote his time independently to submarines and flying devices. His more recent designs call for smaller and more compact vessels, with much less complicated mechanism, power of remaining longer submerged, and increased safety in operation. See Submarine Navigation, History of.

Holland, Josiah Gilbert, American editor and author: b. Belchertown, Mass., 24 July 1819; d. New York 12 Oct. 1881. He began the study of medicine in 1840, in 1844 was graduated from the Berkshire Medical College, and entered practice at Springfield, Mass. The years that followed were discouraging, for patients did not come to the young doctor. With true Yankee versatility he turned his hand to anything,—taught district school, was a traveling writing-master, and a daguerreotypist. Of his boyish mortification at being a mill hand he has written in 'Arthur Bonnicastle.' He tried editorial work, and started 'The Bay State Weekly Courier,' which ran for six months. Subsequently he taught at Richmond, Va., and for 16 months

was superintendent of public schools at Vicksburg, Miss. All these varied experiences gave him the knowledge of American life and appreciation of workaday struggles which later made the value of his poems, essays, and novels. In 1849–66 he was assistant editor of the Springfield *Republican*, and from 1851 also part owner of that journal. It was largely due to his influence that the *Republican* became so widely known and popular a journal. In it his 'Letters to Young People Married and Single: By Timothy Titcomb' first attracted readers by their vivacious style, moral sincerity, and good common sense. Later, in book form (1858) they had a great and immediate success.

In 1870 Dr. Holland was one of the founders and became editor of 'Scribner's Monthly,' later the 'Century Magazine,' and the editorship of this periodical he retained till his death in 1881. Holland's novels: 'Arthur Bonnicastle' (1873); 'Sevenoaks' (1876); and 'Nicholas Minturn' (1877), although showing his quick and sympathetic observation and containing fine passages, have been less popular than his poems. The latter, in their constant appeal to the moral sense, and in their accurate portrayal of the homely and picturesque in New York life, found many admirers. Several of the short lyrics, with 'Bittersweet' (1858); 'Kathrina' (1868), and 'The Mistress of the Manse' (1871), came as messages of an American poet who understood and honored his own people. Consult the 'Life' by Plunkett (1894).

Holland, Thomas Erskine, English jurist: b. Brighton 17 July 1835. He studied at Oxford, was called to the bar in 1863, in 1874 became a reader in English law at Oxford, and shortly afterward professor of international law. The University of Perugia appointed him to an honorary professorship in recognition of his attainments. His best-known work is his 'Elements of Jurisprudence' (1880; 9th ed. 1900), to which was awarded the Swinney prize (1894), decennially bestowed for the best book published on jurisprudence, and which is now a standard text-book in England and the United States. He wrote further: 'An Essay on Composition Deeds' (1864); 'Essays on the Form of the Law' (1870); 'The European Concert in the Eastern Question' (1885); 'Studies in International Law' (1898), and other works.

Holland, William J., American Presbyterian clergyman and educator: b. Jamaica, W. I., 16 Aug. 1848. He was graduated from Amherst College in 1869, from the Princeton Theological Seminary in 1874, entered the ministry of the Presbyterian Church, and was a pastor at Pittsburg, Pa., in 1874–91. In 1891–1901 he was chancellor of the Western University of Pennsylvania (Allegheny), and in 1897 was appointed director of the Carnegie Museum at Pittsburg. In 1887 and 1889 he was naturalist of the United States eclipse expeditions to Japan and West Africa respectively. A recognized authority on museum administration and zoology, he wrote numerous scientific papers in learned publications, and 'The Butterfly Book' (1898).

Holland, a popular designation for the Kingdom of the Netherlands, derived from the provinces of North and South Holland, formerly constituting a feudal countship allied to the Holy Roman-German Empire, and from 1806–10 with other parts of the Netherlands, Hanover, and Oldenburg, ruled by Louis Bonaparte as the Kingdom of Holland. The region is the seat of the hardy and industrious Dutch race and of the Dutch language called by the natives *Neder-duitsch*, a dialect of Low German phonology, with evolutionary periods of Old, Middle, and Modern, and an interesting historical and varied literature. See NETHERLANDS.

Holland, Mich., city, in Ottawa County, at the head of Black Lake, which is really an arm of Lake Michigan, and on the Père Marquette railroad; about 80 miles west of Lansing and 25 miles southwest of Grand Rapids. It has direct communication by steamers with Chicago, Milwaukee, and other lake ports. Holland was settled in 1847 by a Dutch colony, and many of its inhabitants are of Dutch descent. In 1867 it was chartered as a city. It is located in an agricultural region, once a lumber section. The manufactures are largely articles made of wood, but the beet-sugar industry is growing in importance. The chief manufacturing establishments are planing-mills, furniture, tub, and basket factories, flour-mills, tanneries, wood-working machinery shops, pickling-plants, beet-sugar factory, grain elevators, and creameries. The manufacture of launches is also an important industry of Holland. The trade is chiefly in the manufactures, and in grain and vegetables. The city owns and operates the electric-light plant and the waterworks. Holland is the seat of the Western Theological Seminary and of Hope College, both under the auspices of the Reformed Church in America. It has a number of fine public buildings, and a free public library. The summer resorts on Black Lake add to the industrial wealth of the city. Pop. (1890) 3,945; (1900) 7,790.

Holland-linen, a fine and close fabric, so called from its first being manufactured in Holland; also a coarser linen fabric, unbleached or dyed brown, used for covering furniture, carpets, etc.

Hol'lander, Jacob H., American economist: b. Baltimore, Md., 23 July 1871. He was educated in the Baltimore schools and graduated from Johns Hopkins University in 1891, receiving his Ph. D. degree in 1894. His ability as economist and financier was soon recognized, and he became associate professor of finance at Johns Hopkins. In 1897 he was appointed secretary of the Bimetallic Commission abroad and was chosen chairman of the Baltimore municipal lighting commission in 1900. In the same year the secretary of war appointed him special commissioner to revise the laws relating to taxation in Puerto Rico, and while engaged in this service he was made treasurer of Puerto Rico by President McKinley.

Hollar, Wenzel or **Wenceslaus,** vĕnt'zĕl or wĕn'sĕs-lâs hŏl'lär, Bohemian engraver: b. Prague 13 July 1607; d. London 28 March 1677. He accompanied the Earl of Arundel, English ambassador to Germany, to London, who employed him to engrave some of the pictures of his collection. Among his numerous works, which are greatly esteemed for their delicate,

firm, and spirited execution, and which include some 2,740 plates, are the set of 28 plates, entitled, 'Ornatus Muliebris Anglicanus,' representing the dresses of Englishwomen of all ranks and conditions in full-length figures; Holbein's 'Dance of Death,' etc.

Holleben, hŏl'lā-bĕn, **Theodore von,** German diplomat: b. Stettin, Pomerania, 16 Sept. 1838. He was educated at the universities of Heidelberg, Berlin, and Göttingen; became an officer in the Body-Guard Hussar Regiment; and took a distinguished part in the Franco-Prussian War. He entered the diplomatic service in 1872; was *chargé d'affaires* at Peking, China, 1873–4, and at Tokio, Japan, in 1875; minister at Buenos Ayres in 1876–84; at Tokio 1885-9; and at Washington, D. C., 1892-3. In 1897 he became ambassador extraordinary and plenipotentiary to the United States. At the command of Emperor William he, together with Secretary Hay, of the State Department, had charge of the arrangements for the official reception of the emperor's brother, Admiral Prince Henry, in February 1902. Failing health caused his resignation, and in 1903 he was succeeded by Baron Speck von Sternberg.

Hol'ley, Alexander Lyman, American engineer: b. Lakeville, Conn., 20 July 1832; d. Brooklyn, N. Y., 29 Jan. 1882. He was graduated at Brown University in 1853, and became editor of 'The Railroad Advocate' in 1856, changing its name to 'The American Engineer.' He introduced into the United States in 1865 the Bessemer steel process, erecting the first Bessemer works in the country at Troy, N. Y. He was lecturer on the manufacture of iron and steel at Columbia University 1879–82. Holley secured many patents, the most important probably being that for the detached converter-shell, an improvement in the Bessemer process. He published with Z. Colburn: 'Railway Economy: a Report on European Railways' (1858); 'American and European Railway Practice' (1860); 'A Treatise on Ordnance and Armor' (1865); etc. In 1890 a bronze bust of Holley was placed in Washington Square, New York, by the mechanical engineers of the United States and Europe.

Holley, Marietta, American author, known by her pseudonym, "Josiah Allen's Wife": b. near Adams, Jefferson County, N. Y., 1844. She began her literary career as a contributor to the 'Christian Union,' the 'Independent,' 'Peterson's Magazine,' and other periodicals; and in 1873 published her first book, 'My Opinions and Betsy Bobbet's,' which in a measure recalled the 'Widow Bedott Papers' of F. M. Whitcher. This was followed by a series of works containing many touches of distinctive and genuine humor: 'Samantha at the Centennial' (1876); 'My Wayward Pardner' (1880); 'Miss Richard's Boy' (1882); 'Sweet Cicely' (1885); 'Miss Jones's Quilting' (1887); 'Samantha at Saratoga' (1887); 'Poems' (1887); 'Samantha Among the Brethren' (1891), considered by many her best volume; 'Samantha at the World's Fair' (1893), and others. Her writings have had large sale, and been translated into several foreign tongues.

Hollidaysburg, hŏl'ĭ-dāz-bĕrg, Pa., borough, county-seat of Blair County: on the Juniata River, and the Pennsylvania railroad; about 82 miles east of Pittsburg and five miles south of Altoona. Rich coal-fields, iron-ore beds, and limestone quarries are in the vicinity. The chief manufactures are foundry products, agricultural and mining implements, nails, and furniture. Hollidaysburg Female Seminary is a prosperous institution. Pop. 3,000.

Hol'lins, Alfred, English musician: b. Hull 1865. He was born blind, and was educated at an institution for the blind in York, and at the Royal Normal College for the Blind in Upper Norwood, where he specialized in music (piano and organ); he also studied music in Germany. He was popular at the English and German courts, where he gave recitals; and was for a time organist at the United Free Saint George's Church in Edinburgh. He visited America in 1886 and 1888, and his organ compositions are widely known and liked throughout the United States.

Hollins, George Nichols, American naval officer: b. Baltimore, Md., 20 Sept. 1799; d. there 18 Jan. 1878. He entered the navy as midshipman in 1814, and while assigned to the President, Stephen Decatur, was captured by the English and held prisoner at Bermuda until the conclusion of peace. He served also in the Algerine war of 1815, later assumed command of an East Indiaman, and in 1844 attained commander's rank. In 1855, on complaint of American residents who claimed they had been injured by the local officials, he bombarded Greytown, Nicaragua. At that time Nicaragua was under English protection, and the property and lives of English residents having been imperilled, international complications with Great Britain arose. Hollins was commissioned commodore in the Confederate navy at the outbreak of the Civil War, attacked the Federal blockading squadron at the passes of the Mississippi River, and was appointed flag-captain of the New Orleans station. He was superseded in 1862.

Hol'lister, Cal., town, county-seat of San Benito County; on the Southern Pacific railroad; about 80 miles southeast of San Francisco, and 35 miles east by south of Santa Cruz. It is situated in a rich agricultural region, noted for its fruit. The chief industrial interests of the town are connected with dairying, fruit-growing, and the shipment of grain and live-stock. Pop. (1900) 2,315.

Holloway, hŏl'ō-wā, **Laura Carter,** American author: b. Nashville, Tenn., 22 Aug. 1848. She was at one time editor of the 'Home Library Magazine' of Chicago, Ill., was for 12 years associate editor of the Brooklyn *Daily Eagle*, and collaborated with Anton Seidl in the preparation of musical terms for the 'Standard Dictionary.' She wrote: 'Ladies of the White House' (1870); 'The Mothers of Great Men and Women' (1884); 'The Home in Poetry' (1884); 'Chinese Gordon' (1885); 'The Buddhist Diet Book' (1887); and other volumes.

Holloway, Thomas, English patent medicine proprietor and philanthropist: b. Devonport 22 Sept. 1800; d. Tittenhurst 26 Dec. 1883. About 1837 he began to sell his well-known ointment, and soon afterwards brought his pills to the notice of the public. He ultimately

succeeded in amassing a very large fortune which he partly devoted to benevolent objects. The Royal Holloway College for Women, on the equipment and endowment of which he expended about $4,000,000 was opened on 30 June 1886. It contains a collection of pictures valued at $500,000. Near it is a sanitorium founded by him for the mentally afflicted of the lower middle class.

Holls, hōlz, **George Frederick William,** American lawyer and statesman: b. Zelienople, Pa., 1 July 1857; d. Yonkers, N. Y., 23 July 1903. He was graduated from Columbia in 1878, and from the law school there two years later. He was admitted to the bar and established a large law practice in New York city, becoming senior member of the firm of Hollis, Wagner & Burghard; in his later life he visited Europe frequently and became widely known there, especially in Germany where he established a branch of his law firm. He was prominent in philanthropic work, being for years an officer of the Legal Aid Society and a director of the Charity Organization Society. He was also an active member of the Republican party, and much in demand as a campaign speaker, especially as he could address the Germans in their own language. In 1893 he was a delegate-at-large to the New York Constitutional Convention, where he was chairman of the committee on education, a member of the committee on cities, and author of several amendments. His frequent visits abroad gave him a wide and intelligent interest in international questions, and at the time of the Hague Conference he was very influential in arousing interest and obtaining a large delegation from the United States. He was secretary of the American delegation at the Conference (1899), was the American member of the committee which drafted the arbitration treaty, and author of the clause on "Special Mediation." He was afterward appointed a member of the permanent international court of arbitration. A few months before his death President Roosevelt asked him to umpire the adjustment of claims between Germany and England and Venezuela, but he declined. He has written: 'Sancta Sophia and Troitza' (1888); 'Compulsory Voting' (1891); and 'The Peace Conference at the Hague and Its Bearings on International Law and Policy' (1900).

Hol'ly, James Theodore, American Protestant Episcopal bishop: b. Washington, D. C., 3 Oct. 1829. He was of African Roman Catholic parentage, but withdrawing from the Roman Catholic Church, entered the Episcopal Church in 1851, studied for the ministry and in 1856 became rector of St. Luke's, New Haven, Conn. In 1874 he became missionary bishop of Haiti.

Holly. See AQUIFOLIACEÆ.

Holly Springs, Miss., a point on the Mississippi Central Railroad, about 40 miles southeast of Memphis and about 25 miles south of Grand Junction, on the Memphis & Charleston Railroad, and an important strategical point. After the battle of Iuka, 19 Sept. 1862, and the Confederate defeat at Corinth, 3-4 Oct. 1862, the Confederates fell back to Holly Springs. Early in November Gen. Grant had concentrated an army of 30,000 men in the vicinity of Grand Junction to make a movement along the line of the Mississippi Central Railroad in the direction of the rear of Vicksburg. On 8 November Gen. McPherson, with 10,000 infantry and 1,500 cavalry, advanced from Grand Junction southward and pushed the Confederates under Gen. Pemberton back to Holly Springs. The main body of Grant's army moved forward, and Pemberton, abandoning Holly Springs, fell back to Grenada, Grant following to Oxford, 30 miles beyond Holly Springs. There he arrived 5 December, and arranged with Gen. Sherman a combined movement on Vicksburg. Grant was to move directly south on the line of the railroad and take the place in rear; Sherman to move a force from Memphis, accompanied by a gunboat fleet, to descend the Mississippi and attack in front. A depot of supplies was established at Holly Springs, guarded by Col. Murphy, with two regiments of Wisconsin infantry and a regiment of Illinois cavalry, and Grant was about to move forward from Oxford, when Gen. Earl Van Dorn, at the head of 3,500 cavalry, dashed into Holly Springs at daylight, 20 December, and attacked Murphy, who had been warned of the impending danger on the 19th, but neglected to take the necessary precautions and was surprised. He made a feeble resistance and surrendered his infantry; the cavalry cut its way out and escaped with the loss of only seven men. Van Dorn took about 1,500 prisoners, destroyed stores to the value of $1,500,000, and left town in the afternoon. This disaster, in connection with Forrest's raid into West Tennessee, which destroyed Grant's communication, forced him to abandon his movement on Vicksburg and fall back to Grand Junction, leaving Pemberton at liberty to concentrate his forces at Vicksburg against Sherman. Sherman was informed of Grant's failure, but the information reached him after his bloody repulse at Chickasaw Bluff, 27–28 Dec. 1862. Consult: 'Official Records,' Vol. XVII.; Greene, 'The Mississippi.'

E. A. CARMAN.

Hol'lyhock, a tall and rather coarse flowering plant (*Althæa rosea*) of the mallow family, said to be a native of China, but now cultivated all over the world as an ornament of old-fashioned gardens. It rises in a single leafy stalk, sometimes to the height of six or eight feet, studded with large single or double flowers, in varieties from white to yellow, scarlet and purple. Although rather difficult to start and slow of growth, it remains a hardy and easily nurtured perennial of highly effective beauty when suitably placed.

Holm, Saxe, a pseudonym affixed to a collection of 'Stories' (1st series 1874; 2d 1878), originally published in 'Scribner's Monthly' and generally believed to be by Helen Hunt Jackson (q.v.).

Holman, hōl'man, **William Steele,** American politician: b. Veraestau, Dearborn County, Ind., 6 Sept. 1822; d. Washington, D. C., 22 April 1897. He studied at Franklin College (Ind.), was admitted to the bar, and began practice at Aurora, Ind. In 1847–9 he was prosecuting attorney, in 1850 a member of the State Constitutional convention, in 1851–2 of the State legislature. He was a judge of the court of common pleas in 1852–6, in 1856 was elected as a Democratic representative to Con-

gress, where with the exception of eight years, he served until his death. His vigilance in opposing unnecessary appropriations and doubtful measures obtained for him the sobriquets of "The Watchdog of the Treasury," and "The Great Objector."

Holman-Hunt, William. See HUNT, WILLIAM HOLMAN.

Holmes, hōmz, **Abiel,** American Unitarian clergyman and annalist: b. Woodstock, Conn., 24 Dec. 1763; d. Cambridge, Mass., 4 June 1837. He was graduated at Yale College in 1783, and became subsequently a tutor in the college, pursuing at the same time his theological studies. In 1785 he was settled over a parish at Midway, Ga., where he remained till 1791. Returning north he became pastor of the first parish in Cambridge, and continued to fill the office till 26 Sept. 1832. Besides publishing a 'Life of President Stiles' in 1798, he was the author also of 'Annals of America' (1805), which gave him a high reputation for care and accuracy. It was republished in England in 1813. He contributed frequently to the collections of the Massachusetts Historical Society, in Vol. XXVII. of which will be found a complete list of his publications.

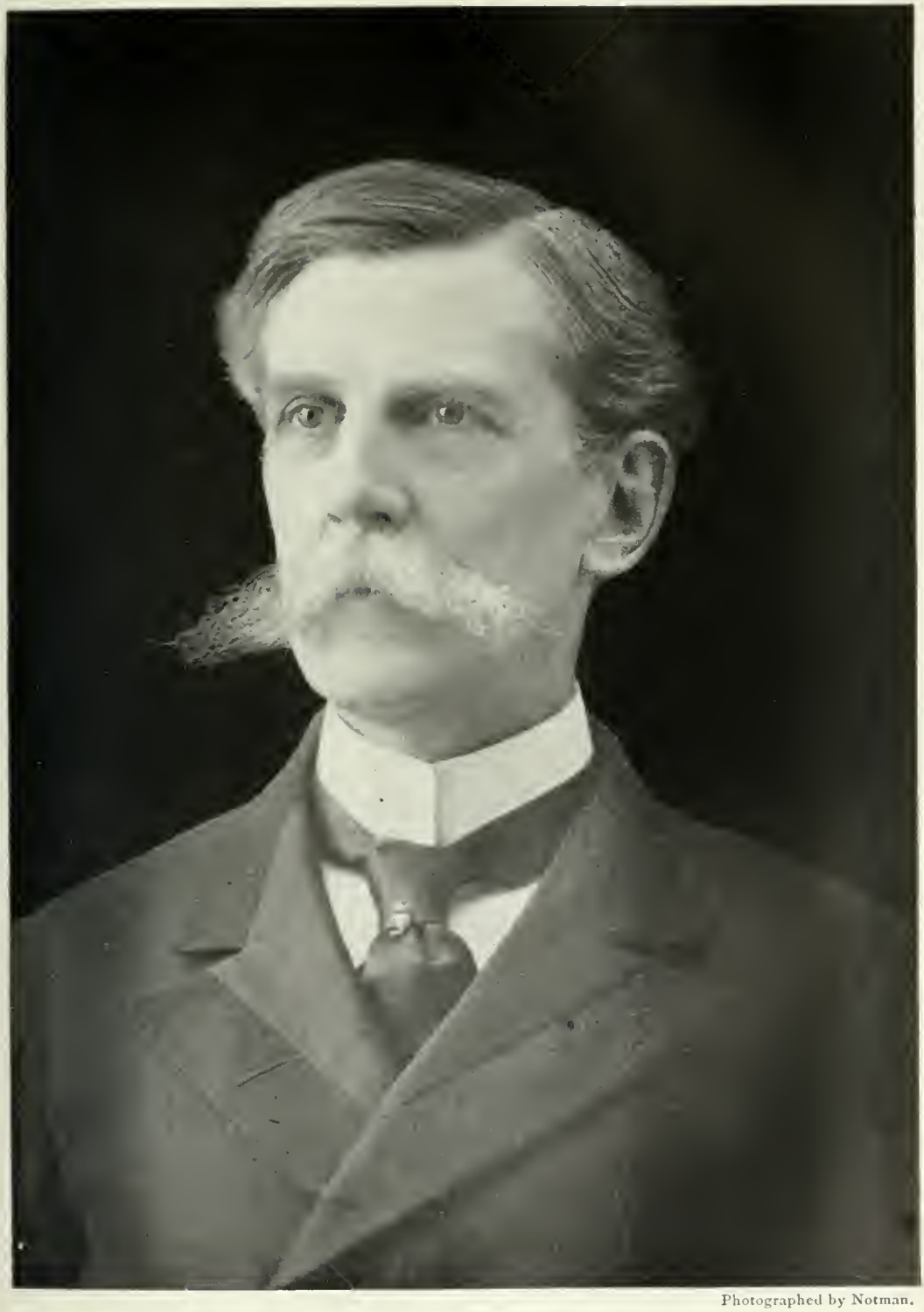
Holmés, ō-mēs', **Augusta Mary Anne,** French composer: b. Paris 1847; d. there Jan. 1903. She studied composition with Lambert, Klose, and César Franck, and began her career as a pianist. Her first work of magnitude was a setting of the psalm 'In Exitu,' sung for the first time in 1873. She later wrote considerable music, including 100 songs, characterized by much grace of expression. In the larger forms her compositions include the well-known symphony 'Hero et Léandre'; three other symphonies, 'Lutèce,' which in 1879 won third prize in an open competition directed by the Paris municipality. 'Les Argonautes' and 'Irlande'; the symphonic poems, 'Les Sept Ivresses,' 'Roland,' 'Pologne,' 'Au Pays Bleu'; an ode of triumph, 'Patrie'; a four-act lyric opera, 'Le Montagne Noire' (Grand Opera 1895), and an allegorical cantata, 'La Vision de la Reine.'

Holmes, Burton, American traveler and lecturer: b. Chicago 8 Jan. 1870. After a secondary education at Chicago he traveled in all the countries of continental Europe, as well as in Japan, Algeria, Tunis, Morocco, Corsica, Greece, and Thessaly, Hawaiian Islands, the Yellowstone Park, the Grand Cañon of the Colorado, the Philippines, and China. About 1890 he became known as a platform lecturer, giving in popular form the results of his observations.

Holmes, Mary Jane Hawes, American novelist: b. Brookfield, Mass. She was married to Daniel Holmes, a lawyer of Brockport, N. Y., where she has since resided. She has published many volumes of domestic fiction which have had an extraordinarily wide circulation but in which the literary element is slight. Among her novels are: 'Tempest and Sunshine' (1854) (perhaps the best known of them all); 'Lena Rivers' (1856); 'Marian Gray' (1863); 'Milbank' (1871); 'Queenie Hetherton' (1883).

Holmes, Nathaniel, American jurist and Shakespearian scholar: b. Peterboro, N. H., 2 Jan. 1815; d. Cambridge, Mass., 26 Feb. 1901. He was graduated from Harvard in 1837 and after admission to the bar in 1839 began to practise in St. Louis. He was judge of the supreme court of Missouri 1865–9, and Royall professor of law at Harvard 1868–72. He retired from his profession in 1883 and henceforth devoted himself to study and authorship. He was a strong believer in the Baconian theory of the origin of Shakespeare's plays, which he defends in his work, 'The Authorship of Shakespeare' (1866). In 1888 he published 'Realistic Idealism in Philosophy Itself.'

Holmes, Oliver Wendell, American poet, essayist and physician: b. Cambridge, Mass., 29 Aug. 1809; d. Boston, Mass., 8 Oct. 1894. He was the son of Rev. Abiel Holmes (q.v.), minister of the first parish in Cambridge, and on the maternal side was a descendant of Anne Bradstreet (q.v.) and related to the orator Wendell Phillips, the poet Richard Henry Dana, and the theologian, Dr. Channing. He was educated at Phillips Academy, Andover, and at Harvard, and was graduated from the latter in 1829 in a class which contained several who afterward became famous. In the next year he became well known through his poem 'Old Ironsides,' first published in the Boston *Advertiser,* and which prevented the breaking up of the famous frigate Constitution. He spent a year in the Harvard Law School but soon turned his attention to medicine and after studying in Paris three years returned to America where he received his degree of M.D. in 1836, the same year in which his first volume of poems appeared. He was professor of anatomy and physiology at Dartmouth College 1839–40. He married in the last named year and established a practice in Boston, becoming in 1847 professor of anatomy and physiology in the Harvard Medical School, a post which he resigned in 1882, when he was at once made professor emeritus. In 1849, and for several succeeding years, he made his summer home at Pittsfield, Mass., the scene of his novel 'Elsie Venner.' He was one of the first contributors to the 'Atlantic Monthly' when it was established in 1857, the opening chapter of his 'Autocrat of the Breakfast Table' appearing in the first issue. It is this work, which has found innumerable readers both at home and abroad, by which he will be longest remembered. These brilliant, conversational papers were followed in 1859 by a similar series, 'The Professor at the Breakfast Table.' and these in 1872, by 'The Poet at the Breakfast Table.' Many of his best poems were scattered through these volumes. In 1861 appeared his novel 'Elsie Venner: a Romance of Destiny,' and in 1868 'The Guardian Angel,' a less striking fiction than its predecessor, but like that exhibiting a remarkable series of studies of character. 'A Mortal Antipathy' (1885) was his only other essay in fiction. His volumes of verse 'Urania' (1846), and 'Astrea' (1850), had made him well known as a poet ere he appeared before the public as the kindly breakfast table autocrat, and he continued to write poetry at frequent intervals for the rest of his life. He was especially happy as the poet of occasions, but much of his verse, witty and sparkling as it is, is ephemeral from its very nature and not destined to endure. In such serious poems,



Photographed by Notman.

OLIVER WENDELL HOLMES,

ASSOCIATE JUSTICE OF THE UNITED STATES.

however, as: 'The Chambered Nautilus'; 'The Voiceless'; 'The Last Leaf'; 'The Iron Gate'; and one or two hymns, he takes high rank among the poets of his time, while such poems as 'The One Hoss Shay'; 'Evening, By a Tailor,' and 'Parson Turell's Legacy,' to name no others, are inimitable examples of humorous verse. His later collections of poems comprise: 'Songs in Many Keys' (1861); 'Songs of Many Seasons' (1875); 'The Iron Gate' (1880); and 'Before the Curfew' (1887). As a physician and medical lecturer he was very successful, and among his purely professional works may be named: 'Lectures on Homeopathy and Its Kindred Delusions' (1842); 'Currents and Counter Currents in Medical Science' (1861); 'Border Lines in some Provinces of Medical Science' (1862); 'Medical Essays,' a reissue of some of his earlier work (1883). Still other volumes by Dr. Holmes are: 'Soundings from the Atlantic' (1864), a series of essays originally contributed to the 'Atlantic Monthly,' where the bulk of his writing first appeared; 'Mechanism in Thought and Morals' (1871); lives of 'John Lothrop Motley' (1879); and 'Ralph Waldo Emerson' (1884); 'Our Hundred Days in Europe' (1888); a sprightly record of a short visit to England in 1886, on which occasion honorary degrees were conferred upon him by the universities of Cambridge, Oxford and Edinburgh; and 'Over the Teacups' (1891). His 70th birthday was celebrated by a breakfast given in his honor by the publishers of the 'Atlantic Monthly,' and on this occasion the poet read his poem 'The Iron Gate,' which many persons have considered even finer than 'The Chambered Nautilus' which Holmes himself preferred to any other verses of his. At its best Holmes's prose style is thoroughly admirable, characterized as it is by an unerring sense of the value of words and their fitness for conveying a desired impression, and illumined by the interfused play of a delicate fancy and the most sparkling humor. Next to 'The Autocrat' must be ranked 'The Guardian Angel' among his prose works, the same kindly tolerant spirit being dominant in both, and the same shrewd, wholesome perception of character. In much of his earlier poetry, excepting in his lyrics, Holmes uses the formal ten-syllabled iambic pentameter of the 18th century, but in his hands the measure seems at times more flexible than when used by Pope and his school, and it is at all events relieved from solemnity by his ever present humor. 'Urania' is the best-known of his earlier efforts in this manner, and 'The Schoolboy' (1878) his most notable later one, this latter having been written for the centennial anniversary of Phillips Academy at Andover. Holmes's special characteristic was kindliness, which found its expression as well in his verse as in his prose, and in his ordinary living. He could be keenly satirical on occasion but he never became in the least cynical. Perhaps no American writer, not even Longfellow or Lowell, ever won the English heart so completely as Holmes. Longfellow found a wide hearing in England for his poetry, it is true, and Lowell was thoroughly appreciated by the upper class Englishman of his time, but Holmes was the most generally beloved of the three. In his own country Holmes's gentle, tolerant writing did not a little toward softening the asperities of controversy and liberalizing unconsciously the heart of Puritan New England. Consult: Morse, 'Life and Letters of Oliver Wendell Holmes' (1896); and lives by Kennedy (1883); E. E. Brown (1884).

Holmes, Oliver Wendell, Jr., American jurist: b. Boston 8 March 1841. He was graduated from Harvard in 1861, and in the same year entered the army as lieutenant of the 20th Massachusetts regiment. He was wounded at the battles of Ball's Bluff, Antietam, and the second battle of Fredericksburg, and was mustered out of the army in 1864, with the rank of brevet lieutenant-colonel. He then studied at the Harvard Law School, and was admitted to the bar in 1866, beginning his practice in Boston. He was editor of the 'American Law Review' (1870–3); became professor at the Harvard Law School in 1882, and in the same year justice in the Massachusetts supreme court; in 1899 he was appointed chief justice of the same court. His decisions in this position gave him wide fame among lawyers, and were characterized by originality and literary finish. In several cases his decisions were in favor of organized labor; his position being that workingmen had a right to combine and to "support their interests by arguments, persuasion, and the bestowal or refusal of those advantages which they otherwise lawfully control, so long as they do no violence or threaten no violence." In August 1902, he was appointed a member of the United States Supreme Court. He has published: 'The Common Law' (1881), lectures delivered before the Lowell Institute; and a collection of speeches (1900); he also edited the 12th edition of Kent's 'Commentaries' (1873).

Holmes, Theophilus Hunter, American soldier: b. Sampson County, N. C., 1804; d. near Fayetteville, N. C., 21 June 1880. He was graduated from the United States Military Academy in 1829, served in the Florida war, the occupation of Texas, and the Mexican War, and at the beginning of the Civil War was major and superintendent of the general recruiting service. On 22 April 1861, he resigned his commission in the United States army, forthwith was appointed brigadier-general in the Confederate forces, and organized several North Carolina regiments. He was in command at Aquia Creek, and, promoted major-general, was in command of the trans-Mississippi department from September 1862 to March 1863, was commissioned lieutenant-general, and 3 July 1863 lost heavily in an unsuccessful attack on Helena, Ark.

Holmes, William Henry, American geologist: b. Harrison County, Ohio, 1 Dec. 1846. He was graduated at the McNeely Normal College in 1870, in 1872 was made an assistant on the United States geological survey, and in 1880–9 was a geologist on the survey. In 1889–98 he was archæologist to the United States bureau of ethnology, directing explorations, and in 1894–8 also curator of anthropology in the Field Columbian Museum of Chicago, and professor of anthropic geology in Chicago University. In 1898 he was appointed head curator in the department of anthropology in the United States National Museum. His chief works are: 'Archæological Studies among the Cities of Mexico'

(1895); and 'Stone Implements of the Potomac-Chesapeake Tidewater Province' (1897).

Holocaine. See COCAINE.

Holocephali, hŏl-ō-sĕf'a-lī, or **Chimæroidea,** a group of small shark-like fishes of bizarre appearance occurring in the deeper portions of all colder seas, including in all about seven species, five in American waters. They have a cartilaginous skeleton, are of no value as food, and are known to fishermen as rat-fish and elephant-fish (q.v.). The name Chimæra, given to one genus, emphasizes the strange appearance of these fishes. See ICHTHYOLOGY.

Holophytes, hō'lō-fīts. See FUNGI.

Holostei, hō-lŏs'tē-ī, a group of fishes, the bony ganoids, largely fossil, represented by the garpikes. See ICHTHYOLOGY.

Holothuria, hŏl-ō thū'rĭ a, echinoderms of the class *Holothuroidea,* popularly called "sea-cucumbers," from their resemblance in shape and rough skin to that vegetable, in which the body is long, cylindrical, somewhat worm-like, less radiated than other echinoderms with a thick muscular body-wall of longitudinal and transverse muscles. The skin is usually thick, tough, and imbedded in it are in certain forms calcareous plates, wheels and anchors. The mouth is surrounded with a circle of ten branched tentacles, adapted both for respiration and for seizing the food, which consists mainly of foraminifera. The intestine is very long and slender, thus in *Thyone briareus,* which lives in mud and sand on the coast south of Cape Cod, the intestine in an individual three or four inches long is nearly seven feet in length; it opens at the end of the body, and connects with the "respiratory tree," by which the water is introduced into the interior of the body. Unlike other echinoderms the so-called madreporic body is internal. Holothurians move by tubes or ambulacra feet which are filled with water, and when distended act as suckers to drag the animal over the bottom. These suckers are either arranged in five rows or with three rows on the ventral surface, and two above, the latter in some form obsolete, or they are scattered irregularly over the surface of the body, while in *Caudina arcnata* of the New England coast there are no suckers. A tendency to bilateral symmetry is seen in a form like *Psolus,* which has a creeping disk and three rows of suckers on the flattened disk-like under side.

The holothurians undergo a metamorphosis, somewhat like that of the starfish: but the transparent larva called "auricularia," is barrel-shaped; what corresponds to the hoops of the barrel being bands of cilia, while the ear-like projections in certain forms give it the name auricularia. Before the larva is fully grown, the body of the young holothurian begins to bud out from near the side of the larval stomach, the calcareous cross-like plates are deposited, and the tentacles begin to grow out. Finally after the larval body is absorbed the young holothurian sinks to the bottom. The degree of metamorphosis is less marked than in other echinoderms, while in two forms development is direct, the young growing in a marsupium or brood-pouch. A form (*Cladodactyla crocea*) living in the south seas at the Falkland Islands, carries its young in a sort of nursery where they are densely packed in two continuous fringes adhering to the dorsal tubes. Holothurians are remarkable from the fact that when captured they eject their intestine, a new one in time being regenerated. The large forms lying about on the coral reefs are known to harbor a small slender fish (*Fierasfer*) which lodges in their cloaca or in the branchial tree. Many of the species are very large, being nearly two feet in length. A common species on the Florida keys and reefs is *Holothuria floridana;* it lives in water only a few inches deep and can be picked up in large numbers; it is fully 15 inches in length, and lives on foraminifera. It has been collected, dried and a shipload exported to China, but the trepang or beche-de-mer of commerce is either of two species (*H. edulis,* and *H. tremula*) inhabiting the Pacific Ocean (see TREPANG). A California species is also dried and exported by the local Chinese.

The class of *Holothuroidea* is divided into two orders: (1) *Actinopoda* represented by *Holothuria, Cucumaria, Thyone, Psolus,* etc.; and (2) *Paractinopoda,* of which *Synapta* is an example, the common form living in sand at low water on the New England coast being *Leptosynapta girardii.* A few forms inhabit great depths. Remains of holothurians have been found fossil; certain calcareous plates attributed to them occurring in the Carboniferous, Lias, Jura, and Cretaceous strata. Minute calcareous bodies referable to *Synapta,* etc., have been detected in the Paris Eocene limestones.

Holst, hōlst, **Hermann Eduard von,** German-American historian: b. Fellin, Livonia, Russia, 19 June 1841; d. Freiburg, Germany, 20 Jan. 1904. He studied history in Dorpat and Heidelberg and in 1865 traveled through France, Italy, etc. His writings were looked upon with suspicion by the Russian authorities and his further stay in that country becoming unsafe, he removed to the United States in 1866. Here he became American correspondent of the 'Kölnische Zeitung,' and sub-editor of the 'Deutsch-amerikanischer Conversations-Lexicon.' In 1872 he was appointed extraordinary professor of history in the University of Strasburg and in 1874 ordinary professor at Freiburg-im-Breisgau. In 1876 he undertook, with means furnished by the Baden government, a journey to London for the purpose of study and in 1878–9 a similar journey to North America at the expense of the Prussian Academy of Science. In 1892 he accepted an appointment in the University of Chicago. He has published: 'Constitutional and Political History of the United States' (1873); 'The French Revolution Tested by Mirabeau's Career' (1894), etc.

Holstein, hōl'stīn, Germany, a former duchy of Denmark, and member of the Germanic Confederation, since 1866 united to Schleswig-Holstein (q.v.), Prussia.

Holstein Cattle. See DAIRY CATTLE.

Holston, hōl'stŏn, a river which rises in the southwestern part of Virginia, flows south and southwest into Tennessee and unites with the French Broad River about five miles east of Knoxville. The Holston and the French Broad are the head-streams of the Tennessee River. The course of the Holston is through a mountainous country, noted for its beautiful scenery.

It has as tributaries many small mountain streams. Its length is about 200 miles.

Holt, Joseph, American jurist: b. Breckinridge County, Ky., 6 Jan. 1807; d. Washington, D. C., 1 Aug. 1894. He began legal practice at Elizabethtown in 1828, and in 1857 was appointed commissioner of patents. In 1859 he became postmaster-general and in 1860 secretary of war. He was made by Lincoln a judge-advocate general of the army, with colonel's rank, was promoted brigadier, brevetted major-general for distinguished service in the bureau of military justice, and was retired in 1875. With the exception of Cass, he was the only member of Buchanan's cabinet that was not a Confederate sympathizer. Among the courts over which he presided were those before which Fitz-John Porter and Lincoln's assassins were tried.

Hol'ton, Kan., city, county-seat of Jackson County; on the Missouri P., the Chicago, R. I. & P., and the Union P. R.R.'s; about 28 miles north of Topeka and 30 miles west of Atchison. It was settled in 1859 and received its charter in 1870. It is situated in a section noted for good farms. The chief manufactures are flour, wagons, cigars, creamery products, and planed lumber. Its trade is chiefly in wheat, corn, hay, live-stock, and local manufactured products. The government is vested in a mayor, who holds office two years, and a common council. Pop. (1900) 3,082.

Hölty, Ludwig Heinrich Christoph, lood'-vĭg hĭn'rĭH krēs'tŏf hĕl'tĭ, German lyric poet: b. Mariensee, near Hanover, 21 Dec. 1748; d. Hanover 1 Sept. 1776. In 1769 he went to Göttingen to study theology. Here, falling in with Bürger, Voss, the Stolbergs, and other poets of kindred tastes, he became one of the founders of the Göttingen "Hainbund." This league of young enthusiasts was aflame for Klopstock, then considered the greatest German poet for patriotism and for friendship, detested Wieland's sensual poems and his Frenchified manner, read the classics together, and wrote poetry in friendly emulation. Hölty's poems reveal a lovable personality. The strain of sentimentality that runs through all his work is not affectation, as it was with so many of the younger poets of that age in which Rousseau had made sentimentality fashionable, but the true expression of his nature. His range was small; but within its limits his work was excellent, and many of his songs have become the common property of the people. Consult: Voigts, 'Hölty, ein Roman' (1844); Reute, 'Hölty, Sein Leben und Dichten' (1883).

Holub, ho'loob, Emil, Austrian explorer: b. Holics, Bohemia, 7 Oct. 1847; d. Vienna 21 Feb. 1902. At 25 he went to South Africa, where he practised in Kimberley and elsewhere as a physician. Later he became engaged in African exploration and in recognition of his services as an explorer received from the Austrian emperor the Order of the Iron Crown. He published 'Beiträge zur Ornithologie Südafrikas'; 'Sieben Jahre in Südafrika' (1881); 'The Colonization of Africa'; and 'From Cape Town to the Maskukulumbe.'

Holy Alliance, an international league proposed by Alexander I., emperor of Russia, 26 Sept. 1815, after the defeat of Napoleon at Waterloo had cleared the way for the execution of his desire of establishing a settled peace in Europe. Alexander, Francis of Austria, and Frederick William III. of Prussia, signed with their own hands, and without the countersign of a minister, the act establishing this alliance, which is said to have been sent to the two latter in the handwriting of the first. It was not wholly published till 2 Feb. 1816, when the text was given in full in the Frankfort *Journal.* It consisted of a declaration, that, in accordance with the precepts of the gospel of Jesus Christ, the principles of justice, charity, and peace should be the basis of their internal administration, and of their international relations, and that the happiness and religious welfare of their subjects should be their great object. Its real aim, however, was to maintain the power and influence of the existing dynasties. It was also stipulated that the three sovereigns should invite others to become members of the Holy Alliance. In Russia and Germany its principles were not discussed except in a spirit of eulogy, but they were uncompromisingly condemned in Britain by many of her foremost statesmen. On 4 Feb. 1823 both Lansdowne and Brougham openly condemned its doctrines in their places in Parliament. Sir James Mackintosh said of the doctrine of legitimacy, in the sense in which it was used by the Holy Alliance, "Sophistry lent her colors to the most extravagant pretensions of tyranny." The events of 1848 broke up the Holy Alliance. It had previously lost much of its authority from the death of Alexander, and the French revolution of 1830. By a special article of the treaty the members of the Bonaparte family were declared incapable of occupying any European throne.

Holy Cross, College of the, an institution in charge of the Fathers of the Society of Jesus, situated at Worcester, Mass. The school was founded in 1843. It has a preparatory department; and the college grants the usual degrees given by classical and scientific institutions. It is self-supporting; up to 1903 it had received no State aid nor any endowments. It has established six fellowships. In 1903 there were connected with the school 28 professors and instructors, and nearly 400 students. The library contained about 25,000 volumes.

Holy Cross, Mount of the, a peak of the Rocky Mountains, in Eagle County, in the State of Colorado. The peak is about 75 miles southwest of Denver, and 20 miles north by west of Leadville. It is 14,006 feet high.

Holy Day, a day set apart in the Catholic Church for the commemoration of some saint or mystery. It is called "of obligation" when attendance at Mass and abstention from servile works are prescribed.

Holy Ghost, or **Holy Spirit,** the third person in the Holy Trinity. The Roman Catholic Church declares the Son to be begotten by the Father, and the Holy Ghost to have proceeded from both. The Orthodox Greek Church maintains that the Holy Ghost proceeds from the Father only; and this is one of the main points of doctrine on which Roman and Greek Catholics differ. The history of the controversy is shortly this: Tertullian and Origen, two distinguished Fathers of the Church in the 3d century, maintained that the Holy Ghost was begotten by the Father through the Son.

Macedonius, bishop of Constantinople in the middle of the 4th century, denied that the Holy Ghost was equal in essence and dignity to God the Father. The Council of Alexandria in 362 declared this bishop and his adherents, the Pneumatomachists, teachers of heresy; and the general council at Constantinople in 381 declared expressly to the whole Christian Church, that the Holy Ghost was the third person of the Trinity, proceeding from the Father, and to be worshipped equally with the Father and the Son. Augustine taught that the Holy Ghost proceeds from the Father and the Son; and the Council of Toledo, in 589, condemned all who believed otherwise. This new formulation of the dogma occasioned a controversy which lasted from the 8th to the 11th century, between the Western or Latin, and the Eastern or Greek Churches, and finally led to their complete separation. The Anglican Church and the Protestant Episcopal Church in the United States use the Greek form of the Nicene Creed. The worship of the Holy Ghost as the third person in the Godhead is common to both Roman and Greek churches, and to the Protestant Trinitarians, being essential to the faith in the divine Trinity. See CREED: TRINITY.

Holy Ghost Flower, or Holy Spirit Plant. See DOVE PLANT.

Holy Ghost, Order of, a former order of Hospitalers, founded by Guy, son of William, Count of Montpellier, in the 12th century, for the relief of the poor, the infirm and foundlings. In the 18th century it was united with the order of St. Lazarus by Clement XIII. Also the name of the principal military order in France instituted in 1578, abolished in 1789, revived at the Restoration, and finally abolished in 1830.

Holy Land, a name given by Mohammedans to Arabia because it was the birthplace of Mohammed; also by Buddhists to India because it was the country of Sakya Muni. It is a common name of Palestine, because the place where Christ lived when upon earth. See PALESTINE.

Holy Orders, the several ranks of the ministry of a church; also the power or authority to exercise that ministry.

In the Roman Catholic Church Holy Orders is one of the sacraments and there are seven orders of the ministry, viz.: priesthood, deaconate, and sub-deaconate: these are the greater or sacred orders; and the four minor orders of lector, acolyte, exorcist, and doorkeeper. Usually the episcopate is classed, not as a separate order, but as the completion and extension of the priesthood. Though every candidate for the priesthood is inducted into the four minor orders and the sub-deaconate and deaconate before he receives priestly ordination, it happens very seldom that a man enters any of those inferior orders intending to remain therein: they are simply steps to the priesthood.

In the Oriental churches, both those in communion with the Roman See — as the Greek Uniate, the Maronite, the United Armenian, etc., and those which are separated from Rome by schism or by heresy, the number of orders is less than in the Latin Church: in all the foregoing churches only four orders, or, counting the episcopate as a distinct order, five orders are recognized; those of bishop, priest, deacon, and lector: and of these the first three, at least, are held to be of divine institution and sacramental.

By the Anglican Church and the Protestant Episcopal Church of the United States three orders are recognized; those of bishops, priests and deacons: but in the 25th of the Articles of Religion those orders are expressly declared to be no sacrament.

The orders of the Oriental churches are generally recognized as valid by the Church of Rome; and when a priest of any of those churches is received into the Roman Catholic Church he is still regarded as a priest: but an Anglican or a Protestant Episcopal minister enters the Latin Church as a simple layman even though he were in Anglicanism a bishop; for Anglican orders have ever been held by Rome to be invalid.

Other Protestan churches, whether episcopal (as the Lutheran) or presbyterial or congregational, do not regard holy orders (or clerical order) as of divine institution or as setting up any essential difference between minister and layman. See CLERGY.

Holy Roman or German-Roman Empire, a title conferred on the German empire in 962 by Pope John XII. at the coronation in Rome of Otho I., who considered himself the lineal representative of the rulers of the ancient Roman Empire which practically had ceased to exist in 476. The designation ended in 1804 with the accession of Francis II. as hereditary emperor of Austria. See HAPSBURG.

Holy Water, in the Greek and Roman Catholic Churches, water which has been consecrated by prayers, exorcism, and other ceremonies to sprinkle the faithful and things used for the church. Some antiquaries think that the use of holy or lustral water was borrowed from the Jews. The Roman Catholic Church considers holy water not only symbolical of the purity of the soul, but in certain cases as effectual in exorcism. At the entrance of all churches is kept a font of holy water, in which those going in and out dip the fingers and bless themselves. The consecration of holy water takes place on Holy Saturday before Easter Sunday.

Holy Week, or Passion Week, is that which immediately precedes Easter. The name Passion Week rather refers to the days following and exclusive of Palm Sunday, since this day, strictly speaking, does not commemorate any incident of Christ's passion, but his triumphant entry into Jerusalem. The three chief days of the week are Maundy Thursday (or Holy Thursday), Good Friday, and Holy Saturday, the most sacred of all being Good Friday. The observance of Holy Week is of very early origin, and it was known as Great Week, Silent Week, Penitential Week, etc. In the ancient Church of Rome, when any of the ordinary Church festivals falls on this week, it is not observed till after Easter. In Rome it used to be observed with much greater solemnity and penitential rigor than now; for the shops are kept open, concerts and other amusements are given, though the theatres are closed. The washing of the feet of poor men is still practised in Roman Catholic churches; and the pope washes the feet of 13 poor persons, all of whom are priests. In Austria the emperor keeps up the old rite of feet-washing with much ceremony.

Holyoake, hōlī-ōk, **George Jacob,** English political reformer: b. Birmingham 13 April 1817; d. Brighton 22 Jan. 1906. He early became connected with various advance movements in Birmingham. In 1841 he was one of the lecturers chosen to explain Robert Owen's social theories, and next year was imprisoned on a charge of atheism. He supported the Chartist demands, but did not sympathize with their hostility to the Whigs. He took an important part in the agitation for the repeal of the corn laws, and for the repeal of the so-called "taxes upon knowledge." He was the founder of a purely ethical religion, without theistic element (secularism); and was active as a lecturer and writer in the co-operative movement. His works include: 'The Logic of Death'; 'The Logic of Life'; 'The Trial of Theism'; 'Nature and the Origin of Secularism'; 'Thirty-three Years of Co-operation' (1872); 'History of Co-operation in England, Its Literature and Its Advocates' (1875); 'Among the Americans' (1881); 'Self Help One Hundred Years Ago' (1888); 'The Co-operative Movement of To-day' (1891), a short, useful account of the history of co-operation; 'Sixty Years of an Agitator's Life' (1892), an autobiography; and 'Jubilee History of the Leeds Co-operative Society' (1897).

Holyoke, hōl'yōk, Mass., city in Hampden County; on the Connecticut River, and the New York, N. H. & H. and the Boston & M. R.R.'s; about 75 miles southwest of Boston and 8 miles north of Springfield. Holyoke was settled in the last part of the 17th century by people from Ireland, and for some time it was called Ireland Parish. It was incorporated as a part of West Springfield in 1786; but in 1850 it became a distinct town, with its own government, and it was chartered as a city in 1873. Like the other settlements along the shore of the Connecticut, the inhabitants saw the advantages to be derived from the water-power. At first only the small streams flowing into the Connecticut were dammed, and used for turning machinery; the main stream itself was the great route whereby trade intercourse was established with settlements along its shores. In 1847 the Hadley Falls Company began to devise ways and means of using the water-power of the Connecticut River, which at Holyoke had a fall of about 60 feet. In a few years the dam, 1,000 feet in length, was placed across the river, and the water-power thus obtained gave Holyoke great opportunities for the establishment of manufacturing industries, and they have been well utilized. For some years it was noted for the number and magnitude of its paper-mills; but other industries now enrich the city. Its chief manufactures are paper, paper-products, thread, cotton and woolen goods, knit goods, alpaca, silk, automobiles, machinery, bicycles, wire, belting, screws, bricks, furniture, and school supplies. Some of the public institutions are the College of Music, public library, House of Providence hospital, city hospital, two orphanages located outside the city limits, St. Vincent's for girls and Holy Family for boys. A large percentage of the people are of foreign birth or foreign descent. The school census of 1902 shows the following: Public schools, 3,500 Irish, 3,200 French, 800 German, and 900 American. In the parish schools there were enrolled that same year 3,500 pupils. The law which declares: "No minor who cannot read and write the English language can be employed in any factory or commercial enterprise" is rigidly enforced. Evening schools are provided for those who cannot attend school in the day time. The Holyoke Scientific Society has done special and excellent work in American archæology. It owns a valuable collection of Indian relics. Some of the places of interest near the city, and which may be reached by the electric railway, are Mount Holyoke (q.v.), Mount Tom (q.v.), and Springfield. In 1896 the city charter was revised, and the government is now vested in a mayor, who is elected annually, and a city council. Pop. (1890) 35,637; (1900) 45,712.

Holyoke College, Mount. See MOUNT HOLYOKE COLLEGE.

Holyoke, Mount, a narrow ridge of greenstone, the highest point of which is about 1,120 feet above the sea. It is in Hampshire County, Mass., about one mile east of the Connecticut River, five miles southeast of Northampton, and eight miles northeast of Holyoke. On the summit is a hotel, built in 1821. The hotel can be reached by a carriage road which winds to the top, or by a railway which runs up a steep incline.

Holyrood, hō'lī-rood, **Palace and Abbey of,** Scotland, the ancient royal residence at Edinburgh (q.v.).

Homatropin, hō-măt'rō-pĭn. See ATROPINE.

Home, Henry, LORD KAMES, Scottish lawyer and author: b. Kames, Berwickshire, 1696; d. Edinburgh 27 Dec. 1782. He studied law at Edinburgh, and, called to the bar in 1724, soon acquired reputation by a number of publications on the civil and Scottish law. In 1752 he became a judge of session, and assumed the title of Lord Kames. In addition to legal works he published 'Essays on British Antiquities'; 'Essays on the Principles of Morality and Natural Religion,' in which he advocates the doctrine of philosophical necessity; 'Introduction to the Art of Thinking'; and his best-known work, 'Elements of Criticism,' in which, discarding all arbitrary rules of literary composition, he endeavors to establish a new theory on the principles of human nature. In 1776 he published the 'Gentleman Farmer'; and in 1781 'Loose Thoughts on Education.'

Home Education. From the earliest recorded school the conception of education has steadily broadened, till now careful thinkers recognize that education should be for adults as well as for the young, carried on at home as well as in school and through life instead of for a limited course. The agencies for this broader education are in five distinct groups, and workers in this special field after mature deliberation have given to it the name "Home education" because it differs from school education in being carried on at home while the students are engaged in their regular callings, instead of in schools as a chief occupation. The five groups of schools (elementary schools, high schools and academies, colleges, professional and technical schools, universities) might be called the five majors of education, while libraries, museums, study clubs, extension teaching, tests and credentials might be called the five minors.

1. *Libraries.*— This includes reference and lending libraries, magazine and news rooms and all reading of the conventional symbols called print. Reading courses, circles, clubs, and home study from books without instructors belong to this library group, which is the cornerstone of all home education. See LIBRARIES; TRAVELING LIBRARIES.

2. *Museums.*— This includes museums and laboratories of science, art, history, etc. As the library group includes education through the eye by means of conventional symbols, so in its broadest sense the museum group represents education also through the eye from reading the interesting and beautiful language of nature and art; and as reading may often have no direct connection with the public library, so also the museum group may include detached monuments, statues, busts, pictures, and other works of art. See MUSEUMS.

3. *Extension Teaching.*—This includes all agencies which extend personal help or teaching to those who cannot attend regular schools; for example, summer, vacation, Saturday, night schools or classes, extension lectures, correspondence teaching, home study under direction, classes in libraries, Y. M. C. A. or Y. W. C. A. and other organizations. Mere lectures or addresses not accompanied by class or paper work, or instruction in the more limited sense, should be sharply distinguished from extension teaching. They represent the platform and perhaps should be counted as an independent group. Some so-called extension teaching is really little more than lectures, while under the name lecture some excellent instruction is given. The group should perhaps be called "extension teaching and lectures," to keep prominent the difference between the two, while it recognizes as their common distinguishing quality the personal aid and inspiration given by the teacher or lecturer to his class or audience. Lecturers give the inspiration and magnetism of personal contact which cannot be transmitted in print. This personal element, however, is chiefly on the side of the lecturer; the audience is a mass. In extension teaching where the lecturers are to stimulate to personal study and are supplemented by class and written work, the personal element is reciprocal; for the teacher, dealing with each student as an individual, answers his questions, solves his difficulties and is his personal teacher, guide and friend. The lecture is chiefly for inspiration; the teaching, for instruction.

The chief factors in extension teaching are:

Summer Schools.—In the last decade skepticism as to the practical value of summer schools has given way to official recognition by the leading American universities of the demand for such instruction and of the duty to supply it of institutions with buildings, libraries, laboratories, reputation and faculty. Fortunately, many weak institutions, some of them started or maintained from commercial motives and others lacking funds for proper work, have been discontinued as one by one the strongest institutions have offered the needed instruction and thrown open to the public during the summer months their great facilities. See SUMMER SCHOOLS.

Correspondence Teaching.— Commercial experiments have proved that there is a large demand for instruction in many subjects, especially those which add most directly to wage-earning capacity, from those wholly unable to leave their positions to attend any of the established schools. The growth of this demand is evidenced by the great number of advertisements of such instruction and by the marked success of some of the more prominent schools. One of these schools in 1903 had 650,000 students and 114 professors, and upward of 2,000,000 persons were taking correspondence courses in this country. The method having been proved efficient is beginning to be adopted by the endowed institutions; and inevitably as they offer better instruction at less cost and with it their established reputation, correspondence teaching with full recognition of its limitations but also of its possibilities, will become an established and creditable educational factor.

Extension Courses.— In America for the few years near the end of the 19th century hundreds of university extension centres were established, most of them with insufficient knowledge of what a real extension course was and with inadequate facilities and teachers inexperienced in this peculiar but important work. The result predicted naturally followed and most of the organizations which sprung into existence died out. The University of Chicago won first place by the excellence of the work it offered and still carries on. The American Society for the Extension of University Teaching in Philadelphia has been most active and successful of all the voluntary organizations. The New York State extension work was from the first announced to be wholly subsidiary to the more important function of the public library and study clubs. Experience has proved the great merit of the extension method in the hands of skilful teachers with a gift for this difficult kind of teaching, where inspiration is more important than instruction. See UNIVERSITY EXTENSION.

Lectures.—In most cases lecturers have been desultory and have been intellectual entertainments rather than entitled to rank as educational factors. Students of home education, however, recognize the inspirational lecture as a strong lever in their work and are using it more carefully and effectively, and organizing into courses which give better results. The Brooklyn Institute has maintained for many years a remarkable system, giving each year hundreds of lectures from recognized authorities, and in connection with its library and museum affords the best existing example of a great metropolitan home education centre. In New York the free lectures for the people have grown steadily from year to year and exert a great influence for good on the hundreds of thousands who hear them annually. Progressive librarians are more and more feeling the responsibility of guiding the local demand so that the lectures shall become a still more efficient ally of the library in its broad work of giving information, inspiration and intellectual recreation. See also ADULT EDUCATION.

4. *Associations or Clubs.*— This includes all forms of mutual help through associated effort, from the club of two friends in a single house to the great summer schools like Chautauqua, where each July and August thousands gather

from all parts of the country. This work with one's fellows supplies something of the element of residence, which is as valuable a part of the usual college course as are the studies. A certain subtle mental chemistry of the greatest practical value results from contact with other minds pursuing the same studies. If this gives a few weeks actual residence away from home, with daily student life, and a course in such company and surroundings as our best summer schools now offer, the student gets an invaluable taste of real college residence. This mutual help element in home education is chiefly supplied by the numerous literary and study clubs, many of which are coming to give their annual programs, a definite educational value by limiting them to a single worthy subject and supplying members with books, pictures and, if needed, specimens or other aids.

5. *Tests and Credentials.*— The great problem in popularizing education is to secure continuous and systematic study from those lacking the stimulus of the schools. Experience shows that a goal is needed by most people to hold them to completion of what they begin, by giving tests and official recognition, with suitable credentials for work well done. Differing from the other groups their field is to stimulate, test, record, and certify, rather than to give instruction. In spite of the criticisms and abuses of examinations, no satisfactory substitute for the good they accomplish when properly used has yet been found. They are last and least of the minors, but necessary to a complete system.

Educational Factors.— Most well equipped schools have all the factors of home education in active operation, but it is the use of these factors by those who cannot attend schools that constitutes home education. Schools imply residence and are attended consecutively, students advancing stage by stage from kindergarten to university. In home education the student will often use all five minors at once, and in well organized extension courses with lectures, syllabus, class, paper work, directed reading, student club and final examination we have four of the five minors, and in many subjects the museum or laboratory element is also added. A town that aims to provide educational facilities for both old and young at home, through life must make all five groups available. For most places the ideal would be to combine in a single building suitably arranged, the public library, museum, extension, examination, and association or club rooms, thus massing in a single institution, for which the best name is institute, all the essential educational agencies outside regular schools.

While there should be constant co-operation and the utmost harmony between the agencies for home and school education, experience constantly proves that the best results cannot be obtained by putting home education work in charge of school authorities. The obvious reason is that school trustees naturally and properly feel that the school system is the vital part, while libraries, museums, clubs, and extension teaching are only incidentals. The best results are always reached with independent trustees, who regard home education as quite as important as school education, and who devote all their energies to promoting their own work. While two governing boards are thus a necessity, a larger number is more costly and less efficient in administration, so that most close students of this problem advise in all ordinary circumstances the massing of the five minors together under a single board with headquarters in a single building. While in theory the library is one of the five home education factors, in fact the rapidly growing practice is wisely making home education a part of the library. This is because the country is being rapidly dotted with library buildings supported by taxation and endowments and receiving private gifts and public appropriations and support to a degree never equaled in educational history. The public library is already one of the most popular of American institutions and is rapidly gaining ground in all civilized countries. With buildings, endowments, trustees and public sympathy and support, it is the most economical, natural and best centre for the other elements of home education. In New York the official title now used is "New York State Library and Home Education," but it is frankly stated that the words "home education" will be dropped when the public learns that library means not a mere collection of books, but the home of all this closely allied work.

At the national meeting of American librarians in 1898 the entire program was given to impressing as strongly as possible the fact that small as well as large public libraries had the privilege and duty of giving stimulus and aid not alone to readers of books, but to all citizens, young or old, who were seeking intellectual advancement. Libraries are rapidly introducing the museum element in collecting and lending pictures as they do books. Many have started collections in art, science, or history. Laboratories are sure to follow, where persons without such facilities at home may pursue investigations and supplement their reading with experimental work. Even small towns now consider a library building inadequate which does not provide rooms for literary, scientific and similar societies for mutual improvement, and lecture halls, large and small, for the various phases of extension teaching. In the last few years this development has become less a matter of discussion than the rapidity with which individual libraries may take on their new and broader functions.

MELVIL DEWEY,
Formerly Director New York State Library.

Home Rule, the domestic control of local affairs in a province, colony, or dependency of an empire. The term has been employed in recent history most especially with regard to Ireland, which has been a dependency of England ever since Pope Hadrian, as is averred, handed it over to Henry II. of England in 1155, on condition that a certain portion of its revenue should flow into the treasury of the Holy See. Since that time Ireland has been more or less subject to the government of England. English viceroys have ruled at Dublin, and English troops kept the peace. The Irish are a high-spirited and proud nation, and the history of their subjugation has been a bloody one. For many years, however, they had their own parliament, and managed their own domestic affairs. Then came what was called the Union. The Irish

parliament was abolished, and Irish boroughs elected representatives to seats at Westminster. This was in 1801, when it is said that the Irish parliament which passed the bill for its own destruction was bribed or cajoled into what Irishmen of to-day consider a fatal and suicidal act. The first Irishman of note to attempt a remedy for Irish grievances was Daniel O'Connell. Catholic emancipation had been won largely through his agitation, seconded by the strong and clear-headed statesmanship of Wellington. In 1834 O'Connell brought forward in the House of Commons his motion for a repeal of the Union. By recent act of Parliament the municipal councils of Ireland had been thrown open to Roman Catholics. O'Connell was elected lord mayor of Dublin, and while his motion for appeal was supported with but 40 votes in parliament, he carried it by 45 to 15 votes in the municipal chamber at Dublin. This was undoubtedly the earliest step in the movement toward home rule, which from that time to the present moment has convulsed Ireland. In the town council at Dublin one of the 15 who had voted against O'Connell's motion for the repeal of the union was a brilliant young lawyer named Isaac Butt. In 1871 he was elected member of Parliament for Limerick and with him the Home Rule party in the English Parliament was born. The party struggled along for many years striving by obstruction and agitation in several quarters to maintain the rights of Ireland, and obtain for her better terms in her relations with the mother country. Mr. Butt, who was a true home ruler, though a conservative, was at length incensed by the obstructionist tactics of Parnell and Biggar, which he thought beneath "the dignity of Parliament," and practically surrendered the leadership of his party, in which he was succeeded by Parnell. In 1877 Parnell was elected president of the Home Rule Confederation of Great Britain. Parnell very quickly showed that he not only had very definite views, but possessed also the courage of his convictions. He became an advocate of peasant proprietorship. For the realization of this idea the Land League was constituted. At a meeting held in London 21 Oct. 1879 it was declared that the objects of the league were, first to bring about a reduction of rack-rents; second to facilitate the obtaining of the ownership of the soil by the occupiers. It was very remarkable to see how English opinion was gradually molded by the great Land League and Home Rule Party. In the elections of 1885 many Conservative candidates almost echoed the words of Parnell in declaring for a "liberal measure of home rule for Ireland." In the elections of 1885 the Liberals came in for a majority and Mr. Gladstone was premier for the third time. He was not long in bringing in a bill providing for "the constitution of an Irish parliament sitting in Dublin with the Queen as its head." He urged the passing of the bill with one of the most powerful, the most effective, and most touching speeches which he ever delivered. But his eloquence was in vain, the measure was defeated by a majority of 30. This was not the last time that Gladstone was to attempt the liberation of Ireland. But bold as had been his change of opinion in putting forth a measure he had in earlier life condemned, his conception of Home Rule for Ireland was quite inadequate compared with what O'Connell contemplated in his agitation for repeal. Such as it was, Gladstone again staked the existence of his ministry on its realization in 1893. The bill passed the House of Commons, but was rejected in the House of Lords, and since that time Home Rule for Ireland has been a dead issue in English politics.

Home Rule, Municipal. See MUNICIPAL GOVERNMENT.

Homer, hō'mėr, a poet to whom was attributed in ancient Greece the authorship of the two epic poems, the 'Iliad' and the 'Odyssey,' which form the foundation of Greek, and consequently of European literature. Of Homer's personality, birth, place, and time, we have no certain knowledge. His very existence has been brought into doubt, and in accordance with the etymology of his name Homer, which means the same as Vyasa, to whom the Mahabharata has been attributed, he is sometimes taken merely for the "arranger" or "compiler" of the works that go by his name. Seven cities, however, contended for the honor of being his birthplace; their names form the hexameter line

Symrna, Rhodos, Colophon, Salamis, Chios, Argos, Athenæ.

These names cover almost the whole geographical area of Greece and at least point to the extent of the poet's fame and influence. Although the dates of his birth and death are equally doubtful, critics have placed him anywhere in the 9th and 10th centuries before Christ, though some have thought these dates 500 years too early. He is traditionally said to have been blind, like Demodocus, the minstrel of the Odyssey. Some in ancient times attributed to him also the Batrachyomachia, and the so-called Homeric hymns, but it is at least doubtful whether these were written by the author of the 'Iliad,' as the Batrachyomachia seems a century later than the epics, and the hymns to Apollo, Demeter, Hermes, Aphrodite, and minor divinities were probably preludes or introductions which the rhapsodes or minstrels sang or chanted before beginning the serious business of the epic recitation.

The 'Iliad' and 'Odyssey' deal with the war waged by European Greece against Asiatic Troy.

The Iliad.— This 'Poem of Ilium' or Troy describes some phases of the war waged by Agamemnon and his brother Menelaus against Priam, whose son Paris had carried off Helen, the beautiful wife of Menelaus. The subject of this epic is called the wrath of Achilles, the representative Greek hero, a romantic and dazzling figure. He remains in his tent without helping in the war because Agamemnon has taken from him the captive slave girl Briseis. At length Hector, the champion of the Trojans, slays in fight Patroclus, the bosom friend of Achilles, who is roused by this from his sullen inactivity, and rushes forth to the battlefield, where he meets and slays Hector, whose funeral rites form the closing incidents of the poem.

The Odyssey.— The 'Odyssey' describes the return of Odysseus from the siege of Troy to his island kingdom, Ithaca, where he is restored to his faithful wife, Penelope, and takes vengeance on the suitors who have sought her hand and wasted her husband's substance in

revelry and debauchery during his absence. The first four books describe Odysseus detained in the magic isle of Calypso, and the despatch of his son Telemachus to bring him home. The following eight are taken up with the hero's homeward voyage with his various adventures. In books 13–19, Odysseus in the attire of a beggar is found unrecognized at the door of his home; books 20–24 describe his vengeance on the suitors.

There were some critics of Greece, notably Xenon and Hellanicus, who held that the so-called Homeric epics were written by different men. This school of grammarians were called chorizontes, or separators. There is much indeed to give color to such a view. As has been said, the 'Iliad' was written for men, the 'Odyssey' for women. But what principally distinguishes the 'Odyssey' from the 'Iliad' is the fuller and more complete individualization of the Greek divinities, the higher tone of religious and social life. The knowledge of foreign lands and their products and the means of travel by sea seem also to have reached a more advanced stage.

It remained for F. A. Wolf in his famous 'Prolegomena ad Homerum' (1795) to make the keenest and most searching analysis of these epics, as regards their unity of composition and identity of origin. He relies upon the statement in Greek history that Pisistratus in 540 collected and arranged the Homeric poems in something like their present form. The epics are thus made up of separate ballads, sung by rhapsodes, probably written by different poets, and Wolf has shown much acuteness in pointing out that long epic poems could not have been transmitted from such early antiquity without handwriting, which did not then exist, and in indicating what portion of each epic originally formed individual and distinct songs or lays. Consult: Jebb, 'Introduction to Homer' (1887); Monro, 'Homeric Grammar' (1891); Ebeling, 'Lexicon Homericum' (1885); Leaf, 'The Iliad' (1888); Hayman, 'The Odyssey' (1882).

Homer, Winslow, American painter: b. Boston 24 Feb. 1836. He studied in the National Academy of Design and was also a pupil of Frederic Rondel. He was sent to the front during the Civil War as special artist to 'Harper's Weekly' and on his return to New York exhibited his first important work, 'Prisoners from the Front' (1864), which won him recognition. In 1865 he was elected Academician. Taking up his residence in Scarboro, Maine, he painted for many years a series of pictures which indicated a marked development in style, sentiment, and power. There was a trace of conventionality at least in the subjects of such pictures as 'Home, Sweet Home,' which he painted between 1864 and 1884. From the latter date he began his portrayal of the fisher population of New England. Dramatic and realistic in the highest degree is the series of seven canvases from the 'Life Line' (1884) to the 'Lookout' (1897). But this artist has reached his finest vein in his pure marines, of which by far the greatest is 'The Maine Coast.'

Homestead, hōm'stĕd, Pa., borough, in Allegheny County, on the Monongahela River and on the Pittsburg & L. E. and the Pennsylvania R.R.'s; about seven miles south of Pittsburg. It was settled in 1871 and incorporated and chartered in 1880. The chief manufactures are foundry-products, glass, machinery, and steel products. It is noted for its large steel plants, which employ over 6,000 men. The borough owns and operates the waterworks. At one time Andrew Carnegie (q.v.) was the principal owner of the Homestead steel works. Pop. (1890) 7,911; (1900) 12,554.

There occurred in Homestead a serious strike which began 6 July 1892. Reductions in wages, change in time of signing the schedule, and refusal to recognize the Amalgamated Iron and Steel Association, or to hold any conferences with the men, had brought on a general strike to date from a certain time, and enraged the men into burning H. C. Frick, the manager, in effigy; whereupon the works were at once shut down, 1 July, two days ahead of the agreed time, and the men armed themselves and prepared to resist by violence any attempt to supply their places with non-union men. The advisory committee of the union took charge of the town with regular armed companies, and allowed no one to enter the mills without their permission. On 5 July the company announced an intention to make repairs, and appealed to the sheriff for protection; he sent a small squad, who were at once driven from town by the strikers, the latter denying that any damage was intended and offering to be sworn in as deputies themselves. The company then hired a body of 300 Pinkerton detectives, who came up the river in barges; but the strikers broke through the fence surrounding the mill, intrenched themselves behind a barricade of steel rails and billets, and whenever the Pinkerton men attempted to climb the steep bank (which they began at 4 A.M. of 6 July), shot them down. Next day they procured a 10-pounder brass cannon and bombarded the boat, splintering her wooden sides, but failing to pierce the steel plates within. They then sprayed the boats with oil from a hose, and emptied barrels of it on the river, setting it on fire to float down and fire the boats. The detectives repeatedly ran up flags of truce, which were at once shot down. At length the advisory committee sent delegates to offer a safe-conduct to the detectives, if they would leave their arms and ammunition and quit the town under guard; they were forced to submit, but when leaving under escort, the mob stoned, shot, and clubbed them shockingly, one having an eye struck out by a woman in the mob. Seven were killed first and last, and 20 to 30 wounded; and 11 strikers and spectators were killed by their return fire from the boats. The governor (Pattison) refused to use the State power to quell the riot till the 10th, insisting that the local authorities must do their utmost first, and the sheriff must summon the citizens; and the troops did not arrive till the 12th, when the town was put under martial law. A committee of Congress was appointed to investigate the case; and later, a Senate committee in the interest of the strikers was appointed to inquire into the hiring of private armed parties to maintain public order. On 21 July Mr. Frick was shot and stabbed in his office, but recovered. On the 18th a number of the strikers were arrested for murder; and

retorted by indicting the Carnegie Company, the Pinkerton brothers, and five of their men, for murder. The advisory committee was also charged with treason and usurpation, in taking military possession of the town. The mills were soon supplied with new men, but the strike was not officially declared "off" till 20 Nov. 1892.

Homestead and Land Laws. Under the United States laws any citizen or person who declares intentions to become a citizen, male or female, 21 years old, or head of a family, may become the possessor of a homestead of 80 or 160 acres, by occupation and cultivation, to be taken from unreserved public lands, surveyed or unsurveyed. A fee of $5 or $10 is required to be paid for filing affidavit of settlement, citizenship, age or family status. Total fee is from $26 to $34, according to the land district. Five years' residence and cultivation are required, but only three are demanded where 5 or 10 acres of forest trees have been cultivated. Ex-Union veterans or their heirs obtain patent one year after residence. Benefits are limited to one claim, except that veterans who have made one land settlement may also take a homestead claim. Under timber-culture provisions homestead locators may secure another 160 acres, including timber area, by cultivating 40 acres of trees. A homestead is free from debt liability before patent issues. Locator may, on proof of settlement six months after occupancy, buy said land at pre-emption price.

Homestead discussion began in 1852 by the Free-Soil party demanding reservation for settlers. It was presented first in Congress by Galusha Grow, 1854. A bill was first offered in 1859, and passed the House; an act passed in 1860, granting homestead on payment of 25 cents an acre, was vetoed by President Buchanan. The present law was signed by President Lincoln, 20 May 1862. Homestead law initiated the national land policy. It marks the third step in definite change from purchase to settlement. Pre-emption policy, granting preference to occupancy over speculating purchases, was the second step. First was sale or grants *en bloc*. It began in 1801 when an act was passed granting pre-emption to Miami Valley settlers on Ohio-Symmes tract. Sixteen acts were passed before that of 1832, which fixed the price at $1.25 and $2.50, and divisions at 40, 80, 120, and 160 acres. Under Pre-emption Laws, a locator having civic rights and also able to testify that he or she does not possess 320 acres of land in the United States, or has not abandoned any to settle on public lands, can hold for cultivation and residence up to 160 acres. After a limited period a locator may on satisfactorily proving settlement, purchase and obtain patent at minimum or maximum rate, the latter, $2.50, being paid for government land within railway grant. No restriction is placed on pre-emptor's acquirement of private lands. Under timber-culture acts entry additional to pre-emption or homestead may be made of legal subdivision, one fourth of which must be devoted for eight years to timber culture. On proof, a patent will issue for tracts; the total fee is $18.

Timber acts are in the nature of a land bounty for forest culture in sub-humid areas. Desert land acts are designed to encourage reclamation by irrigation of arid lands. Entry is of 640 acres permitted on "dry lands" within California, Nevada, Oregon, Arizona, New Mexico, North and South Dakota, Wyoming, Utah, Idaho, Montana, and Washington. Three years are allowed to bring water thereon. On proof of this, same may be purchased at 25 cents an acre. Under present laws mineral lands are held for industrial development, miners' customs being recognized by Congress and upheld by the federal judiciary. Locators form district, lode, or placer, adopt regulations, and elect recorder. Quartz or lode claims permitted of 1,500 lineal by 600 lateral feet, 300 on each side of lode. Boundaries must be marked plainly, entry recorded, and work to the value of $100 or more be performed each 12 months in order to hold claim. Qualifications as to persons or associations are the same as in other land entries. No alien is permitted to hold, occupy, work, or possess public lands. Placer claims of 20 acres to the individual, or not over 160 to associations, are similarly permitted. Patents issue on proving up and payment of fees.

The mineral land policy of the United States fluctuated till the act of 1866 was passed. Lands were sold or leased at different periods, and the procedure was wasteful both to miners and people. Mill sites and right of way for ditches are provided for. Coal lands are pre-emptible on civic and occupancy requirements by payment of from $10 to $20 per acre. First priced land is not within 15 miles of a railway; the other is within such distance. The individual limit is 160 acres; association 320 acres. An association on proof of $5,000 expenditure may enter one section. Only one entry is permitted. Saline lands being exempt from settlement, are offered for sale at $1.25 an acre, and then become subject to private entry. Public land for town site purposes is arranged for (1) by Interior Department setting aside suitable area and selling lots of definite size; (2) by town associations, filing plats of 640 acres or less therein. Town associations failing to file plats, lots may be sold publicly after 12 months at increase of 50 per cent. on minimum price. The actual occupant of a town lot may prove up and pre-empt by time of sale, paying minimum price for same. Stone and timber lands designated as unfit for cultivation, within California, Oregon, Nevada, and Washington, may be purchased by persons having required civic qualifications as follows: Affidavit and proof of non-mineral character and non-speculative purpose required, and they must be sworn to as for personal use and benefit. Notice of application to be published for 60 days in land-office and nearest newspaper. Penalties are provided for perjury or for trespass on timber lands.

The domain is also subject to various land-grant and bounty laws. These include State grants for internal improvements, institutions, common schools, seminaries, and agricultural colleges; land bounties, naval and military; canal, wagon, and railway grants; military and Indian reservations. Under graduation act, land unentered privately can be sold at public sale at minimum figures. The public domain area was acquired by cessions from original States, 259,171,787 acres; by purchase from Spain,

France, Mexico, Texas, and Russia 1,580,900,800 acres; total, 1,840,072,587 acres.

Public lands are surveyed into "hundreds," 10 miles square: then into "sections," of 1 mile square, again subdivided into quarters, and down to eighths. This is known as the rectangular system. A general land-office, forming a bureau of the Interior Department, is in charge of land administration. Each State and Territory has a surveyor-general, and each congressional district a land-office. In the Territories these are provided as required. A large portion of the domain acquired from Mexico still remains subject to private grants. The land laws of Hawaii were drawn up to protect small holders. See PUBLIC DOMAIN.

GORHAM D. GILMAN,
Ex-U. S. Consul to Hawaii.

Homicide, hŏm'ĭ-sīd, is either justifiable, excusable, or felonious. Of the first sort are such cases as arise from unavoidable necessity or accident, without any imputation of blame or negligence in the party killing. So where a crime is punishable capitally according to the laws, the judge is bound to condemn the criminal to death, and the sheriff or other executive officer to carry the sentence into effect in the manner prescribed by the sentence of condemnation. But the judge must have jurisdiction of the offense, and be duly commissioned; and the executive officer must be empowered to carry the sentence into effect, and must perform the execution in the manner prescribed by law, otherwise the execution of the criminal will make the judge or the officer, as the case may be, guilty of criminal homicide. So, too, where an officer of justice is resisted in the execution of his office, in his attempt to arrest a person in a criminal, or, as is maintained, even in a civil case, he is not obliged to give back, but may repel force with force; and if the person resisting is unavoidably killed, the homicide is justifiable, for few men would quietly submit to arrest if, in case of resistance, the officer was obliged to give back. It is, however, laid down as law that if a felony be committed, and the felon attempts to flee from justice, it is the duty of every private citizen to use his best endeavors to prevent an escape, and if in the fresh pursuit the party be killed where he cannot be taken alive, it will be deemed a justifiable homicide. The same rule applies to cases of an attempt on the part of a felon to break away and escape after he has been arrested, and is on the way to jail. So if a party has been indicted for felony, and will not permit himself to be arrested, the officer having a warrant for his arrest may lawfully kill him if he cannot be taken alive. But this is to be understood only of officers, and not of private persons. Magistrates and officers authorized to suppress and disperse mobs are justified by the common law in taking the requisite measures and using the requisite force for this purpose, though it extend to the killing of some of the rioters. The law arms every private citizen in the community with the power of life and death for the prevention of atrocious felonies accompanied with violence and personal danger to others, as in case of an attempt to murder or rob, or commit burglary or arson, the person making the attempt may, by the common law, if he cannot be otherwise prevented, be killed on the spot, and the law will not recognize the act as a crime. In cases of this sort, in order to justify the homicide, it must appear that there were good grounds for a suspicion that the person killed had a felonious intent. A woman is justifiable in killing one who attempts to ravish her, and the husband or father may be justified in killing a man who attempts a rape on his wife or daughter.

The cases already mentioned of justifiable homicide are those in which the public authority and laws are directly concerned. The laws of society, however, leave every individual a portion of that right of personal defense with which he is invested by those of nature. If one may interpose to prevent an atrocious crime against society, where he is not himself in any personal danger, the laws will, *a fortiori,* permit him to defend himself against attacks upon his own person. Murder is the killing of a person who is under the protection of the laws, with malice prepense, either express or implied. Malice is the distinguishing characteristic of murder, and may be either aforethought, or expressed, or implied. It is not necessary in order to constitute the crime of murder that the slayer should have the direct intention of killing. If the act be done with a wicked, depraved, malignant spirit, a heart regardless of social duty, and deliberately bent upon mischief, it is characterized by what the law denominates malice, though it may not result from any enmity or grudge against the particular victim. So if a man wantonly discharges a gun among a multitude of people, whereby any one is killed, the act will be done with that depravity of disposition which the law considers malice. Murder can be committed only by a free agent, for the crime presupposes a will, motive, or disposition on the part of the perpetrator. An idiot or insane person cannot commit this crime. But drunkenness is in general no excuse for homicide, though the act be done under its immediate influence.

The manner of killing is not material. Whether it be by sword, poison, beating, imprisonment, starvation, or exposure to the inclemency of the atmosphere, it will be equally murder. This crime may be committed by mere advice and encouragement. An infant unborn is within the protection of the law, and it is laid down that if, in consequence of poison given or wounds inflicted before the birth of a child which is afterward born alive, it dies soon after its birth, the act is murder. The act of suicide is considered by the law to be murder, and the person making away with himself is accordingly styled a "self-felon."

The lines of distinction between felonious and excusable or justifiable homicide, and between manslaughter and murder, are in many cases difficult to define with precision. But in general the accused has the advantage of any uncertainty or obscurity that may hang over his case, since the presumptions of law are usually in his favor. The characteristic distinction laid down in the books between murder and manslaughter is the absence of malice in the latter. Sudden provocation may be an excuse for striking another without the intention to give a deadly blow; and though death ensue, the party may not be guilty of murder. One circumstance, showing the degree of malice, or rather showing its presence or absence, is the kind of weapon

used in giving a wound on a sudden provocation; and another circumstance of importance is the fact of the weapon's being already in the hand or not, for going to seek a weapon gives time for deliberation. The ground of excuse of homicide, in case of provocation merely, is the supposed sudden passion, some influence of which the law concedes to the frailty of human nature. But the excuse of self-defense goes still further; and where a man is attacked, so that his own life is endangered, or in such way that he may reasonably suppose it to be so, he may repel the attack with mortal weapons. One of the most frequent cases of manslaughter was that occasioned by single combat, and on account of the firm hold which the point of honor had taken of European nations, was long among the most difficult subjects of legislation. (See DUEL.) The crime of murder in its most aggravated degree is punished with death in most parts of the civilized world.

Hom'ily (Greek, *homilia*, intercourse), as an ecclesiastical term, a discourse addressed to an audience on some subject of religion. The homily was so called to distinguish it from the speeches of profane orators. The ancient homily was sometimes simply a conversation, the prelate talking to the people and interrogating them, and they in turn talking to and interrogating him. The difference between the homily and the sermon was the entire absence of oratorical display from the former, and the elucidation of the Scriptural text in natural order, without throwing the exposition into the form of an essay.

The earliest existing examples of the homily proper are those of Origen in the 3d century. In the schools of Alexandria and Antioch this form of discourse was sedulously cultivated, and Clement of Alexandria, Dionysius, and Gregory Thaumaturgus are among the names most eminent in this department. Augustine and Gregory the Great were among the western composers of homilies. Later still Bede, several of the popes, and foreign ecclesiastics still adhered to the homiletic form of exposition as the most suitable to impress the truths of Scripture with efficacy on the popular mind.

In the Church of England there were two books of homilies that were long authoritative, and are still sometimes appealed to to settle disputes as to what the Anglican doctrine is in points on which they bear.

Homing-pigeon, a variety of the common pigeon in which the love of home and power of flight have been developed to make the bird useful and reliable as a bearer of messages; also a fancy variety characterized by the possession of certain definite points, but not necessarily useful as a homer. The show carrier-pigeon is a large, long-necked variety, with abnormally developed wattles about the base of the beak and round the eyes, but the true homer is of smaller size, and lacks the enormous tuberculated growth.

The training and breeding of homing-pigeons were long almost confined to Belgium, and two main types of the Belgian homer have been distinguished as the Antwerp and the Liège varieties, the former being larger but less graceful in form than the latter. American pigeon fanciers breed mainly from the Antwerp type, and the birds are commonly designated Antwerps.

The training of a homing-pigeon begins when it is about three months old. It may then be taken to a distance of about a mile from its loft in a suitable direction and liberated in order that it may fly back. After an interval of a day or two it should be carried three miles from home in the same direction and set free, and on the third occasion, a few days later still, the distance is usually increased to six miles. This mode of training is continued steadily during the season, the successive distances above those already mentioned being 12, 25, 50, 75, 96, 125, 155, and 200 miles. The intervals of rest must be carefully preserved, especially in times when the weather is unfavorable. During the bird's second season it is made to repeat something of its first year's performances and to extend its flight to 250 miles or possibly to a greater distance. During the following three seasons good birds will be at their best, and even for some few years later they may do good work. During the training period and also at other times the housing and feeding of the birds must be carefully attended to.

Velocities of over 30 yards per second have been recorded for various pigeons, but the average velocity is rather less than half that amount. One bird, in 1896, actually covered the distance from Thurso to London, just over 500 miles, within one day, its average velocity being about 24 yards per second. In unfavorable weather the height attained varies from about 320 to rather over 400 feet, but in good weather some birds will reach a height of about 1,000 feet. The distance from Algiers to Paris, fully 1,100 miles, is one of the longest on record as having been traveled by a pigeon.

There has been much discussion regarding the means by which pigeons return to their homes over such long distances. Untrained birds often fail to return, and during training young birds are often lost.

Many instances are recorded of the employment of pigeon messengers by ancient peoples. During the first half of the 19th century pigeons were widely used in Great Britain for the rapid communication of intelligence, and in particular many stockbrokers obtained early information of the state of the markets by this means. The introduction of the electric telegraph, however, soon led to the complete disuse of the pigeon post. The siege of Paris during the Franco-German war of 1870–1 first brought the carrier-pigeon into prominent notice as a valuable means of communication in time of war. During that siege more than 350 birds were sent out of the city in balloons, and of these some 300 were liberated with messages. Only some 70 returns were made, and these were effected by 57 birds. By the adoption of microphotography the space occupied by a message was so reduced that a single pigeon could carry a very large number of messages without having its movements hampered in the least. One of the pigeons that succeeded in returning to Paris carried no less than 40,000 messages on eighteen collodion films which were enclosed in a goose-quill attached to the tail. Since that time the leading Continental powers have established elaborate pigeon systems for use in time of

war. During the war with Spain, in 1898, the fleet of vessels that patrolled the Atlantic coast was supplied with a number of carrier-pigeons' cotes, but happily there was no occasion for testing their effectiveness, though in times of peace messages are frequently successfully carried from war vessels to points on the shore. Consult books mentioned under PIGEONS.

Hominidæ, hō-mĭn'ĭ-dē, the family to which man was assigned in the earlier systems of animal classification; but many modern zoologists refuse him so great a distinction, making man, zoologically considered, only a species (*Homo sapiens*) of a genus of the family *Simiidæ*, which also includes the genera of the anthropoid apes. See MAN.

Homœopathy (Greek ὅμοιος, like, and πάθος, suffering or disease). The term signifies similar affection, passion, suffering or disease. As employed in Medicine, and as understood by Hahnemann and physicians of the homœopathic school, it is properly defined as follows: (1) The treatment of disease by means of its similimum; (2) treatment of disease by a medicine capable of causing, in a healthy person, symptoms similar to those manifested by the patient. This definition can refer only to the symptoms producible by the drug, and the symptoms exhibited by the patient. It makes no direct reference to the name or type of the disease, nor to the type or class of the drug administered, nor to the size or strength of the dose. Nevertheless, homœopathy does hold important incidental relationship to the classification of drugs, to the facts and principles of dosage, and to diagnosis and all other departments of pathology. Under this definition, the experimental application of homœopathy requires that the drug shall cover the *tout ensemble* — or, as Hahnemann expresses it, the "totality" of the symptoms as exhibited by the patient; and not merely one, or a few, of the dominant or diagnostic symptoms or conditions. Neither does it imply that the homœopathic remedy can overcome any and all the adverse conditions and circumstances under which it may be administered.

As a system of medical practice, Homœopathy recognizes this principle of similarity as between the symptoms of the curative drug and the symptoms appearing in the patient. In this form of practice, the symptoms exhibited by the patient are carefully ascertained and studied with reference to their significance and relations, and these furnish the indications upon which the selection of the "similar remedy" is then made with equal care. Whether the object of the prescriber be immediate and complete restoration to health in a curable case, or mere alleviation of suffering in a case not curable, the same course is pursued; since, in the experience of the profession, the similimum possesses peculiar efficacy in either class of cases.

In homœopathic practice, the finding of the curative remedy is of *first* importance, as a matter of course. But, the diagnosis of the case is a most urgent consideration, because it materially aids the physician in his quest for the "totality" of the symptoms, suggests his general management of the case, prompts the sanitary precautions to be taken, guides him in his prognosis, etc. Moreover, it sometimes calls to his mind a group of medicines among which the curative similimum will probably be discovered, and in this indirect way may assist in the medical treatment. Yet is must be distinctly understood that in homœopathic prescribing, the final choice of the remedy is always made, not by the name of the disease, nor even by the symptoms usually present in the disease, but only by those occurring in the individual patient. Pathology, both structural and functional, is also a subject of careful research in connection with homœopathic practice, as under other systems; but never for the purpose of formulating "theories" of the nature of the disease, on which to base treatment.

In common with all other modern "schools" of physicians, homœopathists hold that whenever the originating or "exciting" cause of the disease can be discovered, it should be removed if possible; and they claim that when this is done the disease will often disappear spontaneously. When the disease does not so disappear after removal of the cause which had apparently produced it, homœopathic physicians are convinced that some other ("maintaining") cause has been developed. In most cases this perpetuating cause is occult and its nature altogether undiscoverable. They also hold the view that if this latter cause be removed, the continuance of the malady is inconceivable. Equally incredible is it that the disease can be actually "cured" so long as the cause remains operative; if it could be, it would be immediately reproduced; unless meantime the bodily susceptibility to the disease were also removed. Hence, the homœopathic profession does not concede a "cure" in any case in which the operative cause remains active, and therefore, in the view of these practitioners, the word "cure" has a much narrower meaning, and actual cures are accomplished much less frequently than is generally supposed; the majority of such so-called cures being merely recoveries — recoveries facilitated, or perhaps made possible, by the skilful efforts of the medical practitioner — but recoveries nevertheless.

Under this view, that the disease has a central morbific cause, it is impossible that homœopathists can accept the opinion that the malady can be cured by the mere lopping off of one or a few of its principal symptoms, or of its prominent pathological processes or conditions. How, then, do homœopathists explain their ability to reach with their remedies the perpetuating or "maintaining" cause of disease, conceding, as they do, their inability to determine its nature, or even its location?

Starting out with the accepted principle that "like causes operating under like conditions produce like effects," the homœopathist assumes the converse of the proposition to be likewise true; namely, that like results appearing under like conditions and circumstances, indicate the operation of like causes. When two patients in similar conditions of health manifest similar morbid symptoms, the phenomenon is, by all pathologists, considered as indicating the operation of causes in corresponding portions of the two organisms, and acting in a similar manner. This view is not peculiar to any medical school, but is held by all physicians alike. To this doctrine, the homœopathist adds the belief that it also applies to the effects of drugs, as well as to those of natural (?) diseases; and that when similar

morbid manifestations result, in one case from disease and in the other from the effects of a drug, the phenomenon still indicates a physiological or (pathological) cause operating in a similar part or parts of the organisms involved, and operating in a similar manner in both. So much as to the *locality* of the cause — the "seat of the disease," upon which the "similar" drug acts. What of the *manner* in which it acts?

It was long ago shown by Hahnemann and others that the effects of almost any drug upon the human body are of two kinds, primary and secondary, direct action and reaction; and that these two actions are, in a measure, the opposite, one of the other. This view has been advocated by numerous physicians, not always of the homœopathic school. Of late years the phenomenon has attracted more attention from medical writers than formerly, and is generally spoken of as "the dual action of drugs." To illustrate: a drug may first stimulate, and afterward depress, a certain organ of function. Another may first depress and then stimulate; and the symptoms will, of course, take their character from the action or reaction of the drug. Some homœopathists are of opinion that this dual quality of drug action is the proper explanation of the curative potency of the similimum. Others, Hahnemann included, explain it on other grounds. Others consider it likely that the different effects of large and small doses — a fact observed by many practitioners — may account for the cures made by the similar remedy. All homœopathists agree, however, that the question turns upon the curative *fact*, and not upon its explanation; and hold that one and all of these explanations may yet prove to be erroneous; yet firmly convinced that the main fact will remain unaffected through all changes in theory and doctrine.

Homœopathy, like any other principle or art, has its own particular field of application and operation. Thus it does not cure *directly*, a mechanical injury to the tissues, or any impairment wrought by chemical means; though it does cure the functional diseases and disorders caused by the irritation of such injuries. The homœopathic remedy acts *directly* only upon function. It never alters a structure except by first modifying a function. Nor does a drug ever act homœopathically upon a function unless that function be disordered. When a drug acts on a healthy function, or when it causes disorder in a function, such action is never homœopathic, whatever may be the mode of its selection and whatever the form or quantity in which it is administered. *The homœopathic medicine is a specific-restorative-stimulant, only and always.* Such, in brief, is an exposition of homœopathic belief and practice, and of its underlying principles and doctrines as taught by Hahnemann and held by the profession as a body. The small dose used by homœopathic prescribers is considered in another part of this article.

Homœopathy as a mode of medical practice is usually said to have originated in 1796, when Dr. Christian Friedrich Samuel Hahnemann published in 'Hufeland's Journal,' at Jena, an 'Essay on a New Principle for Ascertaining the Curative Powers of Drugs.' In this essay he criticizes the state of the medical art, and especially urges that the chemical properties and powers of drugs are not adapted to the work of curing disease, but that cures must be accomplished by an entirely different property resident in medicinal substances. Having read of cures in medical literature and observed, in his own patients, recoveries occurring under the evident influence of the "similar" remedy, he offers the following theory of the phenomenon: "Every powerful medicinal substance produces in the human body a kind of peculiar disease; the more powerful the medicine, the more peculiar, marked, and violent the disease. We should imitate nature, which sometimes cures a chronic disease by superadding another, and employ, in the (especially chronic) disease we wish to cure, that medicine which is able to produce another very similar artificial disease, and the former will be cured; *similia similibus.*" Hahnemann further explains his conception of a homœopathic cure in his 'Organon,' section 26, in the following language: "A weaker dynamic affection is permanently extinguished in the living organism by a stronger one, if the latter (while differing in kind) is very similar to the former in its manifestations." This language he designates the "homœopathic law of nature." The term "homœopathy" or "similar disease," as representing the new medical practice, may have been suggested not alone by the fact of cures produced by the similar drug, but also by Hahnemann's theoretical explanation of the phenomenon.

A correct and adequate conception of homœopathy, of the difficulties necessarily encountered in its propagation and establishment, and of the place it holds and the influence it exerts in the development of therapeutics can be obtained only through knowledge of the conditions of general medicine down to the close of the 18th century. It is essential, therefore, that reference be made to certain points in the progress of medical history from its beginnings to and including the period of the investigations that resulted in the discovery of homœopathy as a general therapeutic principle. This reference does not need to embrace all the departments of medical science — anatomy, physiology, pathology, etc. — but the department relating to treatment, or therapeutics only. It is requisite for us to know and appreciate the mental conception — the basis of reason — upon which the "art of healing" was established prior to the advent of homœopathy as a system of medical practice.

The earliest efforts of men to alleviate the sufferings caused by illness and mechanical injury were chiefly instinctive. Water, moist earth, the fleshy portions of plants, and other cooling substances, were employed by men, as well as by the lower animals, to mitigate the pain, heat, and discomfort of local inflammation; and other simple expedients were instinctively resorted to for various disordered conditions. In time the number and variety of known remedial agents, as well as of the diseases for which they were used, must have been rapidly extended by experience. And thus began the "empirical method" of treatment — the natural second step in the progress of medicine.

Inefficient as were these modes of treatment, they were far more rational than most of those that occupy the pages of medical history for many succeeding centuries. These later methods were based, not on observation and experience,

but upon pure assumptions having, as John Stuart Mill expresses it, "no limitations other than those of the imagination." (The construction of medical theories, or philosophical explanations of observed facts, was a still later development.)

Among the large number of these hypotheses are the following: (1) That disease is a punishment sent by some malevolent deity; (2) that it is due to the influence of a comet, a planetary conjunction, an earthquake, or some other celestial or terrestrial phenomenon; (3) that it is caused by abnormal preponderance of some one of the four elements (fire, air, earth, and water) of which the human body was said to be composed; (4) that it originates in a disturbance of the bodily states of heat, coldness, moisture, and dryness; (5) that it arises from disproportion in the four humors which supply the organism — blood, mucus, black bile, and yellow bile; (6) that it is produced by a *materia peccans*, or offending matter, which must needs be expelled; (7) that the body contains multitudes of "invisible pores" through which circulate infinitesimally minute atoms or corpuscles, and that disease has its cause in obstruction or relaxation of these pores; (8) that disease is based upon three possible states of the organism — "strictum," "laxum," or "mixtum" — which must be treated with laxatives, astringents, or a combination of both, as might be needed; etc., etc. All these hypotheses, and many others, arose prior to the close of the 2d century A.D. Their absurdity is not more grotesque than that other hypothesis which underlies each and all of them; namely, that a knowledge of the cause or nature of disease can indicate the means and method of its cure; a view not held at present by any homœopathic or other scientific physician.

The period between the 2d century and the 15th presents little record of therapeutic art; but with the invention of the printing-press came a stronger impetus to all forms of research, medical included. Since that time increasing knowledge of anatomy, chemistry, and physiology has led to the elaboration of therapeutic theories based upon certain facts relating to these natural sciences. The advances in anatomy had suggested a mechanical basis for therapeutics; pneumatics, friction of fluids in vessels, the diameters, curvatures, and angles of blood-vessels were brought forward to explain the phenomena of disease and to suggest measures for its cure. Physiology and chemistry brought out a renewal of the ancient doctrine of "four elements" and the substitution of the three "alchymistic symbols" represented by mercury, salt and sulphur, whose union is health, and their separation disease. The author of this doctrine, Paracelsus, also ascribed to the "vital force" not only the power, but also the intelligence, to resist disease and to provide for its cure. About the middle of the 18th century, or near the time at which the discovery of the general principle of similars was made, physiological hypotheses became largely identified with therapeutics; and the same might be said of chemical theories. Health and disease were the results of a contention between the acids and the alkalies. Haller held to the view that disease was due to change in the "irritability" of the tissues. Cullen revived an old doctrine that disease was caused by "spasm" and "atony," and required to be treated in accordance with that view. Brown, the rival of Cullen, concluded that diseases were either "sthenic" or "asthenic," and required asthenic, or sthenic medication, as the case might be.

Before the close of the 18th century the medical profession had acquired knowledge of a number of drugs possessed of "specific" properties for the cure of particular diseased conditions; among them Peruvian bark for intermittent and other malarial fevers, mercury for syphilitic diseases, sulphur for itch, etc. These specifics exerted their curative effects by virtue of properties not at all understood at that time, and but imperfectly known a century later. These specific cures were limited to comparatively few diseases. For the treatment of the conditions with which the medical practitioner is contending daily, which constitutes almost his entire duty, he had nothing but fallacious assumptions and hypotheses to depend on. Such was the condition of the medical art at the time when Hahnemann began his independent researches in therapeutics.

Hahnemann possessed unusual linguistic attainments, which gave him access to the publications not only of Germany, but of England, France, Spain, Italy, Austria, Greece, and Arabia. He was not only a literary scholar. He was also a practical expert in the fields of chemistry, pharmacy, and industrial technology. He made many discoveries in industrial chemistry, and introduced scores of improvements in the details of manufacturing chemical products. At the period of his earliest responsible connection with medicine, "there was," says Rapou, "complete anarchy in the domain of therapeutics." Hahnemann, unwilling to trust the lives of his patients to the tender mercies of this conglomeration of assumptions, adopted the use of the class of remedies known as specifics, whose effects were easily ascertainable, though their *modus operandi* was altogether unknown.

Homœopathy was not an invention, like some of the "systems" of medicine that preceded it; neither was it a sudden discovery. It was an evolution extending from 1790 to 1835, a period of 45 years. The earlier portion of the process is described by Bradford, who in speaking of its beginning says: "We now come to the translation of a very important book (Cullen's 'Materia Medica'), from which must be dated the discovery of the Law of Similars. It has been asked why Hahnemann at this time happened to translate this particular book, and it has been asserted that he used it as a blind to foist on the world his peculiar theories. It is not probable that when he commenced upon Cullen Hahnemann had any particular medical theories, but only a growing disgust for the medical fallacies of the day. This is clearly evidenced by his writings at that time. It is not to be wondered at that he should translate the work at that particular time. He was translating for money, for the booksellers and publishers of Leipsic, and it is not likely that he selected the books which he was to translate. Dr. Cullen was an authority on the subject of the materia medica of his day, an experienced lecturer, a talented chemist, and a brilliant and popular teacher in Edinburgh. Naturally the Germans wished to learn of his new and peculiar theories regarding disease, as well as to obtain the use of his 'Materia Medica,' which at this time was a standard work.

"Hahnemann was the most accomplished translator of medical works of the time, and

what more natural than that the task should be given to him. Cullen published the first edition of this book, in London, in 1773. Another edition was issued in 1789, in two volumes, and it was this edition that Hahnemann used in his translation. In this book, Volume II., Cullen devotes about 20 pages to *Cortex Peruvianis* (Peruvian Bark), gives its therapeutical uses in the treatment of intermittent and remittent fevers, advises its use to prevent the chill, and gives minute directions for the safest period of the disease in which to use it. Hahnemann was impressed with the use of this drug, with which he as a physician had before been familiar. Something in the manner in which Cullen wrote decided Hahnemann to experiment with it upon himself and to see what effect it would have upon a person in perfect health. The result of this experiment will be given in Hahnemann's own words. In the translation of William Cullen's 'Materia Medica,' Leipsic, Schweikert, 1790, page 108 of Volume II., appears the following foot-note by Hahnemann: 'By combining the strongest bitters and the strongest astringents, one can obtain a compound which, in small doses, possesses much more of both these properties than the bark, and yet no specific for fever will ever come of such a compound. This the author (Cullen) ought to have accounted for. This perhaps will not be so easily discovered for explaining to us their action in the absence of the Cinchona principle.

" 'I took, by way of experiment, twice a day, four drachms of good *China*. My feet, finger ends, etc., at first became cold; I grew languid and drowsy; then my heart began to palpitate and my pulse grew hard and small; intolerable anxiety; trembling (but without cold rigor); prostration throughout all my limbs; then pulsation in my head, redness of my cheeks, thirst, and, in short, all those symptoms which are characteristic of intermittent fever, made their appearance, one after the other, yet without the peculiar, chilly, shivering rigor.

" 'Briefly, even those symptoms which are of regular occurrence and especially characteristic — the stupidity of mind, the kind of rigidity in all the limbs, but above all, the numb, disagreeable sensation which seems to have its seat in the periosteum, over every bone in the body — all these made their appearance. This paroxysm lasted two or three hours each time, and recurred *if I repeated this dose, not otherwise;* I discontinued it, and was in health.'

"The next note in the German translation is as follows: 'Had he (Cullen) found in bark traces of a power to excite an artificial antagonistic fever, he certainly would not have persisted so obstinately in his mode of explanation.' " ('Life and Letters of Dr. Samuel Hahnemann,' by T. L. Bradford, M.D., pp. 35–7.)

These experiments seemed to show that Peruvian bark is capable of producing in the healthy human organism a series of symptoms quite closely resembling those of that peculiar form of fever which it is known to cure. Instead, however, of solving any questions in the mind of Hahnemann, it only served to suggest several others. Does Peruvian bark then produce the same symptoms that it specifically cures? Is its specific curing property dependent on its power to cause the symptoms which it cures? If so, is this power peculiar to *Peruvian bark,* or is it to be discovered in other drugs? And do all drugs possess the power to cause symptoms similar to those they cure?

To obtain light upon these questions occupied his efforts during the six years between the translation of Cullen's 'Materia Medica' and the publication of the 'Essay' above mentioned. To quote from a writer in the British 'Homœopathic World,' 1875, p. 234: "Drug after drug, specific after specific, was tested on himself and on healthy friends with one unvarying result — each remedy of recognized specific power excited a spurious disease resembling that for which it was considered specific. But many more symptoms than those diagnostic of any one disease resulted from almost every medicine, and aroused a hope in the experimenter's mind of specifically treating a greater number of diseases than had ever been so treated before. Besides discovering many valuable phenomena undreamt of, he verified his discoveries and observations by ransacking the volumes of recorded experiments in materia medica and the whole history of poisoning." The members of his family and his personal and professional friends aided in the work of experimentation, and tests of each medicine were made with different doses, and on many different persons, all the work being conducted under his own supervision.

Dr. Bradford tells us that at the time of Hahnemann's translation of Cullen's 'Materia Medica,' that is, at the beginning of his independent investigations in 1790, he had no preconceived theories or opinions to sustain. This view of his biographer is corroborated by the absence from Hahnemann's writings of even remote reference to any *a priori* conception or suspicion of a general curative relation between drugs and diseases. Nor does it appear that he then possessed the faintest conception of the magnitude, or of the quality, of the task he was gradually assuming. His original object evidently was to ascertain why Peruvian bark cures intermittent fever, and to learn if the view held by Cullen — that its curative property resides in a combination of bitter (tonic) and astringent qualities — was indeed true. There is no historic evidence that before 1790 the general therapeutic principle of similars had even dawned upon his mind. But we may be quite sure that the logical and philosophical principles that must necessarily govern his researches had been well thought out before the work had very far advanced.

Hahnemann and his disciples claim that in the discovery of homœopathy as a general principle of organic science, and in its conception and development as a system of medicine, assumption, speculation and hypothesis have had no place; but that observation, experimentation, and inductive classification constitute the scientific and solid foundation of fact upon which it rests. They assert that all its essential doctrines are susceptible of demonstration, that they have been verified and reverified times without number, and that for the first time in the history of intellectual development the establishment of the homœopathic principle showed that the Baconian method of research is as applicable in the realm of therapeutics as in any other department of scientific investigation. If we look over the records of the processes leading to its discovery, it appears that these processes were

under the guidance of the following principles of scientific philosophy, all of which are distinctly set forth by Hahnemann in his 'Organon':

1. That in the study of disease with a view to its cure, the only safe dependence is upon the manifestations (symptoms) perceptible to the senses, and that no safe conclusions can be drawn from mere theories erected upon these signs and symptoms. The signs and symptoms constitute the only side of the disease that is turned toward the physician, and the totality of these signs furnishes the only true expression or portrait of the disease.

2. That the specifically curative power of a drug resides not in its physical, nor yet in its chemical properties, but in its capacity to produce changes in the functions of the organism.

3. That the dynamic properties of a drug — in other words, its power to specifically cure disease — can be ascertained only by observing the signs and symptoms which it can produce in the organism, and that these specifically curative properties cannot be inferred from the physical or chemical properties of the drug substance.

4. That experiments for the purpose of ascertaining the pathogenetic properties (signs and symptoms) of drugs must be conducted under the precautions necessary in other researches; and the tests must be repeated and varied with a view to eliminate every influence and agency that can vitiate the experiment. The drug experimented with, and the person experimented upon, must both be "standard." That is, the drug must be pure and unmixed with any other substance capable of disguising, modifying, or otherwise affecting its own specific activity, and the person experimented upon (prover) must be possessed of good health, and free from any unhealthful occupation or habit, and from any mental, moral, or other influence or agent that can modify the pure effects of the drug upon his organism. Also, that the experimentation with the drug must be continued until its whole pathogenetic effect has been elicited.

5. That the observations made from such experiments as those here indicated constitute the only source of a pure and "standard" materia medica, and supply the only material from which general therapeutic principles can be discovered or deduced.

6. That effects observed from the action of a drug upon diseased persons (clinical effects) or those obtained from a combination of drugs (polypharmacy) are not "standard" effects and cannot serve as reliable guides in a search for therapeutic principles.

In the opening sections of the 'Organon,' Hahnemann mentions as among the physician's essential acquirements:

(1) Knowledge of diseases; (2) knowledge of the dynamic properties of drugs; (3) knowledge of the curative relations between the two. This knowledge he holds essential both to the development of therapeutic science and to enable the physician to prescribe the curative remedy.

In order to qualify the physician for his work his knowledge of disease must be composed of facts perceptible to the senses. Our physiological and pathological deductions in reference to a case of disease are more or less uncertain and theoretical. Absolute knowledge of disease is limited to its signs and symptoms, besides which there can be no certain and assured foundation for a science of therapeutics.

The knowledge of drug-properties must be equally certain and substantial. All drugs possess three classes of properties — physical, chemical, and specific or "dynamic." The physical and chemical properties can be ascertained by physical and chemical methods. The specific or dynamic properties, that is, the properties which alone impart the power to accomplish specific cures of disease, can be learned only by observing their power to cause changes in the health of the organism as shown by their capacity to produce signs and symptoms. Here again the signs and symptoms constitute the only sure basis of classification and induction in the construction of a science of therapeutics.

Having possessed himself of so much of such knowledge as was within his reach, Hahnemann then began the investigation of the great and dominating question: Given a knowledge of diseases as expressed by signs and symptoms, and a knowledge of drug properties as expressed by signs and symptoms, can we discover between them any general relation that will guide the physician in his search for the curative drug? In this work of "interrogating nature" he had already been led to infer what her reply might be. His experiment with Peruvian bark had given him a somewhat emphatic hint. Then followed the six years of experimentation upon himself, his family, and friends; with what result we have already seen. Accompanying and following these experiments came the "ransacking of the libraries" — a work for which few men were so well fitted. This literary search resulted in two important discoveries. First, that when two diseases manifesting quite similar symptoms appear in the same organism, they antagonize or annihilate each other. This subject is carefully outlined in the 'Organon,' sec. 42–45, and in sec. 46 the writer cites a score of illustrative instances obtained from the pages of contemporaneous literature, the authority being carefully mentioned in every citation.

The second result of this literary search is that it corroborates the view with which Hahnemann set out; namely, that even under the modes of treatment in vogue before his day, undoubted cures frequently resulted from the action of drugs possessed of the power to cause symptoms similar to those of the cases cured. Some of these cases are well worthy of study by those interested in medical subjects. In the earlier editions of the 'Organon' and in the 'Essay on a New Principle for Ascertaining the Curative Powers of Drugs,' these published cures are reported *in extenso*, the literary source being given, together with the name of the physician in each case. In the Dudgeon translation of the 5th German edition the same list occupies 31 pages of the appendix. In practically all of the cases reported, the mere name of the disease is sufficient to suggest the fact of similarity between the symptoms of the malady cured and the symptoms of the drug prescribed. In other cases the symptoms themselves are given with more attention to detail than was customary at that period of medical history. If we sum up the remedies named in the 'Essay,' together with those mentioned in the 'Organon,' we have a total of 63 drugs to which Hahne-

mann was able to ascribe homœopathic cures occurring in the practice of physicians who had no knowledge of the homœopathic principle.

In presenting this list of cases successfully treated with the similar remedy, Hahnemann has made nearly 500 citations of writers who had no suspicion that any general law of therapeutics was involved in the operation of their prescriptions. The degree of similarity shown between the pathogenetic properties of the drugs administered and the symptoms manifested by the patients seemed, in most cases, to be positive and emphatic, and in some instances striking. In what he has to say regarding the curative effects of opium this fact is graphically shown. He says:

"A condition of convulsions without consciousness, resembling the death-agony, alternating with attacks of spasmodic and jerky, sometimes also sobbing and stertorous, respiration, with icy coldness of the face and body, lividity of the feet and hands and feebleness of the pulse (precisely resembling the symptoms of opium observed by Schweikert and others), was at first treated unsuccessfully by Stütz with potash, but afterward cured in a speedy, perfect, and permanent manner by opium. According to Vicat, J. C. Grimm, and others, opium produces an extreme and almost irresistible tendency to sleep, accompanied by profuse perspiration and delirium. This is the reason why Osthoff was afraid to administer it in an epidemic fever which exhibited similar symptoms, for the system he pursued prohibited the use of it under such circumstances. It was only after having employed in vain all the known remedies and seeing that death was imminent that he resolved to try it at all hazards, and behold, it was always efficacious. J. Lind also avowed that opium removes the head troubles, and the burning sensation in the skin and the difficulty of perspiring during the pyrexia; under opium the head becomes free, the burning febrile heat disappears, the skin becomes soft, and its surface is bathed in a profuse perspiration. But Lind was not aware of the circumstance that opium produces very similar morbid symptoms in the healthy. Alston says that opium is a remedy that excites heat, notwithstanding which it certainly diminishes heat where it already exists. De la Guérène administered opium in a case of fever attended with violent headache, tension and hardness of the pulse, dryness of the skin, burning heat, and hence difficult and debilitating perspirations, constantly interrupted by the extreme restlessness of the patient. He was successful with this case because opium possesses the faculty of creating an exactly similar feverish condition in healthy persons, of which he knew nothing, though it is stated by many observers. In a fever where the patients were speechless, eyes open, limbs stiff, pulse small and intermittent, respiration labored, snoring, and stertorous, and deep somnolence (all of which are symptoms perfectly similar to those which opium excites), this was the only substance which C. L. Hoffmann saw produce any good effects. Wirthenson, Sydenham, and Marcus have in like manner cured lethargic fevers with opium. C. C. Mathai, in an obstinate case of nervous disease, where the principal symptoms were insensibility and numbness of the arms and legs, after having for a long time treated it with inappropriate remedies, at length effected a cure by opium, which, according to Stütz, Young, and others, causes similar states in an intense degree. Hufeland performed, by the use of opium, the cure of a case of lethargy of several days' duration. How is it that opium, which, as everyone knows, of all vegetable substances is the one which in its primary action (in small doses) produces the most severe and obstinate constipation, should be one of the most efficient remedies in constipation of the most dangerous character, if not by virtue of the homœopathic therapeutic law, so long unrecognized? The honest Bohn was convinced by experience that opiates were the only remedies in the colic called 'miserere'; and the celebrated F. Hoffmann, in the most dangerous cases of this nature, placed his sole reliance on opium combined in the anodyne liquor called after his name. Can all the 'theories' contained in the 200,000 medical books which cumber the earth furnish us with a rational explanation of this and so many other similar facts?"

The great German physician and philosopher was careful to credit other medical men with having obtained foregleams of his great discovery. "How near," he says, "was the great truth sometimes of being apprehended!" And again: "There have been physicians here and there across whose minds this truth passed like a flash of lightning without ever giving birth to a suspicion of the homœopathic law of nature."

From Hahnemann's literary and experimental investigations alone, both he and his disciples have unhesitatingly justified their belief in a general curative relation between drugs, as represented by their symptoms, and diseases as represented by their symptoms, and their belief that this curative relation is properly set forth by the word "similarity." The proofs herein presented are considered conclusive, although similar evidence has been constantly accumulating in the writings of medical men of all schools, and in the practice of hundreds and thousands of homœopathic physicians for more than a century.

In Hahnemann's foot-note (see Dudgeon's Appendix to the 'Organon,' p. 207) it is shown that he early became aware of the "danger which is to be anticipated from large doses of homœopathic remedies." He says, however, that "it often happens, from various causes which cannot always be discovered, that even very large doses of homœopathic medicines effect a cure, without doing any particular harm." In most instances homœopathic physicians came to regard the small dose as a necessity to homœopathic practice. Thus, a full dose of belladonna, or of opium, administered to a patient already suffering with symptoms like those producible by one of these drugs, might be perilous. Experience also taught them that the curative action of the homœopathic drug could be secured as well or even better through the small dose. The results claimed for these small or minute doses naturally aroused the skepticism of physicians and laymen alike, and became a serious hindrance to the spread of the homœopathic system. The very nature of the homœopathic principle, however, carries with it the necessity for the use of the diminished dose.

Homœopathic physicians, when prescribing minute doses of their remedies, are under the necessity of employing great care in securing absolute purity and simplicity in the preparation of their medicines; and this has led to the need of a special pharmacy for homœopathic prescribers. Another corollary of the homœopathic law of cure is the "single remedy," without which no prescription can be strictly homœopathic. Still another principle follows from the application of this law: namely, that a homœopathic prescription can never be made from the *name* of the disease. The similarity must be traced between the symptoms of the drug and those of the individual patient. This fact is fortunate in that it at once brands the advertised "homœopathic" proprietary medicine as a fraud and a pretense, no matter in what form it may be put upon the market.

The spread of homœopathy in the country of its birth, and in other countries of Europe, has been slow. The delay in securing its establishment has been due partly to the cause already mentioned — an unwillingness on the part of both physicians and laymen to accredit the little dose with curative potency. But the chief obstacle to its advancement is to be sought in inimical legislation and the lack of facilities and authority to educate young men and women for homœopathic professional life, and the consequent inability to supply the public need of homœopathic physicians.

Homœopathy was introduced into the United States in 1825 by a physician named Hans B. Gram, who at that time settled in New York. In this country, with its free institutions and its asserted freedom of opinion, the new medical thought found less antagonism to overcome, although there were many obstacles to be encountered, chiefly of a social and legislative character. The physicians of America, less conservative, perhaps, than those of Europe, were more disposed to inquire into the scientific and practical aspects of homœopathy, with the result that in less than 20 years more than 300 of them were engaged in its practice. These physicians speedily conceived the necessity for having their own students educated under teachers of their own faith and practice, and in 1848 organized and equipped a medical college for this purpose. This school was almost immediately succeeded by others; and these institutions have very largely contributed to the rapid spread of homœopathic practice in all parts of the United States.

When Dr. H. B. Gram arrived in New York in 1825, the only homœopathic literature in the English language was Hahnemann's 'Geist der homöopathischen Heilkunst,' a pamphlet of 24 pages, translated by himself and published by J. & J. Harper, of New York. The remaining homœopathic literature was all in the German language, and it is recorded that such was the interest felt in the subject that numerous converts to Hahnemann's system, some of them past middle life, pursued the study of German in order to facilitate their investigations in homœopathy. At the close of the first quarter-century of the new practice, more than 25,000 pages in the English language had been published by the homœopathic press, and at the end of 50 years the aggregate reached more than 150,000 pages. (See 'Transactions of the World's Homœopathic Convention of 1876, Vol. II., pp. 1020–65.)

The progress that homœopathy has made in the United States can be best shown by the records of its organizations and institutions. The American Institute of Homœopathy, the national society of homœopathic physicians, organized in 1844, now has a membership of over 2,000. There are six other national organizations, formed to promote various departments of medical and surgical interest. State societies are organized in 36 of the commonwealths, and at the present rate of increase these bodies will in a few years exist in every State. To these may be added 150 local societies of various kinds. In the United States homœopathic physicians are in charge of 220 hospitals, general and special, 66 other institutions — asylums, homes, etc., and 65 dispensaries, 20 medical colleges, and 32 medical journals.

The exact number of physicians practising homœopathy in this country cannot be ascertained with accuracy, but it is known to be not less than 12,000, and has been estimated as high as 18,000. The number of people employing these physicians, regularly or irregularly, cannot be less than 15,000,000. Thus has the influence of homœopathy extended during its American career of 75 years.

The influence of homœopathy upon public and professional sentiment has been beneficent and pronounced. Laymen and physicians have alike learned from the practice, that large quantities of potent and dangerous drugs are not often necessary to determine recovery from disease, and physicians have reached the wise conclusion that cures sometimes occur under the influence of small doses, as well as quantities with larger.

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PEMBERTON DUDLEY, M.D., LL.D.,
Professor of Institutes of Medicine, Hahnemann Medical College, Philadelphia.

Homol'ogy, a principle first enunciated by E. Geoffrey St. Hilaire. It is the anatomical or morphological identity of parts or organs, which may have entirely different functions. Thus the wing of a bird is homologous with the fore limb of a dog or the arm of man. On the other hand analogy involves the idea of physiological identity, or use. Thus the wing of a bird is analogous to the wing of an insect. Homologous organs are also present in groups of animals which have had a common origin; thus the swimming-bladder of a fish has given origin to the lungs of the higher vertebrates, the physiological differences arising from change of function. See ANATOMY, COMPARATIVE; ANALOGY.

Homoousian, hō-mō-oo'sĭ an (Greek *homo-,* "the same," and *ousia,* "substance") and **Homoiousian** (Greek *homoios,* "like," and *ousia,* "substance"). The Council of Nice adopted the word homoousian to express that the Son was of the same substance with the Father, while the followers of Arius adopted the term homoiousian, as a sort of middle and reconciling theory, to express that the Son, though not of the same, was yet of a similar substance with the Father. The doctrine of Arianism was not only that the Son was subordinate to the Father, but that he was totally unlike him, being a mere created being.

Homoplasy, hō'mō-plăs-ĭ, the effect of the influences of convergence (q.v.), upon homologous structures. The term was proposed by E. Ray Lankester and used at first with a rather broader meaning subsequently restricted and defined by Osborn. See Analogy.

Homop'tera. See Hemiptera.

Homs, hōms. See Hems.

Hondo, hŏn'dō (signifying "chief island"), the largest island of Japan (q.v.), for a long time erroneously known as Nippon or Niphon, the Japanese name for the whole empire.

Honduras, British, or **Belize,** a colony in Central America, bounded on the north and northwest by Yucatan (Mexico), on the east by the Caribbean Sea and Gulf of Honduras, and on the south and west by Guatemala. Its chief town, Belize, has 9,113 inhabitants. The Cockscomb Mountains in the southern district rise to the height of 3,700 feet. Principal rivers are the Old, the New, and the Sibun. The northern part of the colony contains many lagoons, and a chain of cays stretches along the coast. The forests yield mahogany and logwood in large quantities; cattle raising and the cultivation of coffee and fruits receive some attention. The value of exports since 1897 has been decidedly greater than that of imports. During the year ending 31 March 1902 exports reached $1,427,500 in value: imports for the same period, $1,262,500. In 1901 exports of mahogany amounted to 6,485,952 superficial feet; logwood, 19,682 tons. Registered shipping: 6 steamers and 204 sailing vessels. Vessels entering and clearing in 1901, 414,795 tons. The total number of letters, books, postal cards, parcels, and newspapers transmitted by the post-office in 1901 was 245,694. That is to say, proportionately to the population, from 100 to 350 per cent more than in the neighboring Guatemala and Honduras. The standard of currency since 15 Oct. 1894 has been United States gold. In common use are silver coins and government notes. British Honduras is governed as a crown colony, by a governor, assisted by executive and legislative councils, the former composed of five members and the latter of eight. Expenditures since the close of 1899 have been less than the revenue, the latter being derived from customs duties, excise, land-tax, licenses, and the sale or leasing of lands. Total expenditure in the year ending 31 March 1902, about $256,050; revenue, $300,750; public debt, $173,680. There are 36 primary schools, with 3,423 pupils, receiving aid from the government: also a few denominational secondary schools. Population, according to the latest census, 37,479, an increase of about 17 per cent since the previous census. For origin and early history of the settlement, see Belize: also Central America.

Consult: 'Consolidated Laws of the Colony of British Honduras' (London 1887); Gibbs, 'History of British Honduras'; and Henderson, 'An Account of the British Settlement of Honduras.'

Marrion Wilcox,
Authority on Spanish America.

Honduras, Gulf of, a spacious inlet of the Caribbean Sea, having on the west British Honduras, and on the south Guatemala and Honduras. In it several smaller bays of which the Gulf of Amatique, with its inner recess, the bay of St. Tomas, are spacious and deep. Several large rivers, the Belize, Chamelicon, Dulce, Motagua and Ulua, flow into the gulf. Along the shores are the islands of Turneffe, Manabique, the Bay Islands including Ruatan, Utila, and Bonacca, and numerous islets and reefs called cays.

Honduras, Republic of, a country of Central America, bounded on the north and northeast by the Gulf of Honduras and the Caribbean Sea; on the southeast and south by Nicaragua; and on the southwest and west by Fonseca Bay, Salvador, and Guatemala. Estimated area, 46,250 to 46,400 square miles. The departments of the republic, with the population of each as shown by official statistics of 1901, are as follows: Tegucigalpa, 81,800; Copán, 62,398; Gracias, 48,242; Choluteca, 45,340; Olancho, 44,496; El Paraiso, 39,918; Santa Bárbara, 36,228; Valle, 33,450; Comayagua, 29,023; La Paz, 27,384; Intibucá, 26,348; Cortéz, 21,801; Yoro, 19,988; Colón, 13,791; Atlántida, 8,797; Bay Islands, 4,737. The capital, Tegucigalpa, has 12,000 inhabitants. Mountain ranges, which rise to heights of 5,000 or even 10,000 feet, are massed in the western half of the republic; the Juticalpa, Camasca, and Tompocente ranges, however, are near the frontier of Nicaragua in the east. Rivers emptying into the Caribbean Sea or Gulf of Honduras are the Coco or Wanks, and Patuca, in the east, and the Ulua, Chamelicon, etc., in the west. The Choluteca flows southward from the Misoco Mountains near Tegucigalpa, and empties into Fonseca Bay, on the Pacific coast. Large lakes are the Caratasca, on the Mosquito coast, and Yojoa, among the western mountains. The chief port on the Pacific is Amapala; other ports of entry are Puerto Cortez (on the Gulf of Honduras), La Ceiba, Truxillo, Roatan, and Iriona.

Minerals, Woods, and Agricultural Products. — Gold is found between the south and centre; silver in almost all sections. Lead, copper, saltpeter, iron, coal, platinum, zinc, and antimony are also widely distributed. The value of ores produced in 1902 was approximately $1,000,000 (that is, 23,234 ounces of gold, 1,010,204 ounces of silver, and a considerable quantity of copper). Only about 5 per cent of the mines of the country are being worked. The forests from sea-level to an altitude of 1,000 feet, contain mahogany, ebony, dyewoods, sarsaparilla and other medicinal plants, and cabinet woods, cedar, etc. At an elevation of 1,800 feet are dense and very extensive forests of pine and similar woods. Agriculture receives more attention than formerly, and the leading product is the native maize, of which 509,049 bushels were raised in 1902, chiefly in the departments of Copán, Gracias, and Santa Barbara. Bananas and plan-

tains are grown on 42,840 acres of territory in the departments of Cortéz, Atlántida, the Bay Islands, etc. The wheat crop in 1902 was 15,813 bushels; rice, 3,914,219 pounds. Nearly 20,000 acres are devoted to the cultivation of plantains. Cocoanuts, lemons, and oranges are produced for export on a large scale. The coffee crop in 1902 amounted to 4,494,826 pounds, and tobacco to 1,378,573 pounds. Sugar-cane is cultivated on 13,263 acres; indigo on about 9,000 acres. The total value of agricultural products in 1902 was about $2,482,449.10. The number of cattle is estimated at 571,120; horses, 43,549; mules, about 14,000, etc.

Commerce and Manufactures.— The total value of imports in 1902 was 4,377,161.42 *pesos*, or about $1,750,684.68 in United States currency; of exports, 6,170,353.27 *pesos*. Imports came chiefly from: the United States (60 per cent), Germany, Great Britain, Belize, Central America, and France. Exports were sent to: the United States (two thirds of total), Great Britain, Central America, Cuba, and Germany, with comparatively small amounts to other countries. The articles exported, together with their values (in *pesos*), follow: Metals, 2,319,070.49; fruits, 1,943,168.06; cattle, 560,411; coffee, 275,826.68; hides and skins, 257,598.10; woods, 217,459.70; tobacco and cigars, 200,851; indigo, 105,425; sarsaparilla, 80,602.50; rubber, 77,552.50; wheat and flour, 66,992; salt, 22,716.20; hats, 14,150; miscellaneous, 28,529.04. Exports to the United States were valued at 1,235,624.79 *pesos* more than imports from that country. Native industries include the manufacture of cigars, flour, hats, and candles.

Railways, etc.— A contract for the completion of an interoceanic railway was entered into by an American syndicate in 1897; in 1902 the government's concession to the syndicate lapsed, but a prorogue was requested. The line from Puerto Cortéz runs southward to San Pedro and La Pimienta. Tegucigalpa is to be connected with the Pacific coast, at San Lorenzo, by a line which is now being constructed. Roads in the country, with a few exceptions, are mere mule-paths. A cart-road from the capital to San Lorenzo is completed as far as La Venta. There are 245 post-offices, and the number of letters (both internal and foreign correspondence) is not more than 1,250,000 in a year. The republic has 3,249 miles of telegraph wire; the capital and some other towns telephone services.

Money, Weights, Measures, and Banking.— The standard dollar, or silver *peso*, is worth about 40 cent, United States currency. Gold coins of the value of 20, 10, and 5 dollars, and silver pieces, fractions of one dollar, are also in circulation. While the metric system is authorized by law, the chief measures and weights in commercial use, as in the other countries of Central America, are: Centaro = 4.2631 gallons; fanega (dry) = 1.5745 bushels; libra = 1.043 pounds; and vara = 33.874 inches. Note also, manzana = 1 5-6 acres, and arroba = 2¾–3½ gallons. The capital of the Bank of Honduras, 30 June 1902, was 600,000 *pesos;* bank-bills in circulation, 60,242 *pesos*.

Government, Finances, Army and Navy.— The president and vice-president of the republic, nominated and elected by vote of the people, serve for four years; the former is assisted by the ministers (chiefs of departments) of finance, interior, foreign relations, public works, war, public instruction, and justice. The legislative body is composed of deputies elected by the people, there being one deputy for each 10,000 inhabitants. The budget for the fiscal year 1903–4 gives, as the total of receipts from all sources, 2,637,724.20 *pesos*, the largest items being, customs duties, 1,100,000 *pesos*; tax on aguardiente, 805,000 *pesos;* and lottery and wharfage, 223,500 *pesos*. The estimate of expenditures in the same budget is 2,625,985.45 *pesos*, the largest item being for the war department — 941,853.85 *pesos*. The foreign debt of the republic (that is, the loans of 1867–70, with arrears of interest amounting nearly to two and a half times the principal sum) was determined by calculation to be about $96,124,940 in United States currency; and the internal debt was put at 1,332,400 *pesos* in 1900. But in the annual message of the retiring president, Sr. Sierra, sent to Congress 1 Jan. 1903, the assertion was made that the total "recognized" debt had been only $1,704,124.67 silver in 1899, and that this amount was reduced to $1,221,298.09 silver by 31 Oct. 1901. President Sierra completely ignored the large foreign loans, speaking of the 1,704,124 *pesos* as "the entire amount of the debt existing at the beginning of my term of office," "the public debt," etc. The army on 31 July 1902 comprised, according to a statement in the same message, 480 *jefes*, 2,608 officers, and 47,841 men. The permanent force consisted of 87 *jefes*, 226 officers and 2,481 men. Two small steamers belong to the government, and are used as revenue vessels.

Population, Education, and Religion.— The total number of inhabitants, as shown (by departments) in the first paragraph of this article, is 543,741, exclusive of forest tribes. Very few of this number are of Spanish descent, the great mass of the people being Indians or Mestizos. Between 1899 and 1903, new schools to the number of 136 were founded, making a total of 851; and 30,025 pupils received instruction in 1902. There are 13 national "colleges" and one private school for higher education; professional schools with faculties of jurisprudence and political science, and medicine and surgery, at Tegucigalpa; the Escuela de Derecho at Comayagua; a national library with 6,854 volumes; and an art school. Primary instruction is compulsory, gratuitous, and secular. Freedom of worship is secured by constitutional guaranty; the government does not contribute to the support of any church; the prevailing religion is Roman Catholicism.

History.— The first place of debarkation of Christopher Columbus on the American mainland was near the present Cape Honduras, where he landed on Sunday, 14 Aug. 1502. On the following Wednesday Bartholomew Columbus landed at the mouth of Rio Tinto. They sailed thence along the coast to Cape Gracias á Dios (see CENTRAL AMERICA). The conquest of the country was effected by Hernan Cortés, who found the natives manageable, but their land "covered with awfully miry swamps," as he wrote to the Spanish emperor 3 Sept. 1526. "I can assure your majesty," he adds, "that even on the tops of the hills our horses, led as they were by hand, and without their riders, sank to their girths in the mire." The most important fact in the history of Honduras — the fact that the Indians remained in possession of so large a portion of the country that their descendants

constitute the bulk of the population to-day — is a consequence of the policy observed by Cortés and his successors. The natives were tractable; without their assistance it would have been impossible to move about among the dense forests, swamps, and mountains; therefore the Spaniards realized that more was to be accomplished by diplomacy than by force. Massacres occurred, but extermination was not attempted; on the contrary, Honduras became in time a nation of Spanish-speaking Indians, those of pure or nearly pure blood being more numerous now than before the conquest. For the era of independence, confederation with the neighboring states, etc., see CENTRAL AMERICA.

Bibliography.— American Republics, International Bureau of the, 'Monthly Bulletin' (1902–3); Cortés, 'Fifth Letter of Cortés to the Emperor Charles V.'; Diaz, 'Historia Verdadera de la Conquista de la Nueva España'; Sierra, 'Mensaje,' etc., in 'Pabellon de Honduras,' Tegucigalpa 10 Jan. 1903; Squier, 'Honduras,' and 'Honduras Interoceanic Railway'; Wells, 'Explorations and Adventures in Honduras.'

MARRION WILCOX,
Authority on Spanish America.

Hone, hōn, **Philip**, American merchant: b. New York 1781; d. there 4 May 1851. He was a successful auctioneer in New York, established there the first savings bank (1816), was mayor in 1826, and one of the founders of the Mercantile Library Association. Prominent in national political affairs, he aided in the formation of the Whig party. His diary, a portion of which, edited by Tuckerman, appeared in 1889, contains important side-lights on the early history of the Whigs. Hone was also at one time naval officer of New York port.

Hone, a strop or stone for sharpening knives and razors. See WHETSTONE.

Honesdale, hōnz'dāl, Pa., borough, county-seat of Wayne County; on the Lackawaxen River; the Erie, and the Delaware & H. R.R.'s; about 15 miles northeast of Carbondale and 30 miles northeast of Scranton. The first locomotive used in America, the "Stourbridge Lion," made its trial trip from this city. It is situated in a coal-mining region, with good farming land in the valleys. Its manufactures are silk and woolen goods, boots, and shoes, machine-shop and foundry products, axes, electric elevators, green, cut, engraved, and decorated glassware, men's clothing, and wheels for polishing glass. Large quantities of coal are shipped annually from Honesdale. Pop. (1900) 2,864.

Honesty. A flowering herb. See SATIN-FLOWER.

Honey, a sweet sticky liquid obtained by bees and other insects from flowers (see HONEY-BEE; and FLOWERS AND INSECTS) as food, or taken home to be stored as food for the young. The care with which the honey-bee (q.v.) collects and stores this substance in its hive has led to bee-culture (q.v.). Honey is highly nutritive, especially as a fuel for the energies of the body, as four fifths of its components are carbohydrates, the remainder being water with a trifle of protein. The saccharine elements are mainly grape-sugar and some fruit-sugar, which are so readily affected by yeast that various fermented drinks are made with honey as their basis, of which the best known are the mead and metheglin in great demand among all Teutonic peoples a thousand years ago, and the equivalents of which are still made in Russia, Abyssinia and elsewhere. Before the general manufacture and use of cane-sugar, honey was largely depended upon for purposes of sweetening, and was put into a great number of cakes and confections now rare or only locally manufactured. Of the place which it took among the ancients in the household, in ceremonials, worship, and folk-lore a large amount of curious information may be gathered from such books as Beckman's 'History of Invention' (1846); Dutt's 'Materia Medica of the Hindoos' (1877), and similar works, of which lists may be found in Warring's 'Bibliography of Therapeutics' (1868), and in the 'Catalogue of the United States Army Medical Museum.' The importance of honey was, indeed, much greater to the ancients than to us; as might be inferred from its frequent mention in the Bible as a sign of abundance or the resource of the destitute. It has well-recognized medicinal properties, especially as a demulcent against hoarseness, catarrh, etc., in promoting expectoration in disorders of the breast, and as an ingredient in cooling and detergent gargles. Its effect is usually laxative also. It is used to sweeten certain medicines; and is sometimes mixed with vinegar in the proportion of two pounds of clarified honey to one pint of the acetic acid, boiled down to a proper consistence over a slow fire, and thus forms the oxymel simple of the shops. It enters into the composition of various sweetmeats, especially in the East, such as the genuine Oriental nougat. These properties and the flavor and color of honey vary with the qualities of the flowers from which it is made. Thus in Europe the white Narbonne honey of France, is said to owe its peculiar and delicious flavor to the rosemary and other labiate flowers on which the bees feed. The Grecian honey also stands in high estimation. Mt. Hymettus in Attica has been famous since classic times for this product; but that yielded by the bees who range the thyme-covered hills of Corinth is said to excel it. Another famous ancient source of supply was Sicily, especially about Mt. Hybla; and Corsica is yet celebrated for its honey and wax, which in ancient times were the chief exports of that island. In the eastern United States the early light-colored honey obtained from the blossoms of the white clover, is especially esteemed; also that derived from raspberry plantations, bass-wood flowers and the like; while that made later in the summer from buckwheat is in favor among darker varieties. California is an extensive producer of honey from various flowers.

As the aromatic agreeable flavors and healthful qualities of special flowers (fortunately in the majority) are kept and apparent in ordinary good honey, so certain bad qualities are retained and spoil some honey, which thereby becomes deleterious to the human system, acting as a nauseant, a purgative, affecting the nerve-centres or even seriously poisoning those who eat it. This is the case in the United States with honey made from the flowers of the mountain laurel (*Kalmia*) and some other toxic plants. Some persons are unable to eat any

kind of honey, without disarrangement of the digestion or nerves, or both; and all should use it in moderation.

The industry of bee-keeping is for the purpose of supplying the market demand for honey. Modern hives are so constructed that the bees build separate combs each filling a box with glass sides, which are taken out and sent to market as the bees finish them. Another method of marketing is in the form of "strained" honey, the liquid pressed from the comb after warming, through sieves of linen cloth, or by other means. There is no reason why this should not be as good as that left in the comb, if properly prepared and preserved, and it permits of saving the material of the combs for wax (q.v.); but it makes possible adulteration, which is freely taken advantage of. The chief adulterant is commercial glucose, which occasionally is substituted to the extent of three fourths of the volume, leaving only enough real honey to flavor the mass. As glucose (grape-sugar) is a large constituent of this substance in nature no great harm results (when the glucose is good), beyond the deception; and wholly artificial honey has been largely sold in the past as the product of bees.

The United States is probably the greatest honey-producing region of the globe, and exports a vast quantity to Europe annually. The census of 1900 reported 4,149,426 swarms of bees, valued at $10,186,513; and the annual production of honey at 61,196,160 pounds, which, together with 1,765,315 pounds of wax was worth $6,664,904.

Honey Ant, a true ant of the family *Formicidæ,* fifth sub-family *Camponotinæ,* and allied to the typical ants (*Formica*). The honey ant (*Myrmecocystus melliger*), is so called from certain of the wingless individuals being so many honey-pots, their abdomens being distended with honey fed to them by the normal workers, including both dwarfs and majors. It occurs from central Colorado (Garden of the Gods) to New Mexico and as far south as the city of Mexico. It erects mounds six or seven inches across and two or three inches in height, of the shape of a truncated cone. In the interior is the "honey chamber" or a rough dome-roofed vault or fissure, the honey-bearers (600 in a large colony) clinging by their feet to the roof. Their yellow bodies are stretched along the ceiling, their swollen, round, amber-colored abdomens of the size of currants hanging down. The "honey" is obtained in the night time by the workers which go in long processions to some distant scrub-oak bearing nectar-producing galls. The workers return with distended abdomens, and feed the honey-bearers with the nectar. C. McCook thinks the honey-bearers are not a distinct caste, but simply workers "with an overgrown abdomen." The honey is thus stored, as bees store their honey, for food in winter or times of famine. Consult McCook, 'The Honey Ants of the Garden of the Gods,' etc. (Philadelphia 1882).

Honey-badger, a small mustiline burrowing animal (*Mellivora indica*) of India, which eats insects, frogs, birds' eggs, and small animals generally, and is fond of honey. The natives believe it robs graves, but destruction of poultry is its worst sin. It is nearly related to the South African ratel.

Honey-ball, or **Globe-flower,** the flower of an American shrub (*Cephalanthus occidentalis*) of the madder family, which grows in wet places, where it is called button or river bush, and bears extremely fragrant flowers whose small florets are folded or packed into balls, while "the long styles and capitate stigmas remind us of pins stuck in a cushion."

Honey Bear, the sun-bear (q.v.).

Honey-bee. Bees in general are *Hymenoptera,* of the family *Apidæ.* Bees are distinguished from wasps and other hymenoptera in the first place by the long, broad, flattened basal joint of the hind tarsus, which is adapted for carrying pollen to the nest. Bees are also more hairy than others of their order, and some of the hairs are plumose or feathery. The mouth-appendages are long and highly specialized, especially the long flexible proboscis or tongue (hypopharynx). There are no wingless adult forms. While the more primitive genera are solitary, in the more specialized or social kinds, besides the males and females, there are workers, which are, as a rule, sterile females in which the ovaries are undeveloped. Of the bee family there are now known to be about 150 genera and 1,500 species.

Original Home of the Honey-bee.— Although the honey-bee (*Apis mellifica*) has followed the white man in his migrations from the Old World to the New, and to Australia, New Zealand, etc., its original birthplace is in southern Asia, probably including the eastern shores of the Mediterranean Sea. Besides *A. mellifica* there are seven or eight other species, all except one southern and eastern Asiatic, including the islands of Timor and Celebes; the exceptional one (*A. adamsoni*) inhabiting tropical Africa and Madagascar. We know little of the honey-bees of China and Japan.

Like other domestic animals (and the honey-bee is the only domestic insect we possess), this bee is divided into races of which the Ligurian bee (variety *ligustica*), originally inhabiting Italy and adjoining regions, is a well-marked one, and another is the Egyptian honey-bee (variety *fasciata*). There are several sub-varieties of the northern form of *A. mellifica* in Germany. The English naturalist Ray, who published before Linné gave the name *A. domestica* to the northern dark form, our common honey-bee. This dark, northern form is the one which has been carried by the European race to various parts of the world, in some of which it is now wild. It occurs in the West Indies, in North America, including Mexico, in central and southern Africa, and in Australia and New Zealand. The variety *ligustica* has also been found at the Cape of Good Hope.

Besides the honey-bee there are other social forms in Central and South America, as well as other tropical countries, including Australia, which store up honey; these are small bees, exceedingly numerous in individuals, which belong to the genera *Melipona* and *Trigona,* and are stingless, though the sting exists in a rudimentary state. *Trigona mosquito* is known to send off swarms and to have but a single queen in a colony. The nests are built in hollow trunks of trees, in banks of clay or earth, and they gather pollen, nectar, and resin. On the

whole, the honey-bee stands at the head of the hymenopterous series, and, in fact, at the head of the class of insects, though the house-fly is in some respects more extremely specialized.

Structure of the Honey-bee.— Besides the males or drones, and the female or queen, the colony consists of workers; these carry on the work of the society, gathering nectar, pollen, building the cells and feeding the young. The colony is permanent, differing in this respect from that of bumblebees, which come to an end each autumn. We will first describe the chief points in the external anatomy of the insect. The body is divided into three regions, the head, thorax, and abdomen. The eyes are of two kinds, simple and compound, the male differing from the queen and the workers in the large compound eye meeting in the middle of the top of the head. The mouth-appendages consist of three pairs,— first the jaws or mandibles; these in the queen and drone are notched, but in the worker the edge is entire and serves for biting, and in comb-building for thinning out wax shreds, also for scooping and molding the wax, while the next pair of appendages, or accessory jaws, are called maxillæ, and are used as a trowel. In the bumblebee the maxillæ are also used for piercing the corolla of flowers like the wistaria and honeysuckle, but those of the honey-bee appear to be too weak for this purpose. They also ensheathe the proboscis. The so-called tongue (ligula, lingua or hypopharynx) is the long, slender, hairy appendage adapted for gathering the nectar of flowers. It is an outgrowth of the under lips (labium or fused second maxillæ), is situated in a tube formed by the maxillæ and labial palpi, and can be partially withdrawn into the memtum, or base of the under lip. It can move up and down in the tube thus formed. It is covered by a hairy sheath, and is very elastic, this being due to a rod extending through its centre, enabling it to be used as a lapping tongue. Cheshire states that the rod on the under side has a gutter or trough-like hollow, which forms a false tube by the intercrossing of black hairs. There are also two side-ducts, which extend along to the end of the tongue, where the "spoon" or "bouton" is situated. This is provided with very delicate split hairs, "capable of brushing up the most minute quantity of nectar, which by capillarity is at once transferred by the gathering hairs to two side groove-like furrows at the back of the bouton." The central duct, because of its smaller size and consequent greater capillary attraction, receives the nectar, if insufficient in quantity to fill the side ducts. "But," says Cheshire, "good honey-yielding plants would bring both centre and side into requisition. The nectar is sucked up until it reaches the paraglossæ, which are plate-like in front, but membranous extensions, like small aprons, behind; and by these the nectar reaches the front of the tongue, to be swallowed as before described. The process of gathering the nectar is not exactly either a sucking or a licking process; but, as Cheshire shows, the action is primarily due to capillary attraction.

Organs of Smell and Taste.— Bees are guided to flowers chiefly by smell, rather than by the color of the flowers they visit. (See Flowers and Insects.) The olfactory organs are multitudes of microscopic pits in the antennæ — the organs of smell. The sense of taste is lodged in a minute soft baggy fold on the under side of the upper lip, which is rich in taste-cups; and, besides, there are a few taste-papillæ or cups found by Packard at the base of the paraglossæ and on the base of the labial palpi. These sites of the gustatory organs are situated where the food or nectar will come in contact in passing down the throat into the stomach.

Formation of Honey and the Honey-Stomach.— In insects there is the fore stomach (proventriculus) and the true or chyle-stomach. The former is called by apiarians the "honey-sac" or "honey-stomach." "If," says Cheshire, "it be carefully removed from a freshly killed bee, its calyx-like 'stomach-mouth' may be seen to gape open and shut with a rapid snapping movement." The entrance to the stomach is guarded by four valves, which open to allow the passage of food from the honey-sac to the chyle-stomach. It is closed at will by circular muscles. Thus the bee can carry food for a week's necessities, either using it rapidly in the production of wax, or eking it out if the weather is unfavorable for the gathering of a new store. By means of a complicated mechanism a bee in sucking up from composite and other flowers nectar together with much pollen (1) can either eat or drink from the mixed diet she carries, gulping down the pollen in pellets, or swallowing the nectar as her necessities demand; (2) when the collected pollen is driven into the chyle-stomach, the tube-extension prevents the pellets forming into plug-like masses just below, for by its action these pellets are delivered into the midst of the fluids of the stomach to be at once broken up and digested; (3) "while the little gatherer," says Cheshire, "is flying from flower to flower, her stomach-mouth is busy in separating pollen from nectar, so that the latter may be less liable to fermentation and better suited to winter consumption. She, in fact, carries with her, and at once puts into operation, the most ancient, and yet the most perfect and beautiful, of all honey-strainers.' "

How the Honey is Made.— Honey is made of nectar, and is due to a chemical change in the honey-sac. The bee gathers the nectar with its "tongue," swallows it; it then passes into the honey-sac, and is regurgitated as honey. The nectar when gathered is almost entirely pure saccharose, and, according to Bertrand, when regurgitated it is found to consist of dextrose and levulose; this change appears to be practically the conversion of cane-sugar into grape-sugar. A little salivary fluid is poured out into the mouth as the bee sucks the nectar, and this effects the chemical change. Cheshire thinks that the salivary fluid is added while the nectar is being sucked, and is passing over the middle parts of the under lip, so that the nectar may be honey when swallowed by the bee.

Many and probably all bees eat the pollen while gathering it. The plumose hairs of bees are of use in collecting the pollen grains which adhere to them, but the exact method of accumulation of the pollen and the mechanism of its conveyance from hair to hair till it reaches the part of the body it must attain in order to be removed for packing in the cells, is not fully understood, but the head and front legs scratch up the pollen-grains, and the honey-bee has a pollen-basket on each hind leg, the basal joint of the tarsus being broad and slightly hollow,

with nine rows of short hairs to which the pollen-grains adhere.

Life History and Social Life.— In founding a new colony the young swarms consist of a queen-bee and a number of workers, a surplus population of the old colony. The swarming is not a nuptial flight, but an act of emigration. After the new swarm has been housed, the workers begin their labors by secreting wax. This is formed in glands on the inside of the ventral plates of the abdominal segments, appearing outside as thin projecting plates, which are removed by the wax-pincers on the hind legs; after being molded by the jaws they form the hexagonal cells in which the young or larvæ live and the food is stored, and thus the comb is gradually built up. The queen then lays an egg in each cell, and the larvæ (grubs) on hatching are fed by the workers. This they do by eating honey and pollen, which is formed in the digestive organs, into a kind of pap. This pap looks like arrowroot made with water, and the very young grubs partly float in it, besides absorbing it by the mouth. The young grubs, as they increase in size, are weaned from this glandular secretion or pap, pollen, honey and water being added, while the pap or glandular secretion is gradually withdrawn. The queen larvæ, according to Cheshire, is not weaned, but the secretion or pap (the so-called "royal jelly"), which is a rich, highly nitrogenous food, is added unstintingly to the end, and owing to this the queen becomes larger and fertile. When the colony is progressing well and young bees emerge, these act as nurses, the old ones going out of the hive to forage. When the grub is full-sized the worker bees seal up the cell with a cover made of pollen and wax, but pervious to the air. In this cell the grub spins a cocoon in which it pupates, finally biting its way out; the bee developing in three weeks from the time the egg is laid.

The new queen arises from an egg laid in the royal cell, which is large and slipper-shaped. She develops in 16 days. Only one queen is allowed in the hive at one time. The males (drones) arise from unfertilized eggs. The drone cells are a little larger than the ordinary worker cells. A drone is developed in about 24 days. When a swarm leaves the hive the old queen quits with it, but when a second swarm goes off from a hive it is accompanied by a young queen, who is frequently and perhaps usually, unfertilized.

The young queens will usually mate when five to seven days old, flying from the hive for this purpose. In a day or two after mating the queen generally begins to deposit eggs, and is then ready for use in the hive or to be sent away as an "untested queen."

Bee-Culture.— Spring is the best season to start a hive or apiary. In April a good colony situated in the Central States ought to have brood in five or six combs. The Langstroth hive with its modern improvements is the best, and the novice should select those holding 10 to 12 frames in each story.

Swarming is the result of an abundant secretion of honey, and combs crowded with bees and brood, that is, overpopulation. Just before swarming there is a partial cessation of field-work, the workers clustering or loitering about the entrance to the hives. Suddenly those which happen to be in the hive at this time rush forth, accompanied by the old queen, and cluster on some tree or shrub near by. Hiving the new swarm can be done after a little experience and the use of smoke. Swarming may be prevented by giving abundant room for the storage of honey early in the season, before, as Benton says, the bees get fairly into the swarming notion. The honey also should be frequently removed. Also the hives should be well ventilated and shaded in hot weather. To successfully winter bees the colony must have a good queen, and young workers, also good and abundant food. Those colonies having the most honey compactly stored in the brood department and close about the very centre when the last brood of young bees should emerge, are the ones which will winter best. A good substitute for honey is a syrup made of granulated sugar, to be fed early in autumn. The bees should be kept dry and warm, and there should be no manipulation out of season. (Benton.)

Diseases and Enemies.— Diarrhœa is due to sour or fermented honey, dampness, and chilling of the bees. Foul-brood is a germ-disease, occasioned by *Bacillus alvei;* it affects both the brood and the adult bees. Of insect enemies the caterpillar of the wax or bee-moth is the most destructive, but with care it can be kept out of well-regulated hives.

Agency of Bees in Cross-Fertilization of Plants.— A hive is an essential thing in an orchard, and were it not for the visits of bees the fruit in many cases would not set. Also in hothouses where cucumbers are raised, a small hive of bees is indispensable for fertilizing the flowers. See BEE-KEEPING; FLOWERS AND INSECTS.

Consult: Cheshire, 'Bees and Bee-Keeping' (2 vols., London 1886); Benton, 'The Honey Bee'; Bulletin No. 1, new series, U. S. Department of Agriculture, Division of Entomology, Washington, 1896, contains a list of the best books on bee-keeping.

ALPHEUS S. PACKARD,
Late Professor of Zoology, Brown University.

Honey-bird, or **Honey-guide.** See GUIDEBIRDS.

Honey Bloom, one of the American species (*Apocynum androsæmifolium*), the "spreading dogbane" of the family *Apocynaceæ* (q.v.). It grows in fields and thickets all over temperate North America, and has the medicinal qualities characteristic of the family.

Honey-buzzards, a genus (*Pernis*) of Old World hawks, formerly called "perns," which subsist mainly on insects, especially burrowing wasps, and bees, with their young and food-stores, which they dig out of the ground.

Honey-creepers, a group of small warbler-like birds (the family *Cœrebidæ*) of gay plumage, numerous in the West Indies and neighboring lands, where they are known about gardens and plantations and admired for their agility in searching flowers for small insects, and their cheery notes. Among them are the "banana-birds" (q.v.).

Honey-dew, the sweet secretion of certain plants and insects. (1) Some trees in warm climates yield from their leaves in very warm moist weather a saccharine liquid which may fall in drops, or may form a sticky film over each leaf. This exudation, dried, is one form of

manna. (2) Certain minute insects, chiefly plant-lice, leaf-hoppers, and related bugs, yield a sweetish secretion, sometimes so copiously as to bedew a whole tree, and even fall in drops, giving the phenomena called weeping trees. The usual cause in this case is the presence of a tree-hopper (*Proconia undata*). Honey-dew in both cases attracts insects in large numbers, who feed upon it or upon the lesser insects gathered to the feast: and these, in turn, attract larger predatory animals, as birds, lizards, etc. Moreover dust sticks to it, closing the pores of the leaves to the injury of the tree; and, still worse, the honey-dew forms a highly favorable culture-ground for the spores of smuts and other pernicious fungi.

Honey-eater, or **Honey-sucker,** any of various small and somewhat thrush-like long-billed birds of the family *Meliphagidæ,* which inhabit the Australian regions, and seem to feed upon the nectar of flowers. They do so to some extent, but mainly are in search of insects within the corolla, collecting them easily by means of a peculiar tongue, which is divided near the end into a sort of fringe. They also eat soft fruit, and spend much of their time hunting insects on the ground. Well-known examples are the soldier-bird, parson-bird, pimlico, friar-bird (qq.v.) and others familiar in Australia and New Zealand.

Honey-guides. See GUIDE-BIRDS.

Honey Hill, Battle of. On the night of 28 Nov. 1864 Gen. Foster, commanding the Federal troops in the Department of the South, left Hilton Head, S. C., with 5,000 infantry, cavalry, and artillery, and about 500 sailors and marines, for Boyd's Neck on the south side of Broad River, the object of the movement being to cut the railroad connecting Savannah and Charleston, and otherwise co-operate with Sherman, who was marching to the coast. Owing to a thick fog many of the boats lost their way, and it was late in the afternoon of the 29th before the troops got ashore. Gen. Hatch was put in command, with orders to push forward and cut the railroad. Hatch marched immediately; the guides and maps proved worthless, and, after marching and countermarching the greater part of the night, he went into bivouac about 2 o'clock on the morning of the 30th. Information of Foster's appearance at Boyd's Neck was carried to Gen. Hardee at Savannah on the evening of the 29th, and next morning at 2 o'clock, the advance of G. W. Smith's Georgia militia arriving at Savannah, Hardee directed Smith to hasten it to Grahamsville Station on the Charleston & S. railroad. The station was reached at 8 A.M., and the men marched out on the road leading to Broad River landing, about three miles where, on the crest of the north bank of a small stream, a work for light guns had been thrown up and trenches for infantry prepared. These works were about 100 yards from the little stream, and upon Honey Hill, 10 or 12 feet above the water level. On the right of the battery of five guns was a dense forest, on the left an open pine wood. The ground in front was open. Preparations were completed by 10 o'clock, at which hour about 1,000 militia filled the trenches on the right and left of the battery. Early in his march Hatch encountered the Confederate outposts, drove them in, and, soon after 10 o'clock, came under fire of the guns. Hatch attempted a flanking movement, but failed, and made several direct assaults during the day, all of which were repulsed, and at dusk he began his retreat to Boyd's Neck. His loss was 711 killed and wounded, and 43 missing. During the action Smith was reinforced by the 47th Georgia, but at no time did he have more than 1,400 men. He lost 8 killed and 42 wounded. Consult 'Official Records,' Vol. XLIV.

E. A. CARMAN.

Honey-locust, or **Honey-shucks.** See LOCUST TREE.

Honeysuckle, a genus of plants, *Lonicera,* belonging to the natural order *Caprifoliaceæ.* Upward of 100 species are native to the northern hemisphere. The honeysuckle family is represented in the North American flora by different species, among which are *L. sempervirens,* the trumpet honeysuckle; *L. grata,* American woodbine; *L. flava,* yellow honeysuckle, etc. "Coral honeysuckle" is another name in the United States for *L. sempervirens.* It is much valued in the South, where it is native, for its flowers of beautiful color and grateful perfume. In the eastern United States the Japanese honeysuckle has escaped from cultivation. The common honeysuckle, *L. periclymenum,* with distinct leaves and red berries, is indigenous in Great Britain; but two others have been naturalized, *L. caprifolium,* distinguished by its upper leaves being united (connate) and perfoliate, and by its smooth orange-colored berries; and *L. xylosteum,* an erect shrub, with small, yellowish, scentless flowers and scarlet berries. There are many other species in America, Europe, and Asia, and the name honeysuckle is often given to shrubs with sweet flowers of quite different genera.

Honey-sweet. See MEADOW-SWEET.

Hongkong, hŏng'-kŏng', or **Hian-Kiang,** hē'ăn-kē'ăng (signifying "the place of sweet streams"), an island off the southeast coast of China, forming with Kau-lung on the mainland, a British crown colony and naval station. The island is on the east side of the estuary of the Chu-Kiang or Canton River, 90 miles south of Canton, and is separated from the mainland by the narrow Lyemun strait. About 10 miles long and about 7½ miles broad, the island is of rocky formation, attaining in Victoria Peak a maximum altitude of 1,809 feet. While almost treeless it is noted for its profuse flora. Good water is abundant. Hongkong is a great entrepôt for the foreign commerce of China, and Victoria (q.v.) the chief town and centre of its commerce is a free port. The foreign commerce is carried on mainly with Great Britain and Germany, whence considerable quantities of goods are imported, cottons being the principal item,—and to which tea, silks, hemp, etc., are exported.

In 1902 Hongkong exported, in vessels of European construction, goods to the value of $3,963,463, besides $2,372,397 worth of goods in transit, making a total of $6,335,860, and showing an increase of $720,288 over the previous year.

Comparing 1902 with 1901 the number of steamships which entered the port of Hongkong and their classification by the flags they carried, is as follows:

Courtesy of the Philadelphia Commercial Museums.

QUEEN STREET, HONGKONG.

Flag	Ships		Total Tonnage	
	1901	1902	1901	1902
British	321	324	2,894,519	2,965,030
German	122	123	1,242,499	1,360,524
Japanese	65	56	692,981	865,400
Norwegian	3	3	78,004	263,379
French	22	27	209,094	219,111
Chinese	4	17	3,349	163,396
Austrian	20	20	128,483	125,929
American	19	23	130,476	121,939
Others	33	37	119,498	131,518
Totals	609	630	5,498,903	6,216,226

In 1901 the vessels entered the port 3,510 times, and in 1902 4,000 times.

The currency is chiefly in silver dollars. The revenue of the government is derived from land rents, licenses to sell opium, spirits, etc., taxes, postage, office fees, fines, etc. The colony's prosperity is due chiefly to the presence of large numbers of Chinese engaged in trade or in working building stone, one of the island's principal products. Exclusive of the naval and military establishments which numbered 5,597 and 7,640 respectively, the population in 1901 was 283,905 of which 274,543 were Chinese and one third of these by birth, British subjects. Hongkong was ceded to Great Britain in 1842; some 376 square miles on the mainland, with 100,000 Chinese inhabitants, were leased in 1898.

Honolulu, Hawaii, capital and principal city of the Hawaiian Islands (now a United States Territory), and commercial metropolis of Polynesia; the business heart of the central Pacific. It is 2,089 miles southwest of San Francisco, in lat. 21° 17′ 56″ N., lon. 157° 51′ 48″ W. It lies on the southwest side of Oahu (the third island of the group in size, and northwest of Hawaii, with a safe harbor formed by a natural breakwater of coral reef, pierced by a broad opening. A fine lighthouse here throws a light visible for 25 miles. With its natural advantages, and the absence of rivals, the city occupies a unique position. From its central location it is a common point of touch for the three great trans-Pacific steamship routes — from the United States and British Columbia to New Zealand and Australia, from the same to Japan, China, and the Philippines, and from South America to Japan and China. Several independent steamship routes also run from it. It has regular communication with San Francisco, Vancouver, and Seattle, Peru, Auckland, and Sydney, New York and Boston, Yokohama and Hongkong, Liverpool, Glasgow, and Bremen, besides other places. The steamship line to Sydney touches at the Fijis; the line to Auckland, at Apia, Samoa. From Honolulu it is 3,850 miles to Auckland, about 4,000 to Sydney, and 3,445 to Yokohama. It is the port of foreign trade for the archipelago; hundreds of vessels and some $20,000,000 worth of products pass in and out of it annually. There are numerous wharves and warehouses here and a government custom-house. (For the items of the trade, see Hawaii: the great items are sugar and molasses, rice, coffee, hides, and wool.)

Honolulu lies at the mouth of the valley of Nuuanu, which runs back between two high ridges to a pass between two peaks about 3,000 feet high in the great eastern range of mountains; the view from the brink of the *pali* or precipice at this pass, is one of the notable sights of the neighborhood. The climate is mild and equable, and many sufferers from lung troubles in the United States seek it for a sanatorium. The extreme range of temperatures is 52° to 88°, average 70°. The rainfall is very irregular, but never slight; from 40 to 60 inches annually. The island is volcanic, the bordering reefs coral; hence the city streets are macadamized with coral and lava, porous rock making good surface drainage. The city is well laid out in American fashion, being indeed a modern American place; the old one-story wooden huts, mingled with grass huts among the trees, have mostly given place to cottages, unpretentious indeed, but neat and comfortable, and making parts of a beautiful and picturesque whole of luxuriant gardens and surroundings of tropical trees, with which also some of the streets are abundantly shaded — the great Norfolk pine, papaya, bread-fruit, mango, and monkey-pod, umbrella-tree, tamarind tree, algaroba, bamboo and koa, date and cocoa palms, candle-nut, royal-palm and poinciana regia, alligator-pear, china-rose bush, blooming all the year round, etc., many with rich and fantastic blossoms, others with great parasitic ferns, besides peach, oleander, banana, guava, orange, citron, and others. The flowers are also of great beauty and luxuriance.

The city has nearly 200 acres of public parks. There are all modern appliances and services for civilized work and comfort; several first-class hotels, physicians, lawyers, daily and weekly newspapers, four banks and two theatres, insurance offices, several hospitals, a public library, etc. There are 22 public schools, including a high school and normal school, with a total attendance of over 4,000 pupils, besides 37 private schools, with an attendance of 2,700 pupils. There are a number of churches, Protestant and Catholic; the city is the seat of a Roman Catholic and an Anglican bishop. It is also the residence of the government officials, and the consular agents of many European powers. It has waterworks owned and operated by the Territorial government, and furnishing excellent water, pumped from artesian wells, supplemented by water from the adjoining valleys. Ice is made by machinery. There is an electric street lighting system operated by the government, and an electric street railway system, built and conducted by a chartered company; a telephone system; and there is a submarine cable to San Francisco and wireless telegraph to the neighboring islands. Of manufactures the number of different lines is upward of 30, of course chiefly for local needs; the largest branch is foundry and machine-shop manufacture, which is carried on in large works, and turns out some $650,000 a year of product. Next to this is rice-milling, with some $150,000 a year. Minor industries are ice, harness, leather, jewelry, soap, and shipbuilding. The total number of all employees in 1900 was 1,854, and the total annual wages paid $1,201,648.

The chief building is the former royal palace, now the executive building, in the Italian style, finished in 1882. The judiciary and other government buildings are near it. The most interesting place is the museum, with many curious

relics of early Hawaiian history, corals, and shells and other native curiosities, land and marine. The chief in interest and value is the great feather war-cloak of Kamehameha I., the founder of the monarchy, valued at $150,000. This was the chief treasure of the former sovereignty, and was used as a mantle of state by the sovereigns. It was made of yellow feathers from the *mamo* bird, found only in the mountains, each bird furnishing only two small tufts of feathers for it, one from under each wing. It is four feet long, and has a spread at the bottom of 11½ feet. Nine generations were employed in making it.

Honolulu harbor was discovered by Capt. Brown in November 1794. The city as a modern foundation dates only from 1816, when John Young, an Englishman, and a faithful counsellor of the king, Kamehameha, advised its fortification. Previously it had been only a native village of huts, of little commercial importance. In 1820 it was made the capital of the archipelago, and afterward became the seat of government. Population (1870) 14,852; (1890) 22,907; (1900) 39,306. Since the annexation of Hawaii to the United States, it is rapidly increasing. Of the population in 1900, 24,746 were males and 14,560 females; the total being divided as follows: 11,690 Hawaiians, 9,061 Chinese, 7,229 whites, 6,179 Japanese, 5,000 Portuguese, and 147 negro. Of these, 21,871 were born in Hawaii and 17,435 born in foreign countries. (This classification is based upon a census taken by the plague inspectors during the spring of 1900, and is believed to be approximately correct. Of the 7,229 whites about 2,000 are classed as foreigners.)

W. D. Alexander,
Surveyor-General Hawaiian Islands.

Honor, Knights of, a secret, beneficiary order founded in 1873. In 1902, there were in the United States 36 grand lodges, 1,960 sub-lodges and 54,029 members. Since its organization the order has disbursed over $79,000,000 in benefits, and in 1902 the amount was $3,074,649. The order is incorporated under the laws of Missouri, with headquarters in St. Louis.

Honor, Knights and Ladies of, a fraternal, benevolent society founded in 1877 at Louisville, Ky. In 1902 there were 16 grand lodges, 1,160 sub-lodges, and 63,000 members. Since its organization over $19,000,000 has been disbursed in benefits, and during 1902, the amount was $1,173,000.

Honorius I., hō-nō′rĭ-ŭs, Pope: d. 12 Oct. 638. He was elected pope in 625. In the hope of allaying a controversy he temporized with the leaders of the Monothelite heresy, which, while recognizing the twofold nature of Christ, declared he had but one will, a doctrine condemned by the sixth council of Constantinople. He was anathematized by the council that condemned the heresy. Pope Leo II., in confirming the acts of this council, says that Honorius was condemned for "not extinguishing the flames of incipient heresy." For a full account of the case of Honorius, consult Parson, 'Studies in Church History,' Vol I.

Honorius II., Pope: d. 14 Feb. 1130. He was elected pope in 1124, and was at the time of his election bishop of Velletri. A part of the bishops and cardinals had previously invested Cardinal Thibaut with the papal dignity; but both candidates having resigned Honorius was re-elected.

Honorius III., Pope: d. 18 March 1227. He became pope in 1216, on the death of Innocent III. He at once wrote to the King of Jerusalem to assure him of his support; to the bishops of France, to encourage pilgrims, and to the Emperor of Constantinople to promise him assistance. John, king of England, had left to his successor, Henry III., the burden of a war with the French Prince Louis, who laid claim to the English throne, and had been encouraged in his pretensions by Innocent. Honorius reconciled the barons with Henry, and obliged Louis to renounce his pretensions. He then turned his attention to the crusades, and crowned Frederick II. emperor of Germany, on condition that he would go to Palestine within two years. In France he instigated Philip Augustus and Louis VIII. to support the war against the Albigenses. He was succeeded by Gregory IX.

Honorius IV., Pope: d. 3 April 1287. He was elected pope in 1285, and supported the French king, Philip the Bold, in the war against Peter of Aragon.

Honorius, Flavius, Roman emperor, son of Theodosius the Great, b. Constantinople 9 Sept. 384 A.D.; d. Ravenna, Italy, 26 Aug. 423 A.D. On the death of his father in 395 the empire was divided into two parts, Honorius receiving the western half, with Rome as his capital. The principal events of his reign are the adoption of rigorous measures against paganism in 399; the devastation of Northern Italy by Alaric in 400–403; another irruption of barbarians under Rhadagasius 405–6. Both invasions were repelled by his able minister Stilicho, who, however fell under the displeasure of his weak and indolent master, and was assassinated at Ravenna in 408. Taking advantage of the death of the defender of Rome, Alaric marched upon the city and plundered it in 410.

Hooch, or Hoogh, Pieter de, pē′tĕr dē hooh, or hōg, Dutch painter: b. Utrecht 1630; d. Amsterdam soon after 1677. His early art training was much influenced by Rembrandt. In 1655, he was enrolled in the Painters' Guild of Delft, where he resided, but later removed to Amsterdam. He was the chief representative of Dutch genre painting, and his specialty was the delineation of Dutch interiors, with their semi-darkness, suffused by the witchery of sunlight. Sometimes he set out two or more rooms in perspective, the vista of which was drawn and lit up with extraordinary skill.

Hood, John Bell, American soldier: b. Owingsville, Ky., 29 June 1831; d. New Orleans, La., 30 Aug. 1879. He was graduated at West Point in 1853, and bore a commission in the United States Army till 1861 when he joined the army of secession. The part he took in the Virginia campaign gained for him the rank of major-general, and at Gettysburg his division made a gallant record in its position at the extreme right of the Confederate line. He took part in the battle of Chickamauga on 19–20 Sept. 1863, having come to Tennessee to the support of General Bragg. When General Johnston was endeavoring in the spring of 1864 to impede Sherman's advance on Atlanta, Hood was a lieutenant-general in his army and his corps on

Courtesy of the Philadelphia Commercial Museums.

THE HARBOR OF HONOLULU.

25 May 1864, was attacked by Hooker at New Hope Church. He succeeded Johnston the following July in the command of the Army of Tennessee, fought the battle of Peach Creek with Sherman 20 July 1864, but was compelled to retire behind the fortifications of Atlanta. After the battle of Jonesboro he retired from Atlanta, which was entered by Sherman. His attack on the forces under Schofield at Franklin being repulsed, he proceeded to Nashville, where he met General Thomas. Thomas advanced from his entrenchments on 15 December, and a two-days' battle ensued. Federal preparation had been carefully and deliberately made. A general attack on the afternoon of 16 December caused the entire Confederate line to give way. Soon Hood's army was in full retreat toward Franklin, the larger part of it "in great confusion," according to Hood's official report. After a nine-days' pursuit by the Federals, the remnant of the Confederates, now largely disintegrated, crossed the Tennessee. Hood, at his request, was relieved of his command. Subsequent to the war he was a commission merchant at New Orleans. He wrote 'Advance and Retreat: Personal Experiences in the United States and Confederate States Armies' (1880), and articles for 'Battles and Leaders of the Civil War' (1887). Consult these works; see also NASHVILLE, CAMPAIGN AND BATTLE OF.

Hood, Robin, English outlaw: said to have been b. 1160 and d. 1247. According to the popular account, with his followers, he inhabited Sherwood Forest, in Nottinghamshire, and also the woodlands of Barnsdale in the adjoining West Riding. They supported themselves by levying toll on the wealthy, and more especially on ecclesiastics, and by hunting the deer. The principal members of his band were his lieutenant Little John, his chaplain Friar Tuck, William Scadlock, George-a-Greene, Much the miller's son, and Maid Marian. His skill with the long-bow and quarter-staff was celebrated in tradition. What basis of fact there is for the story of Robin Hood is doubtful. Grimm maintained that he was one with the Teutonic god Woden. Other theories suppose him to have been a rebel yeoman in Lancaster's rebellion under Edward II.; a Saxon chief who defied the Normans; and a fugitive follower of Sir Simon de Montfort after the battle of Evesham. He figures prominently in Scott's novel 'Ivanhoe,' and in 'The Foresters,' a drama by Tennyson. The earliest known mention of him is in 'The Vision of Piers Plowman,' version B. (about 1377), in which Sloth says he knows "rymes of Robin Hood." 'The Gest of Robin Hood' (assigned to 1400), almost epic in length, consisting of 456 four-line stanzas, is the oldest extant ballad on this theme. Others of the more important ballads are 'Robin Hood and the Monk,' 'Robin Hood and Guy of Gisborne,' and 'Robin Hood's Death.' The remaining ballads are, in general, of inferior merit. It seems probable that there were what may be called a Sherwood cycle and a Barnsdale cycle, respectively. Many proverbs and sayings exist in connection with Robin Hood. Consult: Child, 'English and Scottish Ballads' (1883); Fricke, 'Die Robin Hood Balladen' (1883); and Ritson, 'Robin Hood' (new ed. 1885).

Hood, Samuel, VISCOUNT, British naval officer: b. Thorncombe, Devonshire, 12 Dec. 1724; d. Bath, Somersetshire, 27 Jan. 1816. He entered the navy in 1740, was promoted lieutenant in 1746, commander in 1754, and post-captain in 1756. While commanding the Vestal in 1759 he took the French Bellona after a three-hours' fight. From 1767 to 1771 he was commander-in-chief in North America. Having served as commissioner of the Portsmouth dockyard in 1778–80, he was made admiral of the blue in 1780, and almost immediately was sent in command of a squadron to reinforce Rodney on the North American and West Indian stations. He remained on that duty until the signing of the peace, and distinguished himself in several battles. Despatched in 1781 to blockade Martinique, he was intercepted by De Grasse and the French fleet, against which he fought in April and in July (under Admiral Graves). Again in the West Indies in 1782, after an absence along the North American coast, he outmaneuvered De Grasse in several minor contests, and later, on 12 April, took an important part in the victory of Dominica, when he led the rear of the British line. In 1784 he was elected to Parliament for Westminster, and in 1788 made a lord of the admiralty. He took command of the British fleet in the Mediterranean in 1793, and occupied Toulon. Hood had a great reputation as a tactician, and a high tribute was paid him by Nelson, who had been one of his subordinate officers. Consult James, 'The Naval History of Great Britain' (1822–4; new ed. 1837).

Hood, Thomas, English poet and humorist: b. London 23 May 1799; d. there 3 May 1845. In 1821 he became sub-editor of the 'London Magazine,' and from that time appears to have resolved on devoting himself entirely to a literary life. In 1826 he published 'Whims and Oddities.' This was followed by 'National Tales' in prose, and a volume of serious poetry, which, though favorably received, did not obtain much popularity. In 1830 he started the 'Comic Annual,' which, during the eight years of its existence, was made the vehicle of many of his most remarkable productions. At the same time his pen was diligently employed on other subjects, and he published the powerful poem called 'Eugene Aram's Dream,' 'Tylney Hall,' a novel, which, though defective in its plan and structure, abounds in fine strokes of wit and humor. His health had begun to fail, and in consequence he lived on the Continent 1835–40. He continued his 'Comic Annual' during his residence at Coblentz and Ostend, and in 1838 published 'Hood's Own.' His continental experiences also furnished materials for his 'Up the Rhine' (1839), a series of imaginary letters after the manner of Smollett's 'Humphrey Clinker.' The whimsical cuts inserted in the work, as well as its combination of good sense and humor, made it very popular. Shortly after his return, he undertook the editorship of the 'New Monthly Magazine,' and continued it until 1843. His principal contribution to it was the famous tragi-comic story in verse of 'Miss Kilmansegg.' His last periodical, entitled 'Hood's Magazine,' was commenced in 1844. It contains some of his best productions, though several of them were written after his health

had completely given way, and while he was propped up by pillows in bed. Hood is unrivaled as a punster, and seems to have been almost equal master of the comic and the pathetic. In the latter style his 'Song of the Shirt' is universally known, and as a burst of poetry and indignation is not surpassed by anything in the English language.

Hood, Thomas, generally known as Tom Hood, English miscellaneous writer; son of the preceding: b. at Wanstead, Essex, 19 Jan. 1835; d. Peckham Rye, Surrey, 20 Nov. 1874. He was educated at Oxford in 1853, with a view to a clerical career, but edited the 'Liskeard Gazette' in 1858–9, and from 1860 till 1865 was a clerk in the accountant-general's department at the War Office. In 1865 he became editor of the comic paper called 'Fun.' His first separate publication was 'Pen and Pencil Pictures' (1857), and among his subsequent works are: 'The Daughters of King Daher, and other Poems' (1861); 'Jingles and Jokes for the Little Folks' (1865); 'Captain Masters's Children' (1865), his best novel; 'A Golden Heart' (1867); 'The Rules of Rhyme: A Practical Guide to English Versification (1869), a work which has gone through two later editions; 'From Nowhere to the North Pole' (1874). From 1867 he produced 'Tom Hood's Comic Annual.' A volume of his 'Favourite Poems,' with a memoir by his sister, Mrs. Broderip, was published in the United States in 1877.

Hood of Avalon, Arthur William Acland Hood, Baron, English naval officer: b. Somersetshire 14 July 1824; d. Glastonbury 15 Nov. 1901. After service on the coasts of Spain and of Syria, he was made lieutenant in 1846, and in 1854 commander in recognition of his services with the naval brigade before Sebastopol. Assigned to the China station, he participated in the capture of Canton (December 1857), and in 1858 received the commission of post-captain. In 1862–6 he was in command of the Pylades of the North American station, in 1866–9 of the Excellent and the Royal Naval College at Portsmouth, and in 1869–74 director of naval ordnance. He was promoted rear-admiral in 1876, was first sea lord of the admiralty in 1885–9, and became admiral in 1886. His attitude in connection with the development of the British navy was strongly conservative.

Hood, Mount, a peak of the Cascade Range, in the northern part of Wasco County, in Oregon. The height is usually given as over 11,225 feet, but the latest explorers claim it is nearly 12,000 feet. Mount Hood was at one time an active volcano; the lava is found on the slopes and some distance from its base.

Hood River, a name applied to a valley, town, and river in Wasco County, Oregon. The town is situated on the Columbia River and on the line of the Oregon Railway & Navigation Company, 66 miles east of Portland and 22 miles below The Dalles, the county-seat. The Hood River strawberry has acquired a reputation almost phenomenal, and is distributed over an immense area of country extending from Denver and Omaha on the south to Winnipeg in the province of Manitoba to the north and east. The output in 1903 was 150 carloads. The apple industry is also rapidly assuming large proportions, grades of superior excellence are produced, and the highest priced Spitzenburgs and Yellow Newtown Pippins found in the markets of New York and London were grown in Hood River. The valley proper extends south from the Columbia River to Mount Hood, some 20 miles, and is protected and cradled by the Cascade range of mountains on the west and a high divide putting out from Mount Hood on the east. The amount of land adapted for fruit culture in this unique valley exceeds 50,000 acres. The river itself drains all of the north side of Mount Hood, has a large and constant flow of water, and for the last 10 miles of its course before entering the Columbia has an average fall of over 60 feet per mile, affording 10,000 measured horse-power per mile. There are immense forests of fir and cedar about the head-waters of this stream, and one of the largest saw-mills in the State is conveniently situated near its confluence with the Columbia. The climate is a happy mean between the moist section of western Oregon and the semi-arid plains of the Columbia. The scenery is grand in the extreme and yearly attracts the attention of many visitors. The town is pleasantly situated, overlooking the Columbia River, is supplied with electric lights, while the telephone is universally present in both town and country. It is, however, the superlative excellence of its fruits that has given Hood River a reputation almost world-wide. The population of town and valley (1904) is about 6,000.

E. L. Smith.

Hooded Crow, a crow native in northern Europe (*Corvus cornix*), so termed in allusion to markings on the head. Head, wings, and fore parts are jet black, the rest of the bird ash-gray; bill and feet are black. It retires to the southward from its more northerly haunts at the time of the crow migration. In England it is known as the gray, dun, or Royston crow. The hooded crow found in India is similar in general appearance, but is a smaller species.

Hooded Seal, a large dark-gray spotted seal of the North Atlantic, closely related to the common harbor seal, and named *Cystophora cristata.* It reaches a length of about 10 feet, and is especially distinguished by a large inflatable sac upon the face, the expansion of which is thought to be a defensive device, calculated to terrify enemies. It is occasionally seen on ice-floes along the Labrador coast.

Hooded Warbler, a fly-catching warbler (*Sylvania mitrata*), common in the southern United States in summer and making its nest in low bushes. It is bright yellow except a solidly black crown, neck and breast, comparable to a hood, leaving the face golden yellow.

Hoodoo. See Mascot.

Hoof, a toe-nail which is large, envelops the terminal phalange, and is of material assistance in walking, as in the case of horses, cattle and other ruminants, and in the elephant, rhinoceros, etc. It is most highly developed in the horse, where the whole terminal part of the foot is reduced to a single, well-booted toe. In split-hoofed or cloven-hoofed animals there are two toes approximately equal, and booted with hoofs flat on their inner sides and closely appressed. The small non-functional

toes hanging behind the hock-joint in most split-hoofed animals are often called "false hoofs." Accidents and diseases affect the hoofs of domestic animals (see FOOT-ROT, etc.), and require careful attention, especially in the case of horses. The soundness of a horse's foot is mainly preserved by permitting it to grow uninjured by the rasp and knife, and kept clean by being washed with cold water; all other applications are injurious and destroy the toughness of the "horn surface." Softness and brittleness of the hoof, which are fruitful sources of cracks and corns, may be remedied by placing the feet for several hours daily in thick woolen swabs, kept cool and moist by frequent applications of cold water, and by encouraging a more healthy growth of horn by occasional mild blisters round the coronary band. Cracks (or sand-cracks) mostly occur among horses much upon the road, cause lameness, and constitute unsoundness. When serious and recent, poulticing, thinning away of the crust about the crack, and perfect rest are essential. After the earlier heat and tenderness are removed a hot iron should be drawn at right angles to the crack, both above and below, so as to separate the diseased from the sound horn. Waxed thread or fine wire should be wound round the hoof, and a sound growth of horn stimulated by a blister round the coronet.

Hooft, Pieter Corneliszoon, pē-tĕr kor-nā'-lēs-zōn hōft, Dutch poet and historian: b. Amsterdam 26 March 1581; d. The Hague 21 May 1647. He was son of that Cornelius Hooft who did much to procure Elizabeth's recall of the incompetent and tyrannical Leicester in 1587. He traveled through France, Italy, and Germany in 1601, and on his return began with patriotic ardor to improve and purge the speech of his mother country. With this aim in view he translated Tacitus into Dutch, and made that Latin writer the model of his style, as a historian. His historical writings are vivid and comprehensive. His poems are chiefly in the erotic vein. He also produced dramas in the form of pastoral, tragedy, and comedy. In his comedies the domestic life of the Netherlands is admirably portrayed. In the castle of Moritz, Prince of Orange, at Muiden, where he lived as high bailiff, he used to gather round him a coterie of brilliant men and women, and this intellectual circle famous as the "Muiderkring" included the poets Huygens, Vondel, and Baerle. His principal works are 'Hendrik (IV.) de Grote zijn leven en bedrijf' (1671); 'Nederlandsche Historien' (1656); the poems 'Minneliederen'; 'Afbeeldinglien van Minne'; the pastoral drama 'Granida' (1605); the tragedies 'Geraerdt van Velzen' (1813); and 'Baeto' (1616); and the comedy 'Warenar.'

Hook, Theodore Edward, English novelist and journalist: b. London 22 Sept. 1788; d. 24 Aug. 1841. For some years Hook led a life of gaiety in London, and became notorious for practical jokes and similar escapades. In 1812 he was appointed accountant-general and treasurer of the island of Mauritius; but, owing to his gross carelessness, a large deficiency in the military chest was discovered, and in 1818 he was sent home under arrest, but no proceedings were taken against him. From 1820 to 1841 he was editor of the 'John Bull,' and at intervals from 1824 to 1828 published his 'Sayings and Doings,' while in 1836 he became editor of the 'New Monthly Magazine.' His other principal works are a series of novels, among which may be mentioned 'Love and Pride'; 'Jack Brag'; 'Gilbert Gurney'; 'Gurney Married.'

Hooker, hůk'ĕr, **Edward,** American sailor: b. Farmington, Conn., 1822; d. Brooklyn, N. Y., 1 May 1903. He followed the sea in the merchant service until the outbreak of the Civil War when he joined the United States navy as acting master, and served with distinguished bravery. He was commissioned as lieutenant-commander in the regular naval service in 1884 and full commander two years later, when he retired.

Hooker, Isabella Beecher, American philanthropist: b. Litchfield, Conn., 22 Feb. 1822. She is a daughter of Dr. Lyman Beecher (q.v.) and in 1841 married Joseph Hooker, a lawyer. She has made a special study of the right of women of the United States to vote; has been active in various reform movements, and is known as a public speaker. She has written 'Womanhood, Its Sanctities and Fidelities.'

Hooker, Joseph, American soldier: b. Hadley, Mass., 13 Nov. 1814; d. Garden City, N. Y., 31 Oct. 1879. He was graduated at West Point in 1837 and received a commission in the 1st artillery. He served in Florida and on the northeast frontier 1837–40 and during the Mexican War was aide to Generals Smith, Harmer, Butler and Pillow. He saw much service in both the northern and southern campaigns, and resigned from the army in 1853. From that date to the breaking out of the Civil War he was successively farmer, engineer and militia colonel. In 1861 he went to the front as a brigadier-general of volunteers. In 1862 he was commissioned major-general of volunteers and was present at the battle of Williamsburg, Va., and was subsequently conspicuous in the Peninsular campaign and in the battles of Bristoe Station and Chantilly. He also took part in the Maryland campaign, and in September of 1862 was appointed brigadier-general in the regular army. Two months later he was placed in command of the Fifth corps, and at the battle of Fredericksburg commanded the Third and Fifth corps. In 1863 he was put in command of the Army of the Potomac, but although very successful in refitting and reorganizing his troops, failed to show, as head of an army, those qualities which had characterized him in the field as corps and division commander. At Chancellorsville the defeat of the Federal troops by General Jackson was largely due to Hooker's vacillation and his want of power to cope with the sudden surprise of his right flank by the Confederate general.

In 1863 he was despatched in command of the Army of the Cumberland to reinforce Rosecrans at Chattanooga and distinguished himself on 24 November in the so-called "Battle among the Clouds" on Lookout Mountain. He was brevetted major-general in the regular army in 1865, and a paralytic stroke forced him to retire from active service with that rank in 1868.

An equestrian statue of General Joseph Hooker by the sculptor French, was unveiled on Beacon Hill, Boston, 25 June 1903, with imposing ceremonies. The day was made a State holiday.

Hooker, Sir Joseph Dalton, English botanist; son of Sir William Jackson Hooker (q.v.)

b. Halesworth, Suffolk, 30 June 1817. He was educated at the University of Glasgow, accompanied Sir James Clark Ross's Antarctic expedition of 1839–43 as assistant-surgeon and naturalist, and in 1847 published an account of its botanical results in two volumes, entitled 'The Botany of the Antarctic Voyage of H.M. Discovery Ships Erebus and Terror in the years 1839–43.' He went to India in 1847, in order to investigate the botany of part of the Himalayan region, and in 1854, three years after his return issued his 'Himalayan Journals, or Notes of a Naturalist in Bengal, the Sikkim and Nepal Himalayas, the Khasia Mountains,' etc. In his work on the 'Rhododendrons of the Sikkim Himalaya' (1849), he first introduced to the notice of European gardeners many splendid and now familiar species of these favorite shrubs. In 1871 he set sail for Morocco, and in May of that year he and his companions reached the summits of the Great Atlas, which till then had never been trodden by any European foot. A record of this journey is contained in the work written with John Ball, 'Journal of a Tour in Morocco and the Great Atlas' (1879). He traveled in the Rocky Mountains and California in 1877. In 1855 was appointed assistant to his father in the directorship of Kew Gardens, and on his father's death in 1865, succeeded him as director. He retired in 1885. He was president of the Royal Society during the five years 1873–8. Among his other works are: 'Introductory Essay to the Flora of New Zealand' (1853); 'Introductory Essay to the Flora of Indica' (1855); 'Flora Novæ Zealandæ' (1853–5); 'Flora of Tasmania' (1856–60); 'The Flora of Australia: its Origin, Affinities, Distribution, etc.' (1859); 'Genera Plantarum' (1862–83), with George Bentham, an epoch-making revision of the natural system of classification; 'The Student's Flora of the British Islands' (1870; new ed. 1883), an excellent and popular work; 'The Distribution of the North American Flora' (1878); and the great 'Flora of British India' (1875–97).

Hooker, Richard, English theologian: b. Heavitree, near Exeter, March 1554; d. Bishopsbourne, 2 Nov. 1600. He was educated at Oxford. In 1581 he took orders, and was shortly after made preacher at St. Paul's Cross, in London. In 1584 he became rector of Drayton Beauchamp, Buckinghamshire. The following year he was appointed by Archbishop Whitgift Master of the Temple for life. Here he became engaged in a controversy with his colleague Walter Travers, whose sympathies were strongly puritanical, and to this controversy we owe his celebrated work 'Of the Laws of Ecclesiastical Polity.' The first four books were printed in 1594. The fifth book of his great work appeared in 1597; the last three in 1600. 'The Ecclesiastical Polity' written in defense of the Church of England, is no less remarkable for learning and extent of research than for the richness and purity of its style, which entitles its author to be regarded as one of the classics of the Elizabethan age. See Lives by Walton, and Keble.

Hooker, Thomas, American colonial clergyman: b. Markfield, Leicestershire, England, probably 7 July 1586; d. Hartford, Conn., 7 July 1647. After being graduated at Cambridge he took orders, preached in London, and was chosen lecturer at Chelmsford in 1626. Having been silenced by Laud for nonconformity, he established a grammar school, and about 1630 went to Holland, where he preached at Delft and Rotterdam. In 1633 he came to New England with Cotton and Stone, and was settled with the latter at Newtown, now Cambridge, being ordained by the brethren of the church. In 1636 he removed with about 100 others to what is now Hartford, Conn., where he and Stone were the first ministers of the church. He was a remarkably animated and able preacher, of commanding presence and earnest zeal, and he has been called the Luther of New England. It was his custom to preach without notes. Some 200 of his sermons were sent to England, where about half of them were published. His most celebrated work, 'A Survey of the Summe of Church Discipline,' written with John Cotton, was published in England (1648). Many of his works have gone through repeated editions. See Walker, 'Life of Hooker' (1891).

Hooker, Sir William Jackson, English botanist: b. Norwich 1785; d. 12 Aug. 1865. He applied himself to the study of botany at an early age, and in search of botanical specimens visited Scotland and the Scottish islands, France, Switzerland, and Iceland. His investigations on the British 'Jungermanniæ and Mosses' drew attention to his attainments, and he was elected to the chair of botany in the University of Glasgow, a position he filled for 20 years. In 1836 he was knighted, and in 1841 was appointed director of the Royal Gardens at Kew, a post which he held up to the time of his death. Under his management these gardens increased their area from 11 acres to 270. They are well laid out, and contain hot-houses and conservatories far superior to anything of the kind on the Continent, and include museums filled with objects derived from the vegetable kingdom, botanical libraries, and a most extensive and excellently arranged herbarium. Among his works may be mentioned 'Tour in Iceland' (1811); 'The British Flora'; 'Flora Boreali-Americana'; 'Illustrations of the Genera of Ferns, Icones Plantarum'; 'British Ferns'; etc.

Hooker, Mount, Canada, a peak in the Rocky Mountains; 15,690 feet high; near the eastern boundary of British Columbia.

Hoonoomaun, hoo'noo-män. See Entellus Monkey.

Hoop Ash. The black or water ash (*Fraxinus nigra*). See Ash.

Hooper, hüp'ėr, **John,** English reformer and martyr: b. Somersetshire, about 1495; d. Gloucester 9 Feb. 1555. He embraced the principles of the Reformation and in 1539, to avoid the persecution consequent on refusing to sign the new articles of faith put forth by Henry VIII., withdrew to the Continent. On the accession of Edward VI., in 1547, he went to London, and contributed greatly to the progress of the Reformation. In 1550 he was nominated bishop of Gloucester. On the accession of Mary, in 1553, he was one of the first victims fixed upon, and being imprisoned in the Fleet, was treated with great severity. In 1555 he was required formally to recant his opinions. This he refused to do and was burned at the stake near his own cathedral. His works con-

sist chiefly of a 'Godly Confession and Protestation of the Christian Faith'; 'Lectures on the Creed'; 'Sermons on the Book of Jonah'; 'Annotations on the Thirteenth Chapter of the Romans.'

Hooper, William, American patriot: one of the signers of the Declaration of Independence: b. Boston, Mass., 17 June 1742; d. Hillsboro, N. C., October 1790. He was graduated at Harvard College in 1760, studied law with James Otis in Boston, and removed permanently to Wilmington, N. C., in 1767, where he soon rose to professional eminence and was noted for his social qualities and hospitality. He was delegated to the Continental Congress in 1775, and was till his death a leader in the councils of North Carolina.

Hoopeston, hoops'tŏn, Ill., city in Vermilion County; on the Lake Erie & W. and the Chicago & E. I. R.R's.; about 85 miles south of Chicago and 48 miles south by east of Kankakee. It is situated in an agricultural region, and its chief industries are connected with agricultural products. It has large sweet-corn canning establishments, and factories for making the cans and the canning machinery. There are manufactured other canned goods, also horsehoe nails and agricultural implements. Grain and hay are shipped to the larger markets. The government, in accordance with the charter of 1877, is vested in a mayor who serves for two years and in a city council. The city owns and operates the waterworks. Pop. (1890) 1,911; (1900) 3,823.

Hooping-cough, a series of coughs ending in a long-drawn breath, during which a shrill whistling sound, the hoop, is produced. Several fits of coughing succeed one another, until some phlegm or mucus is expelled. Vomiting not infrequently follows a fit of coughing. It has recently been discovered that the cause of the complaint is a poison acting as an irritant on the pneumogastric nerve. Hooping-cough is contagious, and most commonly attacks children, generally but once in their lives. The first symptoms are a difficulty of breathing, and other slight febrile affections, which are succeeded by hoarseness, cough, and difficulty of expectoration. After a fortnight or more the cough becomes convulsive, and is attended by the hoop. In four or five weeks the expectoration becomes loose, and the fits of coughing gradually diminish in frequency and duration. Hooping-cough is seldom fatal to adults, but is most fatal in the first year of childhood. Bronchitis and pneumonia are the most serious complications.

Hoopoe, hoo'pō, a peculiar bird of the Old World, which takes both its vernacular and scientific name (*Upupa*) from its whooping cry. It is of the group *Coccygomorphæ* (q.v.) and represents a family (*Upupidæ*), many species of which inhabit southern Asia and Africa, while one (*U. epops*) is a well known migrant in Europe. It is about 12 inches long, is brown above and white beneath, with black, white-barred wings, and a very large cinnamon-red black-tipped crest and a long, sharp, curved bill. It seeks its food on the ground, nests in holes in trees, crannies in walls, etc., and has many curious traits and habits which have caused the bird to take a prominent place in the folk-lore of all countries. The African hoopoes belong to the genus *Irrisor*, and are called wood-hoopoes. They have brilliant plumage, but no crest. They go about in noisy flocks, and have much the appearance and habits of woodpeckers.

Hoorn, hōrn, or **Hoorne,** hōr'nė, or **Horn,** or **Hornes,** ŏrn, Count of (Philip II., De Montmorency-Nivelle); Flemish soldier and statesman: b. about 1520; d. Brussels 5 June 1568. His father was a descendant of the French family of Montmorency, and on the mother's side he was related to Lamoral Egmont, with whose fate his own was linked. His mother becoming a widow when he was about eight, was married again to John, Count van Horn, one of the wealthiest nobles of the Netherlands, who, left his estates to his wife's children on condition that they should assume his name. Philip was thus at the outset of his career one of the most influential of his order, and received from Charles V. and Philip II. important trusts and distinctions. He accompanied Philip II. to Spain, where he is supposed to have received information of the designs of the Spanish court against the Netherlands, and to have communicated them to the Prince of Orange. Returning to the Netherlands he joined Orange and Egmont in resisting the aggressive policy of Philip; yet continued loyal to the crown. He was, however, suspected by the Spanish court, and upon the arrival of Alva in Brussels was enticed with Egmont to that city, and arrested in September 1567, on a charge of high treason. Ceaseless but vain efforts were made to obtain for him a fair trial, and appeals for clemency on his behalf were made by potentates in all parts of the Continent. He was executed with Egmont in June 1568.

Hoosac (hoo'sak) **Mountain,** the name given to a spur of the Green Mountains (q.v.) which is in the northwestern part of Massachusetts, on the east side of the valley of the Hoosac River. The whole length is about 16 miles. The mountain is noted for its beautiful scenery.

Hoosac Tunnel, in the towns of Adams and Florida, in Berkshire County, in Massachusetts, and piercing the Hoosac Mountain. It is on what is now known as the Boston and Maine railroad, the route from Boston to Troy, N. Y., by way of Greenfield. From the west entrance of the tunnel to Troy is 54 miles; from the east entrance to Boston, 137 miles. The tunnel is nearly five miles in length, the longest tunnel in the United States. Before the general introduction of railroads, and, as early as 1825, the project was broached of making a canal across Massachusetts from Boston to the Hudson River. This plan was abandoned when railroads were built across the State. In 1851 the tunnel question had advanced so far that surveys of various routes were made and some experiments were begun. The work of tunneling began in 1856 and was completed in 1873. For so long a tunnel the ventilation is good owing to the shaft, 1028 feet, sunk near the centre. The width is sufficient for two tracks. The total cost, including 39 miles of adjoining railroad, was about $13,000,000.

Hoo'sic Falls, N. Y., village in Rensselaer County; on the Hoosac River and on the Boston & M. railroad; about 28 miles northeast of Albany. The first permanent settlement was

made in 1688, and the first charter was received in 1827. The charter has been revised and the last revision was in 1890. The village has excellent water-power. The chief manufactures are agricultural implements, paper and paper-making machinery, shirts, cotton and woolen goods, and flour. The government of the village is vested in a president who holds office three years, and a board of trustees. Pop. (1890) 7,014; (1900) 5,671.

Hoosier (hoo'zhêr) **Schoolmaster, The,** a story by Edward Eggleston (q.v.) published in 1875, and the most popular of its author's works. It is descriptive of the life of the Middle West in the pioneer days of the early 19th century.

Hoosier State, a popular name for Indiana. The word is said to be a corruption of «husher,» formerly a colloquial name for a fighter or a bully.

Hop-hornbeam. See IRON-WOOD.

Hopatcong, hō-păt'kŏng, **Lake, in Sussex** County, New Jersey; about 33 miles northwest of Jersey City and 25 miles west of Paterson. The lake is 725 feet above the sea, and eight and one-half miles long and three and one-half miles wide. Its outlet is the Musconetcong River which flows into the Delaware. Lake Hopatcong is a favorite summer resort, its beautiful scenery is one attraction. It is surrounded by hills and low mountains, all well wooded, and many of the trees are evergreens.

Hope, Anthony. See HAWKINS, ANTHONY HOPE.

Hope, Ascott R. See MONCRIEFF.

Hope College, in Holland, Mich., a co-educational institution, founded in 1866, by Dutch settlers, and under the auspices of the Reformed Church in America. At the close of 1902 there were connected with the school 14 instructors and 200 students.

Hope Diamond, a famous blue diamond weighing 44¼ carats, in possession of the family of H. T. Hope, of England, until 1903, when it was sold to an American.

Hope'dale, the name of a community founded by Rev. Adin Ballou, in 1841, at Milford, in Worcester County, Mass. At the beginning there were 28 persons who wished to lead lives in accordance with high ideals of Christianity. They formed themselves into a joint-stock company, purchased a farm of 238 acres, established a settlement, and proceeded to cultivate the soil, and to manufacture their own breadstuffs and clothing. At first a board of trustees were the chief governing power and had entire control of the industries. Later more responsibilities were given to the members, and the industries were, in different ways, apportioned among them. In 1854 there were 200 members; but the community had become a financial failure and dissensions had crept in. In 1856 they were in debt, and as a joint-stock company they disbanded; but continued as a semi-communistic community until about 1862, when they gave up the industries they had established to private individuals, and formed themselves into Hopedale Parish with their founder as pastor. Consult: Adin Ballou, 'Hopedale Community.'

Hop'kins, Alphonso Alvah, American author and lecturer: b. Burlington Flats, N. Y., 27 March 1843. He was for three years professor in the American Temperance University; from 1867–86 was editor of three agricultural papers successively. Since 1868 he has lectured on temperance and other social and political subjects; in 1882 he was the prohibition candidate for governor of New York. He has written 'Geraldine, a Romance in Verse,' a popular poem in the style of Owen Meredith's 'Lucille' (1881); 'His Prison Bars' (1878); 'Sinner and Saint' (1880); 'Wealth and Waste' (1896); 'Ballads of Brotherhood' (1900).

Hopkins, Edward, American colonial governor: b. England 1600; d. London March 1657. He was a prominent merchant of London, and came to Boston in 1637, but soon after removed to Hartford, where he was chosen a magistrate in 1639, and governor of the colony of Connecticut every other year from 1640 to 1654, alternating with Haynes. He afterward went back to England, where he was chosen warden of the English fleet, commissioner of the admiralty and navy, and member of Parliament. But he never lost his interest in the colonies, and at his death bequeathed much of his estate to New England, giving £1,000 for the support of grammar schools in Hartford and New Haven, which are still flourishing, and £500 which went to Harvard College and the grammar school at Cambridge.

Hopkins, Edward Washburn, American philologist: b. Northampton, Mass., 8 Sept. 1857. He was graduated from Columbia in 1878, and going to Germany to study took the degree of Ph.D. at the University of Leipsic. In 1895 he became professor of comparative philology and Sanskrit at Yale. He has written 'Caste in Ancient India' (1881); 'Manu's Lawbook' (1884); 'Religions of India' (1895); 'The Great Epic of India' (1901); and 'India Old and New' (1901).

Hopkins, Esek, first commodore of the American navy: b. Scituate, R. I., 1718; d. North Providence, R. I., 26 Feb. 1802. In November 1775 he received a commission from the Continental Congress as commodore and «commander-in-chief» of the navy, soon after which he put to sea with the first squadron sent out by the colonies. The fleet sailed for the Bahama islands, and captured the forts at New Providence, and with them 80 cannon, and a large quantity of ordnance, stores, and ammunition. On his return, when off Block Island, the commodore took the British schooner Hawke and the bomb brig Bolton. For this act the president of congress complimented Hopkins officially. Commodore, or Admiral Hopkins, as he was generally called (even by Washington, who so addressed him in his official letters), performed other remarkable exploits, though he had great difficulties to contend with. His name became a synonym for heroism, and for American patriotism. In June 1776, Hopkins was ordered by Congress to appear before the naval committee in Philadelphia to reply to charges which had been preferred against him for not annoying the enemy's ships on the southern coast. He was defended by John Adams, and was acquitted. The unavoidable delays at a later period in getting his ships ready for sea gave another chance for his enemies to complain; and neglecting a

citation to appear at Philadelphia, because no specific charges were made against him, and on account of his general disgust at the conduct of his opponents, he was dismissed the service, 2 Jan. 1777. He resided near Providence, and exerted during a long life a great political influence in Rhode Island, being often elected to the general assembly of that State. Consult Field, 'Esek Hopkins' (1898).

Hopkins, John Henry, American Protestant Episcopal bishop: b. Dublin, Ireland, 30 Jan. 1792; d. Rock Point near Burlington, Vt., 9 Jan. 1868. At the age of eight, he was brought to America, his father settling in Philadelphia. He became a successful member of the bar in Pittsburg, where his interest in church work was so earnest that the vestry of Trinity Church unanimously elected him rector of the parish though he was not even a candidate for orders. He accepted the call, was ordained in 1823, and remained in Pittsburg until 1831, when he went to Trinity Church, Boston, as assistant, and became at the same time professor of systematic divinity in a theological school. He was consecrated bishop of Vermont in 1832 and combined with the episcopate the rectorship of St. Paul's Church, Burlington. Though at the head of a small diocese, he exerted a widespread influence as a learned theologian and a controversialist of uncompromising bravery and great versatility. He is said to have been the first to suggest the idea out of which grew the important Lambeth Conferences of the entire Anglican Communion, and it is unquestionably to his prudent and charitable efforts that the happy reunion of the northern and southern dioceses after the Civil War was largely due. Besides controversial works, which at the time had great effect, he published 'The Primitive Creed' (1834); 'The Primitive Church' (1835); 'The American Citizen' (1857); and 'The Law of Ritualism' (1866). See 'Life of Bishop Hopkins by One of his Sons' (1873).

Hopkins, Johns, American financier and philanthropist: b. Anne Arundel County, Md., 19 May 1795; d. Baltimore 24 Dec. 1873. His parents, Quakers, gave him a fair education and the training of a farmer. At 17 he went to Baltimore, there became a grocer, and in 1822 founded the house of Hopkins & Brothers. He built up a trade in Maryland, Virginia, and North Carolina, having practically a monopoly in his line. His credit and counsel were highly valued in financial and mercantile affairs. He retired in 1847 with a large fortune, which he employed in banking and railway operations. In 1873 he gave property worth $4,500,000 to found a free hospital; he presented Baltimore with a public park, and also gave over $3,000,000 to found the Johns Hopkins University in Baltimore.

Hopkins, Lemuel, American physician and political writer: b. Waterbury, Conn., 19 June 1750; d. Hartford, Conn., 14 April 1801. He practised medicine at Litchfield 1776–84, when he removed to Hartford, where he sustained a high reputation, and had an extensive practice till his death. He was singular in his appearance, manners, and opinions; a man of talents and learning, and also a poet. He was associated with Trumbull, Barlow, Alsop, Theodore Dwight, and others (called the "Hartford wits"), in the 'Anarchiad,' the 'Echo,' 'Political Greenhouse,' the 'Guillotine,' and similar satirical compositions; and is said to have written for Barlow the beautiful and well known version of the 137th psalm beginning, "Along the Banks where Babel's Current Flows."

Hopkins, Margaret Sutton Briscoe, American author: b. Baltimore 7 Dec. 1864. She married Prof. A. J. Hopkins of Amherst College, and has been engaged in literary work since 1890. She has written under the pen name of "Margaret Sutton Briscoe" 'Perchance to Dream and Other Stories' (1892); 'Links in a Chain' (1893); 'Jimty and Others' (1898); 'The Sixth Sense and Other Stories' (1899).

Hopkins, Mark, American college president: b. Stockbridge, Mass., 4 Feb. 1802; d. Williamstown, Mass., 17 June 1887. He was graduated at Williams College, Mass., in 1824, and having filled a tutorship in the college two years received in 1828 the degree of M. D., and in the same year commenced the practice of medicine in New York. In 1830 he was recalled to Williams College to fill the chair of moral philosophy and rhetoric, and in 1836 became president of the college, a position which he held till 1872. In addition to his labors as an instructor, he lectured before the Lowell Institute of Boston, the Smithsonian Institution, and various scientific and literary associations. Presiding over a college which has been called the cradle of foreign missions, he took an active part in the deliberations of the American board of commissioners for foreign missions, of which he was president from 1857. He published 'Lectures on the Evidences of Christianity' (1846); 'Miscellaneous Essays and Discourses' (1847); 'Lectures on Moral Science' (1862); 'The Law of Love and Love as Law' (1869); 'Outline Study of Man' (1873); 'Scriptural Idea of Man' (1883); 'Teachings and Counsels' (1884). See Carter, 'Life of Mark Hopkins' (1892).

Hopkins, Pauline Bradford Mackie, American novelist: b. Fairfield, Conn., 1874. In 1899 she married H. M. Hopkins; she has been in literary work since 1896. Her works include 'Mademoiselle de Berny, a Story of Valley Forge' (1897); 'Ye Lyttle Salem Maide, a Story of Witchcraft' (1898); 'A Georgian Actress, an Historical Romance' (1900).

Hopkins, Samuel, American Congregational clergyman: b. Waterbury, Conn., 17 Sept. 1721; d. Newport, R. I., 20 Dec. 1803. He was graduated at Yale College in 1741, studied theology under Jonathan Edwards (q.v.), and in 1743 was ordained at Housatonic, now Great Barrington, Mass., where he continued until 1769, when he removed to Newport, R. I., and was pastor there till his death. He possessed almost incredible powers of application, and is said to have been sometimes engaged during 18 hours of the day in his studies. He published 'Dialogue, Showing it to be the Duty and Interest of the American States to Emancipate all their African Slaves' (1776); 'System of Doctrines Contained in Divine Revelation, Explained and Defended' (1793); etc. His theological opinions gave rise to the famous Hopkinsian Controversy. Hopkins differs from orthodox Calvinism in his opposition to the doc-

trines of original sin and of the atonement; moreover, he put particular stress on the virtue of altruism and unselfishness, even claiming that selfishness, of whatever nature, was inherently and essentially sinful. Consult: West, 'Life of Hopkins' (1805); Park, 'Memoir' (1852). See also Mrs. Stowe's novel, 'The Minister's Wooing,' in which Hopkins is the central figure.

Hopkins, Stephen, American statesman; a signer of the Declaration of Independence: b. Scituate, R. I., 7 March 1707; d. Providence 13 July 1785. In 1733 at Providence he was elected a member of the general assembly, and in 1739 became chief justice of the court of common pleas. In 1755 he was elected governor of the State, and remained in office, with the exception of four years, until 1768. In 1754 he was appointed a member of the board of commissioners assembled at Albany, N. Y., to concert a plan of union for the colonies. In 1765 he was elected chairman of a committee appointed at a special town meeting held in Providence to draft instructions to the general assembly on the stamp act. In August 1774, he was, with Samuel Ward, elected to represent the State in the general Congress held at Philadelphia, and was also chosen in 1775 and 1776. On the naval committee he was placed next after John Hancock, the chairman, and greatly assisted in the formation of a navy. For 50 years he filled some public station; he was for many years chancellor of Brown University. In 1765 he commenced a 'History of the Planting and Growth of Providence,' published in the 'Providence Gazette.' In the same year he published 'The Rights of the Colonies Examined,' which was reprinted in London.

Hopkins, Tighe, English author: b. 8 Dec. 1856. He is a frequent contributor to English and American periodicals and among his numerous works are 'Twixt Love and Duty' (1886); 'For Freedom' (1888); 'Dungeons of Old Paris' (1898); 'An Idler in Old France' (1889); 'The Man in the Iron Mask' (1901).

Hop'kinson, Francis, American jurist; one of the signers of the Declaration of Independence: b. Philadelphia 21 Sept. 1737; d. there 9 May 1791. He was graduated at the College of Philadelphia (now the University of Pennsylvania), having been the first student who entered that institution at its opening, and afterward studied law. In 1776 he was sent from New Jersey as one of her representatives in Congress. During the Revolution he distinguished himself by satirical and political writings, which attained such popularity that it has been said that few pens effected more than Hopkinson's in educating the American people for political independence. He also ridiculed in prose and verse most of the social follies of his time. In 1779 he was made judge of the admiralty of Pennsylvania, which office he held for ten years, until the organization of the federal government, when it expired. As soon, however, as Washington became President of the United States, he addressed to Hopkinson a letter enclosing a commission as United States district judge for Pennsylvania. He was skilled in painting and music, composing highly popular airs for his own songs. Of his political writings the most prominent were: 'The Pretty Story' (1774); 'The Prophecy' (1776); 'The Political Catechism' (1777). The best known of his poems are: 'The Battle of the Kegs,' a humorous ballad, and 'The New Roof, a Song for Federal Mechanics.' The 'Miscellaneous Essays and Occasional Writings of Francis Hopkinson' were published in 1792.

Hopkinson, Joseph, American jurist and poet: b. Philadelphia 12 Nov. 1770; d. there 15 Jan. 1842. He was a son of Francis Hopkinson (q.v.). He was educated at the University of Pennsylvania, studied law, and began to practise at Easton, Pa., in 1791, whence he returned to Philadelphia. From 1815 to 1819 he was a member of the House of Representatives from Philadelphia. He opposed the recharter of the United States bank, and made a noted speech on the Seminole war. At the close of 1819 he retired from Congress, declining a re-election. Having gone to Bordentown to reside, he was elected to the legislature of New Jersey. In 1828 he was appointed judge of the United States court for the eastern district of Pennsylvania, an office which had been filled by his father under Washington. In 1837 he was chairman of the judiciary committee of the convention to revise the constitution of Pennsylvania. He is, however, best known as the author of the national song 'Hail Columbia,' written in 1798 for the benefit of an actor named Fox.

Hop'kinsville, Ky., city and county-seat of Christian County, on the Louisville and Nashville, and the Ohio Valley R.R.'s. Here are Bethel Female and Southern Kentucky colleges, Western Kentucky insane asylum, and manufactures of tobacco, lime, brick, wagons, and carriages, a national bank and the Hopkinsville high school. The city has an assessed property valuation of over $2,000,000. Pop. (1900) 7,280.

Hop'per, De Wolf, American actor: b. New York 1858. He made his first professional appearance in 'Our Boys' (1878), and later appeared in 'Hazel Kirke' and other plays. He studied vocal music for several years and became a star in comic opera and musical comedy.

Hopper, Isaac Tatem, American philanthropist: b. Deptford, N. J., 3 Dec. 1771; d. New York 7 May 1852. He was a member of the Society of Friends, and in the division which took place in 1827–8, joined the anti-orthodox or "Hicksite" branch. In 1829–41 he was director of a New York shop for the sale of Hicksite books, in 1841–5 was treasurer and book-agent of the Anti-Slavery Society, and from 1845 devoted his efforts to the work of the New York Prison Association. He was widely known for his interest in benevolent objects, especially negro emancipation and the assistance of discharged prisoners. At Philadelphia he was a founder and the secretary of a society for the employment of the poor, teacher in a colored school, and otherwise interested in philanthropic measures. He was an eloquent speaker. Consult the 'Life' by Child (1853).

Hop'pin, James Mason, American scholar and author: b. Providence, R. I., 17 Jan. 1820. He was graduated from Yale in 1840, studied law at the Harvard law school (1841–2), theology at the Union and Andover seminaries (1843–5) and the University of Berlin (1847–9), was ordained to the Congregational ministry in 1850, and was

pastor at Salem, Mass., in 1850–9. In 1861–79 he was professor of homiletics at Yale, in 1861–3 also pastor of the College church, and from 1879 until his retirement as professor emeritus in 1899 professor of the history of art. His publications include 'Notes of a Theological Student' (1854); 'Old England: Its Art, Scenery, and People' (1867); 'The Office, and Work of the Christian Ministry' (1869); 'Homiletics' (1881); 'Pastoral Theology' (1889); 'The Early Renaissance' (1892); and 'Greek Art on Greek Soil' (1897).

Hoppner, hŏp'nėr, **John,** English portrait painter: b. London 4 April 1758; d. 23 Jan. 1810. He entered the schools of the Royal Academy in 1775; and became a fashionable portrait painter and the rival of Lawrence. He was a member of the Royal Academy in 1795. His paintings have suffered from his use of bad mediums; but his repute has risen, and in 1896 a portrait by him was sold for 1,800 guineas.

Hopps, John Page, English Unitarian clergyman: b. London 6 Nov. 1834. He was educated at the Baptist College in Leicester, and first entered the Baptist minstry. Becoming a Unitarian, he held pastorates in Unitarian churches in Sheffield, Dukinfield, Glasgow, Leicester, and Croydon. He was a member of the first school board of the city of Glasgow. He was proprietor and editor of 'The Truth-seeker,' 1863–87, and became editor of 'The Coming Day' in 1891; he has written 'Pilgrim Songs'; 'A Scientific Basis of Belief in a Future Life'; 'The Alleged Prophecies concerning Jesus Christ in the Old Testament'; 'The Plain Truth about the Bible'; 'First Principles of Religion and Morality.'

Hops (*Humulus lupulus*) are a climbing plant, often met with in the wild state in northern Europe and in North America. The hop belongs to the hemp family (*Cannabinaceæ*) and it is the sole representative of its genus, but is cultivated in many varieties. It is a dicœcious plant, that is, the pistillate (female) and staminate (male) inflorescence is borne by different plants. In American and English hop-gardens it is customary to grow a sprinkling of male plants, but these are rigorously excluded on the Continent. In the former case the pistillate inflorescence becomes impregnated and forms seeds, in the latter they do not. In good hops the seeds are scarce, small, shrunken and sterile, that is incapable of propagating the plant. Many believe that the formation of seed ought to be prevented, as the seeds are useless to the brewer, the main consumer of hops, and besides they only add weight to the hops. Hop-plants are not raised from seeds, but are propagated by cutting off and transplanting portions of the underground stem or root. Only the pistillate plant is cultivated, because its ripe flower is the part of the hop-plant used in brewing. It has been introduced into Brazil, Australia and the Himalayas.

The hop is a perennial herbaceous plant, which produces each year several long twisting, striated stems, 15 to 20 feet in length, which clamber over hedges, brush, etc., with ease. The leaves are stalked, opposite, three to five lobed, and coarsely serrate. They are, like the stem, rough to the touch. The male inflorescence forms a panicle; the flowers enclose five stamens in a small greenish five-parted perianth. At an early stage the female inflorescence is less conspicuous. The strobile or catkin consists of several small acute bracts or leaves at whose base are situated two sessile ovaries, each subtended by a rounded bractlet. These bracts are attached to the extremity of the stem in such a way as to form a cone, and are shaped similar to roofing tiles, being one half to three quarters of an inch long.

The ovary and the base of the bracts are covered with a yellowish powder, the "hop-meal" or lupulin, which is the active principle of the plant.

Only a very slight amount of hops is used in medicine, being chiefly employed as a stomachic in dyspepsia; a pillow stuffed with hops is said to induce sleep. Nevertheless by far the largest portion of the hops produced is used in the manufacture of various beers, so that here this subject is treated with that idea in view.

The pistillate plant alone is cultivated, because hop growers on the Continent, especially Germany and Austria, find that unfertilized pistillate plants produce strobiles richer in aroma, more plenteous in lupulin, and in general better than where the plants were fertilized through the pollen of the staminate plant. In the United States we always find the strobiles containing much seed, while the choice imported Bohemian and Bavarian hops are seedless. The pistillate plant flowers in August, and its strobiles are ready for harvesting during September.

The continental European growers always strive to have early, medium and late hops, so that there the hop-picking begins late in August and lasts through the early part of October. In the United States the picking is usually over in two weeks. The time at which the strobile is fit to pick is indicated by the change of color from a light golden to a somewhat deeper hue, also by the closing up at the tips and making a rustling sound when touched. The seeds should be firm and dark in appearance before the hops are gathered. Much loss can occur by too early picking, while too late harvesting is also detrimental to the value and quality of the product.

For about 1,000 years hops have been added to beer or wort, in former times to prevent its spoiling and also to give it its pleasant and characteristic flavor and aroma; and its cultivation has progressed as the manufacture of beer became more widespread. Germany and England had hop gardens in the 8th and 9th centuries, but the cultivation was not rationalized until the 16th century, and at the present is a very important agricultural product.

Abroad the finest hops are raised in Bohemia, its "Saazer" hops being known throughout the world. Next to this ranks the Bavarian "Spalter hops," and the product of the so-called "Hallertau." As a rule the Bavarian hop is stronger than the Bohemian, but somewhat inferior in quality. Würtemberg, Saxony, Baden, Prussia and Alsace also raise a good quality of hops; and Belgium, northern France and Burgundy cultivate it on a large scale. England's most famous hops are the "Farnhams," the "Golony" and "Grape" varieties. Owing to the high import taxes, Russia has also begun to raise hops. Of all these only the "Saazer" and the "Spalter" are imported to the United States. The follow-

ing table gives an idea of the size of the world's production during the years 1900 and 1901:

WORLD'S PRODUCTION OF HOPS IN HUNDREDWEIGHTS.

COUNTRIES	1901	1900
United States	451,000	528,000
German Empire	283,580	523,600
Austro-Hungary	308,000	214,500
France	49,500	55,000
Belgium and Holland	93,500	55,000
Russia	88,000	88,000
Great Britain	726,000	385,000
Australia	3,300	13,200
	2,002,880	1,862,300

In the United States, the culture of hops was introduced as early as 1625 in New Netherlands, and 23 years later in Virginia, but although encouraged by special legislation in 1657, never assumed its present important agricultural role until 1800. During the first half of the 19th century Vermont produced seven eighths of the entire United States crop; since then New York has held first place. It has always been the tendency of hop cultivation to concentrate in well-defined districts, but in spite of this accumulative tendency, the centre of cultivation has slowly but surely moved westward. At first Massachusetts, Vermont and Maine were the chief hop States, but as the quality of the New York hops was far superior, and the quantity three times as great, the former States soon abandoned hop culture. The result was that during 1850-65 a small portion of New York, lying south of the New York Central Railroad between Rochester and Albany, monopolized the hop raising of the United States. Small patches were planted in Wisconsin and Michigan in 1860 and in 1866, when the New York crop was completely destroyed by vermin, Wisconsin hop-growers obtained exorbitant prices for their excellent product, which induced many to plant hops, expecting to realize a fortune in a few years, but the prices speedily declined owing to an overproduction. During 1870 and 1880 New York again was at the head, but at that time fresh competition began to develop on the Pacific coast. The "Russian River" hops of California were a marvel; their texture was "fine as silk"; their color "bright golden"; they were "clean picked"; their "contents of lupulin" second only to the best German brands, so that it was no wonder that hop-culture there advanced quickly to 40,000 bales, the yield of 1902. The first of the three following tables shows the yield in pounds of the various States from 1849 to 1899. The next table gives a comparison between the acreage, yield and value of the hop crop for 1899, 1889, and 1879; and in the third table this comparison has been calculated to

STATE	1899	1889	1879	1869	1859	1849
New York	17,332,340	20,063,029	21,628,931	17,558,681	9,671,931	2,536,299
Washington	6,813,830	8,313,280	703,277	6,162	44	.....
California	10,124,660	6,547,338	1,444,079	625,064	80	.....
Oregon	14,675,577	3,613,926	244,371	9,745	493	8
Wisconsin	165,346	428,547	1,966,827	4,630,155	135,587	15,930
All other States	97,951	205,350	558,895	2,626,862	1,183,861	944,792
Total U. S.	49,209,704	39,171,270	26,546,378	25,456,669	10,991,996	3,497,029

STATE	Acres under Cultivation			Yield of Hops in Pounds		
	1899	1889	1879	1899	1889	1879
New York	27,532	36,670	39,072	17,332,240	20,053,029	21,628,931
Washington	5,296	5,113	534	6,813,830	8,313,280	703,277
California	6,890	3,974	1,119	10,124,660	6,547,338	1,444,079
Oregon	15,433	3,130	304	14,675,577	3,613,726	244,371
Wisconsin	342	967	4,439	165,346	428,547	1,966,827
All other States	120	358	1,332	97,951	205,350	558,895
Total	55,613	50,212	46,800	49,209,704	39,171,270	26,546,378

STATE	Average Yield in Pounds per Acre			Value of Total Yield			Value of Crop per Acre		
	1899	1889	1879	1899	1889	1879	1899	1889	1879
New York	629.33	547.12	553.56	$1,600,305	$2,210,137	$6,488,678	$ 58.30	$ 60.30	$166.08
Washington	1,286.41	1,625.91	1,316.99	589,582	841,206	210,983	111.32	164.52	395.09
California	1,468.02	1,647.54	1,290.50	925,319	605,842	433,223	137.06	152.40	387.13
Oregon	950.92	1,154.52	803.85	937,513	322,700	73,311	60.75	103.09	240.15
Wisconsin	483.47	443.17	443.09	18,020	51,983	590,048	56.19	53.78	130.67
All other States	816.26	537.60	412.09	11,190	27,983	167,668	93.25	78.11	125.12
Total	884.85	780.11	567.23	4,081,929	4,059,697	7,963,913	73.39	80.65	170.17

STATE	1899			1889			1879		
	Per cent of Acreage	Per cent of Yield	Per cent of Value	Per cent of Acreage	Per cent of Yield	Per cent of Value	Per cent of Acreage	Per cent of Yield	Per cent of Value
New York	49.5	35.2	39.3	73.0	51.2	54.5	83.4	81.4	81.7
Washington	9.5	13.8	14.5	10.1	21.2	20.8	1.3	2.7	2.6
California	12.4	20.5	22.6	7.9	16.7	14.9	2.4	5.4	5.3
Oregon	27.7	29.8	22.8	6.2	9.2	7.9	0.6	0.9	0.9
Wisconsin	0.65	0.45	0.44	1.8	1.0	1.2	9.5	7.5	7.4
All other States	0.25	0.25	0.26	0.7	0.7	0.7	2.8	2.1	2.1

percentages of the total United States crop, in order to give a clearer idea of the hop industry during these years.

New York hops are almost entirely consumed in the United States, while the greater amount of the Pacific coast hops (especially Oregon) is exported. The English production is scarcely ever sufficient for its needs, so that Great Britain must import some and mostly takes Oregon hops, because they are especially adapted to the English ale brewer's requirements.

The hop plant is subject to many diseases, due mostly to parasites, among which are the hop plant-louse (*Phordon humuli*), the hop-grub (*Gortyna immanis*), the hop-vine snout-moth (*Hypena humuli*), the hop-merchants (*Polygonia interrogationis*), the zebra caterpillar (*Mamestra picta*), the common woolly bear caterpillar (*Spilisonma virginica*), the saddle-back caterpillar (*Empretia stimulca*), hop vine leaf-hopper (*Tettigonia confluenta*); various beetles, the "red spider" or spinning mite, and the needle-nosed hop-bug (*Calocoris fulmomaculatus*), which mostly produce red smut, etc., and even destroy entire crops. Fungus pest, blight and mold (black smut), are extremely rare in the United States, although widespread in England and Europe. It is almost impossible to eradicate these pests, except by extreme measures. The best remedies for the destruction of the animal parasites is the use of bisulphide of lime or a heavy spraying of soap and tobacco emulsion. Sulphur in any form is a good remedy, and a spray of kerosene soap emulsion, to which a small quantity of flowers of sulphur is added, is generally effective. In extreme cases the affected plants are cut down and burned to prevent a spread of the disease.

The elements also play havoc with the development of the tender hop-vine. High winds will tear the vine from its support; drouth will tend to change the color of the light yellow strobile to the objectionable "pole redness"; and too much water will produce a lack of lustre, when the hops are said to be "blind." This is due to the fact that the entire energy of the plant is spent in the formation of leaves, the strobile being scarcely developed.

Hops contain hop-oil, hop-resins, acids, hop-tannin, hop-bitter, hop-wax, nitrogenous bodies, carbohydrates and mineral substances. Diastase (an enzyme) has also been found, which is especially valuable in ale brewing. Hop-oil, the principal constituent of the lupulin, present in 0.2 per cent to 0.8 per cent, is obtained by distilling the hops with water. It is colorless and hardly soluble in water. The characteristic agreeable aromatic flavor of the hops depends on this oil. If exposed to air the oil turns to resin, passing to valerianic acid, to which the cheesy odor of old hops can be traced. According to Hayduck, there are three resins in hops, the α, β, and γ, of which the first two are soft and the latter hard. The preserving, antiseptic effect of hops is due to the two soft resins, as they are distinctly prejudicial to the growth of butyric acid and many other bacteria, but do not have much effect on acetic acid bacteria and sarcina. In old hops valerianic acid, malic acid, citric acid and succinic acid are present. Hop-tannin is chiefly stored in the leaves of the strobile and is a pale brown amorphous powder soluble in dilute alcohol, which through oxidation passes into phlobaphen. The hop-bitter is obtained from the two soft resins, and imparts a pleasant bitter taste to the beer, without which it would be flat and insipid. Hop-wax is present in considerable proportions in hops, but, since it is insoluble in water and even in 90 per cent alcohol, it has no value in beer. Nitrogenous constituents of hops are about 2 per cent to 4 per cent, which calculated to albumen are 12 per cent to 24 per cent, of which 0.75 per cent to 1.6 per cent are soluble. Bungerer maintains that 30 per cent of the nitrogenous substances are asparagin. Behrens says that trimethylamin and free ammonia are also present. Griess and Harrow have discovered cholin in hops. Brown and Morris have shown the presence of an enzyme similar to diastase, which will saccharify starch, that is, change it into sugar. This enzyme is chiefly accumulated in the seeds. The carbohydrates contained are cellulose, sugar, dextrin. According to Brown and Morris there is present 1.55 per cent dextrose and 2.10 per cent levulose, together 3.65 per cent of inverted sugar. According to Thausing hops contain 5.3 per cent to 15.3 per cent of ash and an average of 7.54 per cent, of which over one third is potash, one sixth phosphoric acid, one sixth silica, and some sodium, lime, magnesia, iron oxide, sulphuric acid and chlorine. The presence of an alkaloid in the seed has been ascertained by Dr. Ernst Hantke, but research on this point is still progressing.

Although it is possible to estimate with a fair degree of accuracy the several constituents of hops, it has not been so far found possible to establish any definite relation between the value of the hops and the amounts of hop-oil, resins, tannin, etc., which they contain. Consequently up to the present time, chemistry has not afforded much assistance in this direction. Hence the value of hops is still judged according to its general properties. The color, size and appearance and lustre of the strobile, the quantity and color of the lupulin, the amount of seed, the odor, taste and cleanliness, are the essential points in the valuation of hops.

Fine hops possess a silky lustre which is lacking in inferior grades. The color is greenish yellow, varying with the origin. New York hops have a somewhat paler color of a stronger greenish shade, while the Pacific coast hops have a more pronounced yellowish color. A reddish tint may indicate pole-redness, or, what is worse, that the hops have become overheated in the bale, which implies a darker coloration of the lupulin and deterioration of quality. The form and size of the strobile is also characteristic of the origin. Small strobiles are preferable to big ones, as they contain on an average more lupulin; and the fewer the seeds the better. The bracts ought to lap over one another and hold firmly together, whereby the lupulin is kept in better. The odor and aroma should be strong, fine, free from any off-smell such as odors of fruit, garlic, etc. Only very slight amounts of stems, foliage, or stripped cones should be present, as they impart a coarse taste to the beer. The amount of lupulin present in the strobile is an indicator of the value of the hops, because it contains those resins, volatile oils and bitter substances, which are so essentially valuable to the brewer. In fresh hops,

slight pressure will force out the contents of the strobile in a transparent droplet, but in old hops the contents of the lupulin granule will not flow, due to resinification, and the expressed juice is more syrupy, wax-like and opaque. In short, the preparation of the strobiles for the market should be as follows: After the crop has been harvested, it is dried. The largest part of the German crop is merely air-dried or sun-dried, and it is claimed that this "natural cure" preserves far more of the essential oils and other active principles than is possible by the artificial hot-air cure used in the United States and England, and that this at least in part accounts for the peculiarities of Spalt hops that command such extraordinary prices. The kiln in which the hops are dried resembles in some respects the drying kiln of the maltster. This process requires great care, as much of the hops may be easily damaged. When the moisture has been completely removed, sulphur is placed on the fire, which has the effect of brightening the color; the evolved sulphurous acid also acts as an antiseptic, destroying to some extent the germs of mould-fungi and other organisms. After drying, the hops are stored three or four days, whereupon they are baled and are then ready for the market. They are easily affected by warmth, moisture, air and light, and for this reason must be protected in storage against these influences. For brewing purposes it is almost impossible to pass off a substitute for hops, although lupulin and hop-extract are now manufactured. The lupulin is separated from the strobile, and inasmuch as it contains the essential constituents for which hops are used in brewing, it can be better utilized, although it is impracticable and impossible to replace the entire quantity of hops with lupulin alone because it contains very little tannin, which also is essential. The same remark is applicable to hop-extract.

DR. ERNST HANTKE,
President of the Industrial Chemical Institute of Milwaukee.

Horace (QUINTUS HORATIUS FLACCUS), Roman poet of the Augustan Age: b. Venusia, Italy, 8 Dec. 65 B.C.; d. Rome 27 Nov. 8 B.C. Our information about Horace's life is derived in the main from his own writings, which are supplemented in a few details by a brief biography attributed to Suetonius. He was born at Venusia, a small town in Apulia, near the boundaries of Lucania and Samnium. His father was a freedman, and, according to Horace's own statement, followed the trade of a *coactor*, or collector. He seems to have prospered, for he was able to purchase a small farm. He was not satisfied to send the boy to the local school of Flavius, which was patronized by the aristocracy of Venusia, but moved to Rome to give his son the best possible educational advantages. It is to his credit that he did this, not that Horace might better his position in life, but for the sake of the education itself. At the capital he supplied his son with the means of making a creditable appearance, and he himself accompanied him to and from his classes, giving him moral instruction in a shrewd and homely way by pointing out men who offered examples to be followed or shunned. To this training Horace owed both his habit of self-examination and his consequent temperance and self-control, and that keen observation of men and things which is one of his marked characteristics. He nowhere makes mention of his mother, who very likely died while he was an infant.

At Rome Horace pursued the usual grammatical studies under the notorious "flogging Orbilius," and doubtless supplemented them by more advanced work in rhetoric and literature. It is, however, in marked contrast to the fulness of our information about the other details of his life, that we know little or nothing about the masters who influenced him or about the particulars of his education, except that he implies that he attended the classes of several teachers. We may, however, infer something from the results. He certainly acquired a taste for reading, both in the literature of Greece and that of his native land, a habit which he continued to follow throughout his life. Somewhere about 46 B.C., in his 19th year, Horace went to Athens to study philosophy but he does not seem to have been especially attracted by any particular school. In his early life he leaned toward the Epicurean doctrine, but as time went on he turned more and more to that of the Stoics, without, however, committing himself to either sect. The assassination of Cæsar and the arrival of Brutus in Athens in September 44 B.C., put an end to his quiet student life. He joined the army of the liberators, and received a commission as tribune, though he was in no way fitted for the post. At Philippi he fled from the field with the rest of the routed forces, and, as he himself says, "left his shield behind." His humble estate was confiscated, but on his return to Rome in 41, when a general amnesty was granted by Octavian, he in some way secured a position as clerk in the quæstor's office, which furnished him the means of livelihood.

Horace freely admits that it was lack of money which first led him to write verse, and it was to his efforts in this line that he owed his advancement. He soon made the acquaintance of Vergil and of Varius, by whom he was introduced to Mæcenas. After a delay of several months, during which the astute statesman doubtless took the young man's measure, his position was established by his admission to the select circle of Mæcenas' literary friends. This honor, as he says with pardonable pride, was due not to high birth, but to his personal character. In 33 he received from his patron a small estate, the famous Sabine farm, situated in the valley of the Digentia, a small stream flowing into the Anio, about 30 miles northeast of Rome. Through Mæcenas he became intimate with the most eminent men of the day, both in literary and in political life, including Augustus. Toward the emperor his attitude was one of dignified independence. He was quick to recognize the advantages of the peaceful and established order of things which Augustus had brought about, and he celebrates it in many of his odes; but he did not hesitate to decline the position of private secretary which the emperor offered him. This he did without giving offense, for Suetonius quotes extracts from letters of Augustus which indicate a cordial and even an intimate friendship. Horace also preserved his independence in his relations with his benefactor Mæcenas, as appears from several pas-

sages in his works, although he showed a proper gratitude for his many favors.

In the year 35 Horace issued his first book of satires, to which he himself gave the title of 'Sermones,' or familiar talks. On this branch of literature, which the Romans claimed as their own creation, see SATIRE. He took as his model Lucilius, and at first seems to have followed him closely, but he soon found himself out of sympathy with the earlier poet's severity in invective and disregard of form. In the fourth and tenth Satires he subjects the work of his predecessor to a thorough criticism, and defines his own ideal of what satire should be. This book was complete in itself, and begins with an essay addressed to Mæcenas. That the reception given to his first effort, which did not lack serious defects, was not wholly favorable, and that Horace had not satisfied himself, is evident from the poet's own words in the introductory essay of the second book, which seems to have appeared in the year 30. This book marks a great advance on the first, from which it differs in its externals in having no formal dedication and in being cast almost wholly in dialogue form, whereas in the first book Horace himself had been the chief speaker. In the following year, urged by Mæcenas, Horace published his first collection of lyrics, some of which doubtless represent his earliest attempts at verse. It was a volume of 17 Epodes, or 'Iambi,' as he himself named them. He chose as his model the Greek iambic poet Archilochus, and followed him closely in form. His work, however, has little of the bitter invective for which the Greek poet was notorious, and Horace shows no little originality both in his choice of themes and in his treatment of them. Six years later Horace, now a man of 42, published the first three books of the Odes, which form a work complete in itself, opening with a dedication to Mæcenas and closing with an epilogue in which he predicts his own immortality. In his choice of metres he followed especially Alcæus and Sappho, from whom he also took many of the subjects of his odes. But he shows the influence of many other Greek poets, as well as considerable independence. Although this work did not wholly escape hostile criticism, it at once placed Horace in the front rank of Roman poets. This position was formally recognized in 17 B.C. through his appointment by Augustus to write the ode, the well-known 'Carmen Sæculare,' which was sung at the celebration of the secular games in that year.

His next work was a return to the field of satire, for the 'Epistles' belong with the 'Sermones' to that branch of literature in the Roman sense of the term. They differ from the 'Sermones' in their greater finish and in their external form. Horace regarded the hexameter as the conventional form for satire, and the poetic epistle represents his third and final choice of form for his essays in that measure. The first book was apparently issued in the year 20. Horace was then a mature man, who had made his mark, and his tone is more assured and his self-appreciation is greater, though without any trace of egotism. The practical philosophy of life seemed to him the thing most worthy of serious consideration, and to teaching this he proposed to devote the rest of his literary work. This book, which consists of 20 letters, of which some are genuine and some fictitious, is also dedicated to Mæcenas. The second book is devoted wholly to literary criticism, a subject which lay within the domain of satire and had already been handled in some of the 'Sermones.' The chronology of the book is somewhat difficult. It was probably published in the year 14. Whether the *Ars Poetica* formed the third letter of the second book or not is uncertain. It has been assigned to various years from 20 to 8 B.C., and if it really belongs to the latter date, it must have been published separately, perhaps after Horace's death, and is the latest of his works. The title which Horace gave it seems to have been 'Epistula ad Pisones,' but it received its present designation at an early period. The second book of epistles begins with a letter addressed to Augustus, who is said by Suetonius to have taken Horace to task for dedicating none of his works to him. In his epistles, Horace had formally renounced lyric poetry. Nevertheless, at the express request of the emperor, he published a fourth book of odes in 13 B.C. This collection, though admirable in form and containing some of Horace's best work, is characterized by a certain perfunctoriness and lack of spontaneity. It was not addressed to Mæcenas, but is without a formal dedication. This was, however, not due to any diminution of his regard for his patron, but to the fact that the book was published by the special request of Augustus.

Of the remaining years of the poet's life we know very little. Suetonius says that he died 27 Nov. 8 B.C., and there seems to be no ground for rejecting this testimony. No authentic portrait of Horace has come down to us. From his own allusions to his personal appearance, and from a letter of Augustus, quoted by Suetonius, we learn that he was stout and short, with dark eyes and hair, but prematurely gray. He further tells us that he was quick to anger, but easily appeased. He never married, and of all the loves of which he sings, Canara alone seems to be other than imaginary.

It is probably safe to say that Horace has been the most widely read of all Roman writers, not excepting Vergil, and that he has appealed to a more varied circle of readers than any of his countrymen. This statement applies especially to his odes, since it is to them that his popularity with the general public is for the most part due. It has been said that the odes are not poetry of the highest type, and that when they are analyzed and their contents subjected to searching criticism, the sum total of poetic material is scanty. This is unquestionably true, yet it is equally true that their influence and popularity have none the less been great. This is due in part to the personality of the man and the sympathetic feeling which he rouses in his readers on account of his broad humanity; and in part to the fact that the very simplicity of the odes and their ease of comprehension appeal to readers of all classes. As Mackail says, he realized that limited as was his own range of emotions, that of mankind at large was still more so. In some cases, notably in the love poems and the convivial odes, we are conscious that he did not always feel even the emotions which he describes. In spite of all criticism, the one undoubted fact remains, that the odes of Horace have pleased readers of all epochs and all sorts and conditions of men.

Horace's claim to originality is greater than is usually admitted. In his day the question of imitation of Greek models had ceased to exist, and the question was, rather, which model to choose. In the Augustan Age we find two schools, those who followed the Alexandrine writers, and those who went back for their inspiration to the Greeks of the classical period. Horace belonged to the latter class. His contempt for the followers of Alexandria is outspoken, and so undiscriminating as to include such really great poets as Calvus and Catullus. He certainly knew how to make what he borrowed his own, and many of his odes are so thoroughly national in character that they can have owed little except their external form to Greek sources. In his Satires, in spite of his avowed imitation of Lucilius in the beginning, his originality is far greater, and these are in reality his greatest works. While less popular with the general reader, they are of great interest for the light which they throw on Horace's life, personality, and habits, as well as for the vivid pictures which they set before us of the complex Roman life. In his daily walks about the city, Horace used his powers of observation, and drew material from all sides and from all classes of society. Above all we can trace in them his own self-improvement and the development of his character, and the gradual growth of that sound judgment and good taste which characterize the work of his mature years. The Satires are further characterized by a genial and good-natured humor. Like Dickens, he chose appropriate names for many of his characters — such as *Novius*, or Newman, for the parvenu, though, like those of Dickens, they were not always of his own coinage. The Satires also abound in the familiar phrases of every-day life, in puns and plays upon words, in proverbs and homely fables and stories.

Horace's works, as he himself humorously predicted, became school text-books at an early period. Juvenal implies that this was the case in his day. This fact and his general popularity led to the numerous commentaries on his works, which began to appear as early as the days of Nero, of which those of Porphyrio, of the early part of the 3d century, and the collection falsely attributed to Helenius Acron, have come down to us. The great number of manuscripts which exists testifies to his popularity in the Middle Ages. His fame at that time was, however, much less than that of Vergil, and, though he also was regarded as a magician, it was only at Palestrina and at Venusia that such legends were current. In modern times his influence on French and English satire has been great, as well as on modern poetry in general.

The date of the first edition is uncertain, but is earlier than 1471. Since then the editions of Horace's works, or of parts of them, have been legion. Of these may be mentioned as epoch-making that of Richard Bentley (Cambridge 1711), which has often been reprinted (the reprint at Berlin in 1869 contains a word-index by C. Zangermeister). The standard critical text is that of O. Keller and A. Holder (Leipsic 1864–70, a second edition of the first volume containing the 'Odes,' 'Epodes,' and 'Carmen Sæculare,' appearing in 1899). A commentary on this edition is furnished by Keller's 'Epilegomena zu Horaz' (Leipsic 1879–80). Of editions with notes may be mentioned: J. G. Orelli, 4th ed. by W. Hirschfelder and W. Mewes (Berlin 1886–92), containing a complete word-index; A. Kiessling (Berlin, 2d ed. 1890–8); H. Schutz (Berlin 1880–3); these two appear in new editions from time to time; L. Müller, 'Odes' (Leipsic 1900), 'Satires and Epistles' (Leipsic 1891–3); E. C. Wickham, 'Odes and Epodes' (3d ed. Oxford 1896), 'Satires and Epistles' (Oxford 1891); Page, Palmer, and Wilkins (London and New York 1896). The edition of the 'Odes and Epodes' by P. Shorey (New York 1896) is of special interest to the general reader on account of its large number of parallel passages from English poetry.

The simplicity and directness of Horace's thought have been a constant temptation to translators, and the number of English versions, particularly of the 'Odes,' is very great. But his care in composition and his inimitable skill in the use of words, his *curiosa felicitas*, as Petronius terms it, make him exceedingly difficult to translate, and, while some brilliant successes have been achieved with single odes, no one has done justice to him as a whole. Many of the attempts which have been made are reviewed in two articles in the 'Quarterly Review' (Vol. CIV., 1858, and Vol. CLXXX., 1895). The following may be mentioned: Lord Lytton, 'Odes and Epodes' (London 1869); Cooper, 'Horace's Odes Englished and Imitated by Various Hands' (London 1880); Martin, 'Works of Horace' (Edinburgh 1888); Conington, 'Odes and Epodes' (3d ed., London 1885), 'Satires and Epistles' (London 1892); Gladstone, 'Odes' (New York 1894); Green, 'Odes and Epodes' (London 1904). An edition of Horace's works, in six volumes, containing both text and translations, has recently been issued by the Bibliophile Society of Boston. To give an adequate literary criticism of Horace is nearly as difficult as to translate him, and is out of the question within the limits of a brief article. Consult: the various histories of Roman literature, especially that of Mackail (New York 1900); Sellar, 'Roman Poets of the Augustan Age — Horace and the Elegiac Poets' (London 1892); Nettleship, 'Lectures and Essays' (Oxford 1885); Patin, 'Etudes sur la poesie latine' (3d ed., Paris 1883); Tyrrell, 'Latin Poetry' (Boston 1895); Boissier, 'The Country of Horace and Virgil' (London 1896); Lang, 'Letters to Dead Authors' (London 1886).

JOHN C. ROLFE,
Professor of Latin Language and Literature, University of Pennsylvania.

Horæ, hō'rē, in Greek mythology, goddesses of the seasons. They were generally regarded as attendants of the gods, and guardians of the Olympian gates. Their characteristics, however, varied, and their number was variously represented as two, three, or four. Hesoid names three — Euxomia (good order), Dike (justice), and Eirene (peace), and thus makes prominent their attributes as also guardians of social and political conditions.

Horatii, hō-rā'shĭ-ī, three Roman brothers, who, in the reign of Tullus Hostilius, engaged the same number of Alban brothers (the Curiatii), in order to decide the contest between the two nations. A sister of the Horatii was

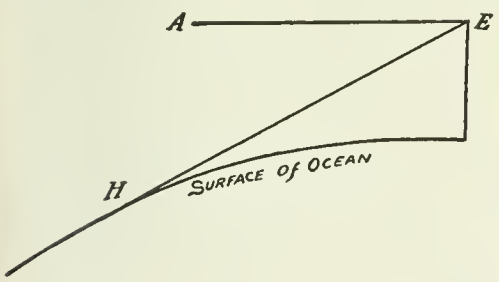
betrothed to one of the Curiatii; but both sides forgot their private relations in the service of their country. Two of the Romans soon fell. The contest was unequal, but Horatius saw his antagonists faint with the loss of blood. In order therefore to separate them from one another, he feigned flight, and, while they pursued him as well as their wounds would permit, at unequal distances, he suddenly turned and slew one after the other. He was conducted back to the city amidst the rejoicings of the Romans, adorned with the spoils of the slain. There he saw, in the crowd, his sister in tears for the death of her betrothed. Angered that her lamentations for her lover should mingle with the rejoicings of the nation on his victory, the brother plunged his dagger into her breast. He was condemned by the duumviri to be scourged to death, but he was later pardoned.

Horeb, hō′rĕb, a mountain in the northern part of Arabia, of the same ridge as Mount Sinai, which lies not far distant from it, memorable in the history of Moses. The monks on Mount Sinai still point out the rock on Horeb from which water issued at the blow of Moses.

Horicon, hŏr′ĭ-kŏn. See GEORGE, LAKE.

Hori′zon. In its most familiar sense the horizon is the line or circle around which earth and sky seem to meet. On the ocean this circle is smooth and easily visible, and is then called the *sea horizon.*

In astronomy the horizon is defined by a plane at right angles to the direction of gravity, extending out indefinitely on all sides, and called the *plane of the horizon.* The circle in which this plane cuts the celestial sphere is called the *astronomical horizon.* All points of it are apparently on a level with the eye of the observer. Owing to the rotundity of the earth



the sea horizon is lower than this astronomical horizon — a narrow strip of sky separating the two. The angular distance between them is called the *dip of the horizon.* The higher the observer is above the ocean, the greater is the dip. To an eye on the surface of the water, the sea horizon and the astronomical horizon coincide, so that there is no dip. The geometrical principle which determines both the dip and the distance of the visible horizon, are seen in the figure. The circular arc is here the surface of the ocean. The eye of the observer is situated at the point E, a short distance above the surface of the water. A tangent drawn from the eye to the surface meets the latter at the visible horizon, H. Let a horizontal line E A be drawn from the eye, the angle A E H is then the geometric dip of the horizon. The geometer will readily see that this is equal to the angle at the surface of the earth between O and H. Since one minute of arc in the curvature of the earth's surface corresponds to one nautical mile, it follows that, geometrically, the dip of the horizon in minutes is equal to its distance in nautical miles. But, in the actual case, the line of sight is curved in consequence of the refraction of the air. The result of this is that the actual horizon is further than given by the geometric theory, and the dip somewhat smaller. The following table shows the relation between the apparent dip and the height of the eye above the water and the distance of the sea horizon.

Height in Feet	Dip of Horizon	Distance of Horizon Miles
1	1.0	1.3
2	1.4	1.8
3	1.7	2.3
4	2.0	2.6
9	2.9	4.0
16	3.9	5.3
25	4.9	6.6

On board a steamship the eye of an observer on the promenade deck is generally from 15 to 20 feet above the water. It follows that the distance of the horizon is about five miles. A ship farther away than this will have more or less of her hull below the horizon. At double the distance the entire hull will be below the horizon, and only smokepipe and masts visible. As she goes yet further, these also will disappear, as if sinking below the water.

SIMON NEWCOMB.

Horn, a tough, flexible, semi-transparent substance derived from the epidermis, which may be developed morbidly as a corn, or naturally, as in the callosities on the legs of a horse; or in connection with important functions, as when it forms the outer sheath of the outgrowths upon the heads of ungulate animals, called "horns," the "shell" of the tortoise, the nails, claws, and hoofs of animals, the beak of bird and turtle; and the hairs and feathers of mammals and birds, or their modification into spurs, scales, spines, bristles, whalebone, nasal horns, etc. This epidermal tissue consists largely of keratin, an albuminoid composed mainly of carbon (about one half), oxygen, nitrogen, and sulphur.

The horns of mammals are in effect modifications of the hairy integument covering parts liable to great wear, or needing to be hard and sharp, especially the outgrowths of the skull characteristic of male ruminants. Hollow horns are usually unbranched and persistent, but in the pronghorn (q.v.) they are shed annually while the bony cores grow and their vascular coverings persist and give rise to the new horns. Hollow horns are found usually in both sexes, but in some genera of antelopes only in the male. In the pronghorn the horns of the female are almost hidden in the hair of the head, and are small, short, and unbranched. Such horns as these are called hollow or sheath horns, and are very different from antlers (q.v.). Another form of true horn is that on the snout of the rhinoceros (q.v.) where, when more than one appears, the projections stand one behind the

other in a median line, and not side by side. This nasal rhinoceros-horn is not a hollow sheath clothing a bony core, but a solid mass of coarse agglutinated hairs, arising from the skin and supported by a thickening of the underlying bone.

Utility of Horn.— In their natural form, the horn-sheaths of oxen, sheep and antelopes have been put to a great variety of use, as weapons, receptacles, handles, and musical instruments — the latter surviving in certain ceremonial usages and in the general term "horn" for a wind instrument. Cleaned and polished it served many additional needs, forming the primitive drinking cups; and it is from this ancient usage that the general name of "horns" has been given to a species of drinking cup, and its spirituous contents. The horns of victims sacrificed to the gods were often gilded by the Romans and suspended in the temples, more especially in those of Apollo and Diana. From the most remote times the altars of the heathen divinities were likewise embellished with horns, and such as fled thither to seek an asylum embraced them. Originally the horns were doubtless symbolical of power and dignity, since they are the principal feature of gracefulness in some animals, and instrument of strength in others. Hence these ornaments were frequently bestowed in imagination and art upon gods, and were actually worn by heroes. In more modern times ox-horns have been used the world over for carrying gunpowder; and museums abound in quaint relics of this kind elaborately ornamented by soldiers and hunters. Small bottles (ink-horns) of this substance were the first receptacles for ink, and are still used in the East, where opium for smoking is usually kept in horn-boxes. Before the general adoption of glass panes in windows thin plates of horn were often used, as they still are in barbarous parts of Asia; lanterns were made of them; and the faces of the mediæval horn-books were so protected. The material now lends itself to manufacturing into many other articles by reason of its toughness, pliability and capability of being softened by heat and then molded. The heat is applied in the form of hot water; and splitting into thin sheets, or welding pieces together, or molding fragments into various forms, may all be accomplished under combined moisture, heat and pressure. Both the natural horn and the molded substance may be carved, or impressed with a die, polished and dyed. Hence an enormous variety of useful and ornamental articles may be made, and the horns of cattle have commercial value.

Horn, a musical instrument, originally formed, as the name denotes, from the horn of an animal. The name includes a large family of wind-instruments, many of which have fallen into disuse. The hunting-horn was long the chief form extant. The French horn consists of a metallic tube of about 10 feet in length, very narrow at top, bent into rings, and gradually widening toward the end whence the sound issues, called the bell, or in French the *pavillon.* It is blown through a cup-shaped mouth-piece of brass or silver, and the sounds are regulated by the player's lips, the pressure of his breath, and by the insertion of the hand in the bell of the instrument. The compass of the instrument is three octaves. Music for the horn is always written on the key of C, an octave higher than it is played, with the key of the composition marked at the beginning of each movement. Great improvements have been made in the instrument by C. J. Sax of Paris, whose saxhorn gives a greater volume of sound than the old instrument. The buglehorn is a tube of 3 feet 10 inches in length bent into small compass. It is usually provided with keys, and has a range of two octaves, and notes commencing with the upper B of the bass clef.

Horn, Cape. See CAPE HORN.

Horn-fly, a European fly (*Hæmatobia serrata*), since about 1890 become widespread in North America, which have a curious habit of clustering in masses about the base of the horns of cattle. It is closely related to the house-fly and stable-fly, and although annoying does no serious harm to the cattle or their horns.

Horn'aday, William Temple, American naturalist: b. Plainfield, Ind., 1 Dec. 1854. He studied zoology and in 1875–9 visited as a zoological collector South American countries, India, Ceylon, the Malay Peninsula, and islands. In 1882–90 he was chief taxidermist of the United States National Museum, and in 1896 was appointed director of the New York Zoological Park. His publications are: 'Two Years in the Jungle' (1885); 'Free Rum on the Congo' (1887); 'The Extermination of the American Bison' (1887); 'Taxidermy and Zoological Collecting' (1892); 'The Man who Became a Savage' (1895).

Horn'beam (*Carpinus*), a genus of trees of the natural order *Cupuliferæ,* of which the species *C. betulus* is common in Europe, in some places growing to nearly 100 feet in height, although in Great Britain, where it is much planted, it is a small tree. It is also called horn-beech, hardbeam, and yoke-elm. It has barren flowers in a cylindrical catkin; fertile flowers in a lax catkin; nuts in pairs. It grows in woods and hedges, often in a damp tenacious soil, and forms a principal part of the ancient forests on the north and east sides of London. The wood is white, tough, and hard, and burns like a candle. It is used in turnery, for cogs of wheels, etc. The inner bark yields a yellow dye. The American hornbeam (*Caprinus Americana* or *Caroliniana*) is a small tree rarely attaining the height of 30 feet, sparingly diffused over most of the United States. It is also called water-beech, blue beech and ironwood. The wood, fine-grained, tenacious, and very compact, is used for handles, as of carpenter's tools, ets., its serviceability being restricted by reason of its inferior size. See IRONWOOD.

Horn'bill, a genus (*Buceros*) and of a family (*Bucerotidæ*) of birds now placed in the division *Coraciiformes,* and related to the hoopoes and owls. The species are numerous, and are found in Africa, India, and throughout the Malayan region as far as New Guinea, are mostly large birds, the largest being more than four feet long, the smallest rather smaller than a magpie. They are bulky birds of heavy, noisy flight; their large bills are surmounted by bony crests or "helmets" of varied shape and sometimes of great size, but rendered light by the presence of numerous air-cells. Their food

is principally fruits, but in certain circumstances they become to a great extent omnivorous. Thus a well-known South African ground-hornbill devours snakes, and is highly regarded by the negroes because of its enmity to them, and ability to overcome the largest and deadliest vipers. Several are mainly terrestrial in their habits. The most curious fact regarding these birds is that during the breeding season the female is imprisoned on her nest in a cavity in a tree-trunk, she herself apparently gradually plastering up the entrance by the use of her excrements, until there is left only a small aperture through which the male supplies her and her offspring with food until the young ones are nearly full grown. In captivity the male bird has been observed to disgorge at intervals the lining of his gizzard in the form of a bag, and it is supposed that the food supplied to the female during her term of captivity in the breeding season is enclosed in this structure. Consult: Newton, 'Dictionary of Birds' (1896).

Hornblende, hôrn'blĕnd, or **Amphibole,** an abundant and widely diffused mineral, remarkable on account of the various forms and chemical compositions that it exhibits, and its diversified colors. Almost numberless varieties of it are recognized, to many of which distinct names have been given. It crystallizes in the monoclinic system, and is brittle, with a hardness of from 5 to 6 and a specific gravity of from 2.9 to 3.4, according to its composition. It has a vitreous or pearly lustre, and its fibrous varieties often have a silky appearance. The variety most commonly known as "hornblende" is usually black or greenish black, and occurs in many rock formations, notably in granites and basalts, and in certain schists and slates. The strongly colored varieties are pleochroic. Common hornblende is a silicate of iron, aluminum, magnesium and calcium. The various hornblende minerals are now collectively known as the "amphibole group." See AMPHIBOLE.

Hornbook, an elementary school book in use in England down to the time of George II. It was made up of a single leaf on which was written the alphabet in large and small letters; the Roman numerals, and the Lord's Prayer. The leaf was sometimes set in a frame and sometimes pasted against a piece of sliced transparent horn; hence the name. There was a handle through which a string was inserted whereby the book might be tied around the waist.

Horne, C. Silvester, English Congregational clergyman: b. Sussex 1865. He was educated at Glasgow University and Mansfield College, Oxford, and after leaving the latter institution was pastor of the Kensington Congregational Church until 1903, when he became pastor of the Whitefield Tabernacle in Tottenham Court Road, London. He has been active in many social and religious enterprises and is one of the most prominent men in his denomination in England. He has published 'History of the Free Churches.'

Horne, Richard Henry, or **Hengist,** English poet and essayist: b. London 1 Jan. 1803; d. Margate 13 March 1884. He was educated at Sandhurst, and entered the Mexican navy as midshipman, serving till the close of the Mexican war of independence. He then returned to London to begin a literary career. To his early period belong two tragedies, 'Cosmo de' Medici' (1837), and 'The Death of Marlowe' (1837), both of which contain fine passages. A poem sent to him for criticism by Elizabeth Barrett opened the way to a cordial friendship and a correspondence of seven years. In 1852 Horne removed to Australia, and remained there until 1866; his book, 'Australian Facts and Principles,' being one outcome of this residence. Again returning to England, he continued literary work until his death. His last publications were tragedies, including 'Judas Iscariot: A Miracle-Play' (1848), and a curious prose tract, 'Sithron the Star-Stricken' (1883), which he pretended to take from the Arabian. His best known work, however, is his epic poem 'Orion' which Poe said might be called "a homily against supineness and apathy in the cause of human progress, and in favor of energetic action for the good of the race."

Horned Dace, Rattlesnake, Screamer, Viper, etc. See DACE, RATTLESNAKE.

Horned Toad, lizards of the family *Iguanidæ,* popularly called toads from a certain general resemblance in form and manner to those animals. The body and head are broad, thick, and flattened, the tail short and the usual attitude a sort of squatting posture with the head elevated. About a dozen species of the genus *Phrynosoma* occur in the arid parts of the southwestern United States and in Mexico. The best known are *P. cornutum* and *P. coronatum,* which, because of the bizarre appearance, quaint ways and tolerance of captivity, are often brought back as souvenirs by visitors to those regions. The scales on the body bear prominent conical spines, and the long horns of the head are supported by bony cores. Their mottled brown and gray colors harmonize well with their natural surroundings. The horned toads love to bask in the sunshine in the hottest weather and to bury themselves in the burning sand. Never very active, they become extremely sluggish in cool or dull weather and hibernate in the winter. They feed on all kinds of insects, for which they search only during the hottest hours of the day, and drink copiously of water when sprinkled in the form of drops. Like many other lizards, but unlike most of the *Iguanidæ,* they are viviparous.

Horned Viper. See VIPER.

Hornellsville, hôr'nĕlz-vĭl, N. Y., city in Steuben County; on the Canisteo River, and on the Erie and the Central N. Y. & W. R.R.'s; about 57 miles south of Rochester and 46 miles northwest of Elmira. The first settlement was made in 1790, but it was a part of Canisteo and was called Upper Canisteo until 1820. The present name was given in honor of George Hornell, who had done much for the early development of the town. It was incorporated as a city in 1890. Hornellsville is situated in a fertile agricultural region, noted for fruit. Its chief manufactures are sash, doors, and blinds, railroad supplies, furniture, leather, carriages and wagons, silk, bricks, tiles, wire-fencings, gloves, and agricultural implements. It has a good public high school, St. Ann's Academy, St. James Mercy Hospital, and a number of fine

public and private buildings. The government is vested in a mayor, who holds office two years, and a city council. The subordinate officers are appointed by the mayor subject to confirmation by the council. Pop. (1900) 11,918.

Horner, William George, English algebraist: b. 1786; d. Bath, 22 Sept. 1837. He was educated at a private school near Bristol, and later taught there, becoming head master in 1806. In 1809 he established a school at Bath, which he conducted until the time of his death. His only work of importance was his discovery of a method of solving numerical equations of any degree, which he first announced in a paper read before the Royal Society in 1819, and afterward published in the 'Philosophical Transactions.' The method is still in use, and is known by Horner's name. See ALGEBRA, HISTORY OF THE ELEMENTS OF.

Hor'net. The true hornet is a European wasp (*Vespa crabro*); but in America the term is applied to almost any form of large stinging wasp, especially such as make papery nests. In some portions of the United States this is considered the only "hornet," but in the vicinity of New York the European hornet also occurs; and southward a somewhat smaller species (*V. carolina*) goes by this name.

Hornet, The, the name of two sloops-of-war in the American navy during the War of 1812. The chief was a ship-rigged 18-gun sloop, and did brilliant service. Through December and January 1812–13, under Master-Commandant James Lawrence, she blockaded the 20-gun English sloop Bonne Citoyenne in the harbor of Bahia, Brazil, till overmatched by a 74; Lawrence was surprised and himself had to take refuge in the harbor, but instead of being blockaded, slipped out the next night under the very guns of the man-of-war. After capturing a merchantman, on 24 February he fell in with the English sloop-of-war Peacock, Capt. William Peake, each at this time having 20 guns; they engaged at 5.25 P.M., and in eleven minutes the Peacock was a sinking wreck and surrendered. Her captors made every effort to keep her afloat, but in a few minutes she sank, carrying down 13 of her own crew and three of the Hornet's. Peake and four men were killed and three wounded; the Hornet had one killed and two wounded, besides two more hurt by an exploding cartridge. "A vessel moored for the purposes of experiment could not have been sunk sooner," said an English paper of the time; "it will not do for our vessels to fight theirs single-handed." On 22 Jan. 1815, under Capt. James Biddle, she encountered off Tristan d'Acumba, in the South Atlantic, the English brig Penguin, Capt. James Dickinson, with 19 guns of about the same metal as her own 20; in 22 minutes the Penguin surrendered, but on Biddle going forward, two British seamen shot him in the neck (not vitally), and were immediately shot down themselves. The Penguin lost her captain and 9 others killed, and 38 wounded; the Hornet, one killed and 11 wounded. The Penguin was shot to pieces, and could not be taken away, so she was scuttled; the Hornet was almost uninjured. On 28–9 April she had a long chase from the British ship of the line Cornwallis, the rear-admiral's flagship, and only escaped by thoroughly dismantling herself.

Horol'ogy. See CLOCK; CLOCK-WORK.

Hor'oscope. See ASTROLOGY.

Horrocks, hŏr'ŏks, Jeremiah, English astronomer: b. Toxteth, near Liverpool, about 1617; d. 3 Jan. 1641. He was educated at Cambridge and was appointed in 1639 to the curacy of Hoole, Lancashire, and in that village made his famous observation (24 Nov. 1639, O. S.) of the transit of Venus, the first on record. Newton, in the 'Principia,' bears honorable testimony to the value of Horrocks' astronomical work. The observation of the transit is by no means regarded as his sole astronomical achievement, as he added to our knowledge of the physical cause of celestial motions, deduced the solar parallax, corrected the solar diameter, and, made tidal observations. Hevelius printed the 'Venus in Sole Visa,' which was first published in Germany (1662); a translation of this work, with memoir by Whatton, appeared in 1859.

Horschelt, Theodor, German painter: b. Munich 1829; d. 1871. He began his early studies in the Munich Academy, and later became a pupil of Albrecht Adam. At first he painted horses, among which is 'The Poacher' (1850), and then turned to military scenes, painting 'The Seizure of Shamyl' and 'Cossacks Returning from a Razzia.'

Horse, in a general sense, a member of the ungulate family *Equidæ* (q.v.); but in ordinary use the word designates the single domestic species (*Equus caballus*), the wild original of which is unknown. It is not decided, in fact, whether a single species, or more than one, was the source, nor where the domestication of the horse was first effected. The evolution of the species, elsewhere sketched, took place in the American continent, and the writings of some of the earliest voyagers to the eastern coast of South America contain allusions which some commentators regard as evidence that horses survived and were known to the people who occupied the La Plata valley at that time, but this is open to doubt. It is probable that at the dawn of civilization the wild ancestors of our modern horses roamed in bands over the whole extent of grassy uplands stretching from northern Africa to eastern Manchuria, on the steppes of Russia, and wherever in Europe open country might be found; and it is also probable that they were among the first animals which men killed for food and afterward captured and tamed in order to keep a supply of food under control. This act must have been one of the earliest steps toward community life and civilization. The oldest paintings and carvings left by the ancient inhabitants of the valley of the Euphrates show that saddle-horses were familiar to them; and it is fair to suppose that the supremacy primitively gained by the people of central Asia over other parts of the world was largely due to their use of horses in war, giving them a great advantage over unmounted tribes; but it was not until much later — probably no earlier than 2000 B.C. — that the animal came into use in Arabia and Egypt, where before had been only camels and asses. So far as can be judged, these early Assyrian war-horses were rather small, robust, large-headed and shaggy beasts, much like Przewalsky's horse or the kiang (q.v.). A very similar animal was domesticated by the men of the Polished Stone Age in Europe, excellent portraits of which

were etched by neolithic artists upon pieces of bone, and have come down to us among the contents of graves opened by archæologists in France, Switzerland and elsewhere. Later, but still in the prehistoric period, Europe was repeatedly invaded by Asiatic hosts who brought with them eastern horses. These modified, if they did not supersede, the local stock. When Rome conquered the barbarous inhabitants of Europe its horses, which were of Asiatic stock, with perhaps some African mixture, largely superseded those of the conquered tribes, and from the mingling there sprang the big heavy breeds which characterized the Middle Ages, and were intended for strength and weight-carrying, rather than for nimbleness and speed. It was not until near the end of the 17th century that the introduction into France and England of certain sires of Arabian breed — a clean-limbed, small-headed, agile, hardy race, which arose in Arabia and Palestine about 2,000 years ago — began the improvement of British stock, which has reached its highest development in the modern European racehorse, hunter and hackney. From this stock was derived the American horses which have been perfected in at least one new direction — that of the trotter.

Horse, Care and Diseases of the. *Breeding.*—As *heredity* is the basis of all permanence in breeding, and *variation* the condition of advancement, we can, under intelligent selection, environment, and control, attain to a constant improvement. In selecting horses for breeding, certain leading principles must guide. These may be shortly stated as: (1) adaptability to the use of the breed; (2) quality, style; (3) strength, endurance; (4) good conformation; (5) good constitution; (6) good pedigree; (7) prepotency; (8) no violent crossing of equally prepotent animals; cross the desirable prepotent animal on a non-prepotent cross-bred animal; (9) a speedy amelioration of a large number is most certainly obtained through a prepotent stallion, which leaves a large number of his offspring every year; (10) sound, vigorous health; the prepotent parent must be at his best, and no non-prepotent one should be bred to him, none that is old, feeble, or reduced by disease, overwork, underfeeding, etc; the lack of prepotency will not prevent the transmission of the systemic weakness to the offspring; (11) secure an environment calculated to enhance the qualities we seek in the progeny. Systematic exercise that is not exhausting, generous tissue forming, but not fat forming regimen, and pure, dry, genial but bracing air are especially important.

Contagion Through Sexual Congress.—Many maladies may be transmitted during coition, but some are especially liable to be so. Dourine, glanders, genital eczema, contagious acne, horse-pox, mange, and contagious abortion are to be specially guarded against. Some, like strangles, influenza, and contagious pneumonia, may be transmitted by an animal that has already passed through the disease and acquired immunity. Special care, therefore, or even veterinary supervision of horses devoted to breeding is a desideratum.

Care of the Pregnant Mare.—Exercise is a valuable provision too often neglected. Free range on breeding ranches, or, for valuable mares, separate paddocks, secure this, while working mares are better to continue the work, provided it is not unduly straining nor jarring, nor productive of excessive fatigue, exhaustion, or debility. This maintains appetite, digestion, assimilation, muscular tone, and vigor, favors the development of a stronger, better foal, and keeps the dam fitter for foaling and nursing. Feed well, avoiding what is hard of digestion, or liable to cause impaction, indigestion, fermentation, or, above all else, diarrhœa. On good pasture grain may be omitted, unless in the last month of gestation, or if the mare is visibly running down. Good, clear, sound oats or barley, or bran mash with some boiled flaxseed may be given, and heating agents like maize, buckwheat, or wheat avoided. During gestation violent purgatives and active diuretics are liable to bring on abortion.

Care of the Foal.—To avoid danger to both mare and foal in parturition, provide a roomy box-stall with door opening outward, or a paddock. The foal born indoors is always in danger of infection through the raw surface of the navel. The common or box-stall swarming with microbes is more to be dreaded than exposure to storms outside. When severe weather forbids foaling outdoors, the box should be thoroughly cleansed, disinfected, and whitewashed to obviate this danger. Navel infection may cause simple inflammation, swelling, and abscess, or the germ may propagate itself through the inactive umbilical vein to the liver, causing infective hepatitis with abscesses or necrosis; or, reaching the bowels, it causes infective diarrhœa (white scour); or it may colonize the joints, as infective arthritis (joint ill); or again it may cause pneumonia, or multiple abscesses in different organs. The gravity of the resulting disease varies with the infection, and a deadly germ, located in a stable, is liable to attack all foals that come later in the season. Both stable and navel should be disinfected. The foal should be delivered on clean straw, which may be sprinkled with carbolic acid. The navel-string may be severed with an emasculator previously cleaned and boiled, or tied with a carbolized new cord painted with tincture of iodine, and, when dry, dusted with tannic acid impregnated with iodine and carbolic acid.

The new-born foal may have the back (flexor) tendons contracted so as to stand over at the knee and fetlock, and in the worst cases the extensor pedis tendon, the opponent of these, is found to be divided across and the muscle wasted and degenerated. A succession of such cases in the same stable suggests infection. Slight cases will recover under splints and bandages, while for more severe ones an aseptic surgical operation may be required. The foal should have the first milk (*colostrum*) to clear away tenacious bowel contents and prepare for healthy function. A mild laxative of raw linseed or olive oil may be requisite in the absence of colostrum. In the absence of the dam's milk the foal may be raised on cow's milk reduced by adding one third boiled water and sugar to sweeten. After two or three weeks the undiluted cow's milk may be allowed. The cow should be free from tuberculosis.

For the pure bred racer or trotter the foal should have half a pint of oats daily at a month old, to be increased with his growth. Even draft breeds are benefited by such early grain-feeding.

Exercise is essential to the growing foal. The quality of bone, muscle, brain, and other parts depends largely on physiological use, and rich blood, active digestion, and assimilation, vigorous health, strength and endurance are incompatible with confinement and inactivity. This may at first be secured by freedom to play in pasture, or by careful handling and training by a judicious manager. But to put the two-year-old into a severely contested race, or full training, or to devote the draft colt to regular work, is but to invite disaster. The bones are as yet too soft, they contain too much organic matter and too little mineral, the muscles lack firmness and power of endurance, the whole system is immature and imperfect, and over-taxing exhausts or deranges the functions, and direct injury or impaired development is the natural result.

CARE OF THE FEET.

Overgrown Hoofs.—With unlimited exercise on firm ground, the unshod foot is sufficiently worn down, but when confined for months indoors or in a limited straw yard overgrowth occurs, especially at the toe, and a dangerously increased strain is thrown on the joints, ligaments, and back tendons. Distorted and twisted feet, bruises of the sole by the ingrowing heels and quarters, ringbones, ossified cartilages, sprains of the flexor tendons, and diseases of the fetlock, pastern, and coffin joints are common, and irreparable results. The feet exposed to this should be frequently pared and adjusted. Remove excess of toe, reduce and balance the inner and outer sides of the wall, file or cut to the level the incurving heels and quarters, and round off the sharp outer edge of the hoof. Dry, imprisoned plates of horn pressing up on the sole must be set free and removed. But do not file the surface of the hoof-wall. This removes nature's protective covering and exposes open horn tubes to exhale moisture, and conduces to dryness, brittleness, shrinking, compression, and inflammation of the sensitive parts, atrophy, and lameness.

Defective Growth of Hoof.—Imperfect growth of hoof may arise from shoeing, pinching, filing, paring, etc., to excess, but also from compulsory idleness. The circulation inside the hoof is greatly accelerated by the ascent and descent of the foot within the horny box in action, and a free blood supply in a healthy tissue favors growth. Life at pasture on firm ground tends to abundant, strong, tough, durable hoof, while close confinement in a stall makes for a thin, friable, brittle, and shrunken horny covering. Constant soaking in water softens the hoof, reducing its tenacity, and tending to flattening of both wall and sole. The Belgian and other horses bred on wet, swampy ground generally show large, flat, pliant, and most undesirable hoofs. Such feet are especially liable to thrush, canker, corns, bruises, grease, and laminitis. Feet habitually resting on piles of reeking manure in stalls, sheds, or yards suffer the additional injury of softening and disintegration from the ammonia gas, and attacks by the swarming putrefying microbes which abound in such material.

Good hoofs, beside use and care, depend on generous living. The fuller growth on the spring and summer grass, forming a permanent ring, illustrates this. Daily washing of the hoof is important, and a subsequent smearing with an ointment of tar and vaseline or oil is useful in preserving the natural moisture and preventing the attacks of microbes.

Shoeing.—For good feet, shoes may be dispensed with on soft ground or mud roads, but they become necessary on hard roads and for hard-worked animals. Tips, extending back to the broadest part of the foot only, are the least objectionable. Full sized shoes are too often made to pinch, distort, bruise, or injure the foot beyond repair; and a poor foot is as injurious to a horse as an unstable foundation to a building. The first consideration is the preparation of the foot, giving due balance to heel and toe, inner side and outer, sole and wall, heel and bars. While removing all overgrown wall and bars, and all sole-plates that have become detached from the tough living horn beneath and now act as foreign bodies, the tough horn itself should not be exposed, nor removed except as a thin margin around the outer edge, where it is smoothed to the same level as the wall, to which it acts as a support, and the bearing surface of which for the shoe it slightly extends. The outer surface of the wall must be spared abrasion by the file, with consequent drying and contracting as already noticed. Shoes should be removed and reset every four weeks at the utmost, to avoid pinching, setting in, bruising, and other injuries. Intelligent shoeing, conserving the feet, goes far to obviate diseases of the feet, the most common and harmful of equine diseases. Among these may be specially named corns, bruises, pricks, quittors, sandcracks, thrush, canker, sidebones, laminitis, navicular disease, contracted hoof, cleft hoof, wry hoof, crooked hoof, loose wall, hollow wall and graveling. As the integrity and easy normal function of the foot is further one of the best means of protection against distortions and diseases of the various joints of the limb, it follows that the preservation of sound feet by good shoeing and intelligent care is one of the greatest desiderata in horse management.

FEEDING AND DIGESTIVE DISORDERS.

The natural food of the horse is *grass* and though charged with excess of water, and at first liable to scour, and always to cause flaccid muscles and lack of energy and endurance, yet a run at pasture, with pure air, normal, easy exercise, and stimulation of stomach, liver, bowels, metabolism, and excretion will often improve or arrest infirmities of digestion, assimilation, elimination and even innervation. Heaves (broken wind), chronic bronchitis, various forms of nasal discharges, indigestion, torpid liver, gall stones, and kidney affections are examples of maladies which improve at pasture. Dried grass in the form of hay is the standard food of the domesticated horse. This is best from natural pastures with a mixture of grasses, to be followed by blue grass, timothy, ryegrass, and clover, the latter being the most dangerous as a horse fed. Upland hay is more aromatic and choice than that from low, damp or irrigated meadows, and the first crop is always the best. New hay will sometimes disagree, while the old, though lacking aroma and less palatable, is less likely to cause digestive disorder. At a year old and over it is brittle, dried, more fibrous and less nutritive. Daily

cured hay is always innutritious, and often directly poisonous, when altered by bacterial ferments, molds and their products. The results are shown in heaves, gastric disorders, liver troubles, brain affections (staggers), kidney and skin diseases. Second crop hay, clover and alfalfa hay are especially dangerous in this sense, the excess of protcids in the last two, and especially of foliage, delaying curing and favoring the multiplication of ferments. Oats are the standard grain feed for horses. But like hay they must be well matured on good soil, and well cured. Mustiness brings essentially the same evils as in hay, and newly harvested they are liable to disagree. Kiln-dried oats are to be avoided, also those that have sprouted. The composition of oats and hay shows the excess of proteids, carbohydrates and fats in the first.

	Water	Proteids	Carbohydrates	Fats	Cellulose	Salts
Meadow hay	14.59	10.11	40.90	2.34	25.52	6.54
Oats	14.3	12.0	60.9	6.0	10.3	3.0
Maize	10.6	10.3	70.4	5.0	2.2	1.5

Maize is notorious for the deficiency of proteids relatively to the carbohydrates and fat. With a great excess of heat and energy producing constituents and a deficiency of earthy salts it is less calculated to foster growth and development, and predisposes rather to fat. It tends more to impactions of the bowels and indigestion, with resulting skin eruptions, and above all to the destructive recurrent inflammation of the eyes, which ruins so many young horses. Yet it is fed over large areas as the exclusive grain feed, and such is the adaptability of the living system that the minimum evil results. To obviate the evils it can be fed with cooling, laxative agents as wheat bran, carrots, or turnips, or an ounce of Glauber salts may be given daily.

Barley, rye and wheat have been successfully fed to horses but are not equal to oats in supporting the animal and fitting for hard work.

Beans, peas and other leguminous seeds are fed when a horse is subjected to an extraordinary strain of work or endurance, being especially valuable for the excess of proteids they contain. They should be thoroughly matured and dried as the fully formed and partially ripened seeds of several species contain a narcotic poison.

The relative amount of hay and oats for a horse of 1,000 pounds live weight may be stated as follows: *Cavalry horse:* Oats 12 pounds, hay 14 pounds. *Carriage horse:* Oats 10 pounds, hay 12 pounds. *Draft horse:* Oats 15 pounds, hay 12 pounds. The horse at rest can live on a mere maintenance ration sufficient to keep up bodily temperature and repair waste. A horse in active work will need about one half more. For very severe or rapid work about one third more must be added. For hard work a broad ration-proteids 1, to carbonaceous matter 6, is preferable to a narrow ration-proteids 1, to carbonaceous matter 3. An economical feed can often be made of a number of agents compounded from their known chemical composition, to form such a balanced ration, but mere chemical ingredients are not final, as palatability and adaptability have still to be reckoned with and a given weight of oats is of more value than an equal amount of similar nutritive elements in wheat or barley.

Good judgment and regularity in feeding and watering are essential to success with any feed. Feeding in irregular amounts at varying intervals, and with uncertain watering will undo the good effects of a generous ration. The small stomach (16 quarts) cannot admit a large feed of oats and saliva without suffering, and, if overdistended, it becomes paretic or torpid, and dangerous fermentation and gaseous distension may ensue. Again, if feeding is delayed the hungry craving and nervous excitement cannot be undone by a generous feed later. Then again, if the perspiring and exhausted animal is allowed to slake his thirst with a bucket of ice-cold water, he may have heart failure, or colic, or gastric congestion with sympathetic skin eruption or laminitis, or inflammation may attack any organ that has been previously weakened.

An excellent appetizing food is molasses. This has been largely neglected because of the mistaken idea that it contained heat producing elements only. But corn carbohydrates furnish energy to the acting muscles and other tissues as fuel does to an engine, and sugar, having no need of digestion, can supply force with less loss than can starch or fat. Not the least of its good qualities is the relish with which it is taken and that it imparts to other less attractive food taken with it. For the horse, otherwise healthy, but debilitated by poor or faulty feeding or overwork, molasses is to be depended on to restore weight and energy alike. For this purpose it may be given in the amount of two pounds per day, and even in double that amount if subjected to severe work.

Overdistension of the Stomach.—Sudden inflation of the stomach with gas, the product of fermentation in unwholesome contents (frosted grass, roots, apples, green potatoes, overripe ryegrass, millet, vetch, etc., irritant plants); from overfeeding (at the cornbin, in ripe grain, etc.), from violent exertion on a full stomach, or from a full feed when debilitated from starvation, disease, or overwork, is liable to cause death in two hours or a little more. The horse can rarely vomit, or belch gas, the stomach does not absorb, and the outlet by the bowels is one hundred feet long, so that the organ is usually ruptured with fatal results. Among the other less rapid disorders are catarrhal inflammation of the stomach, intestinal colic, congestion, inflammation, impaction, twisting, invagination, calculi and worms. Of poisons may be named: lead through water, etc.; molds, fungi, and bacteria in food (causing gastric, intestinal, hepatic, pulmonary, nervous, cutaneous or kidney diseases); ergot, smut (causing gastric disorder, ulcers of the mouth, abortions, etc.); lupines, Senecio Jacobœa (causing cirrhosis of liver); astragalus, oxytropis (loco, brain disease); equisetum (gastric and intestinal catarrh); to

which may be added cicuta, conium, œnanthe, aconite, rhus, ranunculus, larkspur, anemone, digitalis, wild cherry, wild onion, camas, helenium, hyacinth, clematis, thorn apple, colchicum, belladonna, hyoscyamus, bitter sweet, euphorbium, hellebore, wild parsnip, laurel, oleander, etc.

Liver Diseases.—These are notoriously prevalent in hot, damp regions in horses kept in close stables on rich, abundant feeding, in such as have dry feeding and scarcity of water in winter, and in such as have a poorly balanced ration with excess either of proteids or of heating carbohydrates. In damp tropical regions special care is needed as to the site, exposure, ventilation and purity of stables, the dietary, exercise and grooming to obviate liver complaints. Transient fevers, nervous digestion, skin and kidney disorders often originate from troubles in the liver.

Grooming is most important in the finer breeds of horses in clearing off oil and dandruff, rendering the skin pliant, and favoring secretion, exhalation, cooling and elimination. On the contrary, animals at pasture and exposed to cold and wet find a measure of protection in the sebaceous and thick hairy covering. When, however, drenched with perspiration or rain, and in a warm air, the relaxing effect on the skin and general system is very debilitating, hence clipping may become a necessity to be followed by special precautions against cold. The active friction (massage) of grooming renders circulation active, especially that of the lymph, relieving fatigue, favoring elimination and improving the tone of the muscles and general system. The heels need particular care. Clipped heels are irritated by the stubby hair in the folds back of the pastern often precipitating chaps and grease which would have been escaped in the unclipped. The heel is normally protected by the abundance of sebaceous secretion, but when this is rubbed off by dust, clay, sand, etc., the part suffers readily from cold, wet, dried gritty mud or other irritants. Washing the heels, above all with caustic soap, and leaving them to dry in cold air or draft is hurtful. Prompt drying of the heels will obviate the danger, and, if there is already any swelling, gentle massage with a little vaseline will improve the condition. In obstinate cases the source of the trouble may be sought in disorder of digestion, liver or kidney.

Many disorders of the nervous system, lungs, skin, eye and kidneys are due to constitutional troubles which cannot be dealt with here in general terms. Such diseases are usually manifested by elevated body temperature and accelerated or modified breathing or pulse. The temperature of the healthy, mature horse, at rest in a cool or moderate environment, is 99° to 100° F., respirations 10 to 12 per minute, and pulse 35 to 45.

Contagious Diseases.— These agree in one fundamental feature that each is due to a microbe, which passes more or less directly from the affected animal to the sound one, thus propagating the disease. The arrest of the epizootic and even its complete and final extinction, is merely a question of preventing such transmission and of destroying every infecting germ. This truth is not yet duly appreciated by stock-owners, legislators nor sanitary officers, but when it is fully realized we shall be near the total extinction of most animal plagues to the unspeakable profit of humanity. The *Contagious diseases* may be divided into two classes: (1) Those in which the infection is either confined to solipeds, or mainly propagated by the equidæ, so that its extinction in these would mean the final extinction of the disease, and (2) those which are propagated in other genera as well, so that the extinction of the germ in other species also would be essential to its complete eradication.

To the first class belong strangles (distemper), contagious pneumonia, equine influenza, glanders, tetanus, vesicular exanthema, contagious acne, petechial fever, gastro-enteritis of the new born, South African horse sickness, dourine, surra, Nagana, Mal de Caderas, infectious paraplegia. The first four of these affections are constantly spread in the United States through sales, public stables, stockyards, railroad cars, ships, and sale-stables, and no radical measure is taken to destroy the germs in such infected places, or to prevent the infection of all solipedes that pass through them.

In the second class must be included: Horse-pox, contagious abortion, thrush of the mouth, infectious ophthalmia, tuberculosis, rabies, malignant œdema, anthrax and emphysematous anthrax. The first six of these are propagated more by other genera than the horse, so that the burden of the work for their extinction would have to be expended on these other classes. The last three are caused by germs which can live out of the animal body in the soil, and their extinction would involve the drainage and sanitation of the infected soils as well.

Parasitic Diseases.—A number of parasites that prey upon solipeds can live indiscriminately in other animals as well. Among these may be named the *Tricophyton* of ringworm; *Aspergillus* of pneumomycosis; *Actinomyces:* different species of wood ticks; *Dermanyssus* of poultry acariasis; *Trombidium Americanum* (and *T. Holosericium*); *Linguatula Denticulata; Eustrongylus Gigas; Filoria Medinensis; Distoma Hepaticum* and *D. Lanceolatum.* By reason of their variety of hosts these would be less easily got rid of. But another list includes the obligato parasites which must live in the soliped at some stage or perish. These accordingly can be extinguished on the same principle as can the microbes of exclusively equine plagues. They include the larvæ of four species of botfly (*Œstrus Equi, Œ. Hæmorrhoidalio, Œ. Pecorum* and *Œ. Nasalis*); three lice (*Hæmatopinus Macrocephalus, Trichodectes Pilosus,* and *Tr. Pubescens*); four mange acari (*Sarcoptes Scabei V. Equi, Psoroptes Communis V. Equi, Symbiotes Communis V. Equi,* and *Demodox Folliculorum V. Equi;* three tapeworms (*Tœmia Perfoliata, T. Mamillana,* and *T. Plicata*); two stomach worms (*Spiroptera Microstoma* and *Sp. Megastoma*); five intestinal worms (*Ascaris Megalocephala, Oxquris Curvala* and *O. Mastigodes, Sclerostoma Equinum* and *Sc. Tetracanthum*); one of the serous cavities (*Filaria Papellosa*); one of the lungs (*Strongylus Arnfieldi*); and four of the blood (*Filaria Hæmorrhagica, F. Irritans, F. Sanguinis Equi,* and *F. Reticulata*). For the obligato parasites their extinction on the victim, and his removal from the source of a fresh supply means a final extinction of the parasite,

as the worm cannot be perpetuated without its host. In the case of worms, which survive as eggs and embryos in damp earth and water, the exclusion of solipeds for a year or two from infested stables and fields, from waters (ponds, lakes, wells, streams) that receive drainage from infested places, and from food derived from such verminous localities, entails the inevitable destruction of these parasites in such habitat outside the body. An essential condition of complete success is that the infested animals must be themselves cleared of the worms, to prevent their colonizing new places with the parasite, and, in the case of such as are entertained in the blood, or serous cavities or in cysts in the tissues, this takes time to allow of their migrating into the bowels or reaching their limit of life and perishing. The mere use of anthelmintics or vermifuges alone is no radical treatment for these parasites. A veterinary sanitation which is far reaching enough to do away for all time with the class of contagious and parasitic epizootics, is the only one worthy of twentieth century knowledge, or which will fulfill the duties of the age.

James Law,
Director New York State Veterinary College, Cornell University.

Horse, Evolution of the. As a domestic animal the horse is to be found almost everywhere that man can live. He is spread all over the world — from torrid to arctic climates, in all the continents, in remote oceanic islands — he is completely cosmopolitan. But as a wild animal the horse is limited to the Old World, and is found there only in the open arid or desert plains of Central Asia and Africa. There are two species in Asia, the Asiatic wild ass (*Equus hemionus*), and the little known Przewalsky's horse (*E. przewalskii*), while in Africa there are the African wild ass (*E. asinus*) and the several species of zebra (*E. zebra, E. burchelli, E. quagga*). In the Americas and Australia there are no true wild horses, the mustangs and broncos of the Western plains and South America being feral (domesticated animals run wild) and descended from the horses brought over from Europe by the early white settlers. When the Spaniards first explored the New World they found no horses on either continent. The Indians were quite unfamiliar with them and at first regarded the strange animal which the newcomers rode with wonder and terror, like that of the ancient Romans when Pyrrhus and his Greeks brought elephants to fight against them.

The horse is distinguished from all other animals now living by the fact that he has but one toe on each foot. Comparison with other animals shows that thi toe is the third or middle digit of the foot. The hoof corresponds to the nail of a man or the claw of a dog or cat, and is broadened out to afford a firm, strong support on which the whole weight of the animal rests. Behind the "cannon-bone" of the foot are two slender little bones, one on each side, called *splint-bones*. These represent the second and fourth digits of other animals, but they do not show on the surface, and there is nothing like a separate toe. So that the horse may be said to be an animal that walks on its middle finger-nail, all the other fingers having disappeared.

The teeth of the horse are almost equally peculiar. The molars are long, square prisms which grow up from the gums as fast as they wear off on the crowns. Their grinding surface exhibits a peculiar and complicated pattern of edges of hard enamel between which are softer spaces composed of dentine and of a material called "cement," much like the dentine in quality but formed in a different way. The dentine is formed on the inside surfaces of the enamel while the tooth is still within the jaw-bone; the cement is deposited on the outside surfaces of the enamel after the tooth has broken through the jaw-bone and before it appears above the gums.

Various other peculiarities distinguish the horse from most other animals; some of these are shared by other hoofed animals. The two long bones of the fore-arm (*radius* and *ulna*) are separate in the greater number of animals, but in the horse, and in many other hoofed animals, they are consolidated into a single bone. The same consolidation is seen in the bones of the lower leg (*tibia* and *fibula*). The lengthening of the foot and stepping on the end of the toe raises the heel in the horse, as in many other animals, to a considerable height above the ground, where it forms the hock joint, bending backward, as the knee bends forward. In these as in various other ways the legs of the horse are especially fitted for swift running over hard and level ground, just as its teeth are for grinding the wiry grasses which grow on the open plain.

The zebra and the ass have the same peculiar structure of teeth and feet as the domestic horse, and differ only in the color of the skin, proportions of various parts of the body, etc.

Fossil Horses of the Age of Man.— In the early part of the Age of Man, or Quaternary Period, wild species of horse were to be found on every continent except Australia. Remains of these true native horses have been found buried in strata of this age in all parts of the United States, in Alaska, in Mexico, in Ecuador, Brazil and Argentina, as well as in Europe, Asia and Africa. All these horses were much like the living species, and most of them are included in the genus *Equus*. A complete skeleton of one of them (*Equus scotti*) was found by the American Museum expedition of 1899 in northern Texas. The difference between it and the domestic horse is chiefly in proportions, the skull shorter with deeper jaws, the legs rather short and feet small in proportion to the body. In these characters this fossil horse resembles an overgrown zebra rather than a domestic horse. We know nothing of its coloring. It may have been striped, and in this case would have been very zebra-like; but there are some reasons for believing that it was not prominently striped. The bones are petrified, brittle and heavy, the animal matter of the bone having entirely disappeared and having been partly replaced by mineral matter. They are not much changed in color, however, and are so perfectly preserved that they look almost like recent bone.

All the remains of these native horses which have been found in America have been petrified more or less completely; this means that they have been buried for many thousands of years, for petrifaction is an exceedingly slow process.

It serves as an easy method of distinguishing them from bones of the domestic horse, found buried in the earth. These cannot in any case have been buried for more than four or five centuries, and have not had time to petrify. Remains of these fossil horses are found in various parts of the United States, chiefly on the Niobrara River in Nebraska, and in central Oregon. Many separate teeth and bones have been found in the phosphate mines near Charleston, S. C.; other specimens have come from central Florida, from southern Texas, Arizona, Kansas, Louisiana and even from Alaska. They are, in fact, so often found in deposits of rivers and lakes of the latest geological epoch (the Pleistocene) that the formation in the western United States has received the name of Equus Beds.

In South America, in strata of the Pleistocene Epoch, there occurs, besides several extinct species of the genus *Equus,* the *Hippidium,* a peculiar kind of horse characterized by very short legs and feet, and some peculiarities about the muzzle and the grinding teetch. The legs were hardly as long as those of a cow, while the head was as large as that of a racehorse or other small breed of the domestic horse. All these horses became extinct, both in North and South America. It may have been that they were unable to stand the cold of the winters, probably longer continued and much more severe during the Ice Age than now. It is very probable that man — the early tribes of prehistoric hunters — played a large part in extinguishing the race. The competition with the bison and the antelope, which had recently migrated to America — may have made it more difficult than formerly for the American horse to get a living. Or, finally, some unknown disease or prolonged season of drought may have exterminated the race.

In Central Asia, two wild races persist to the present day; others were domesticated by man in the earliest times, and their use in Chaldæa and Egypt for draught and riding is depicted in the ancient mural paintings. In Africa the larger species became extinct in prehistoric times, as in America, but the smaller zebras still survive in the southern part of the continent (one species, the quagga, abundant 50 years ago, is now probably extinct), and the African wild ass is found in the fauna of the northern part. The wild horse of prehistoric Europe, a small race, short-legged and shaggy-haired, was domesticated by man, a fact that is known from the rude drawings scratched on bone or ivory by men of the Neolithic or Polished Stone Age. But the domestic horse now in use is derived chiefly from the Asiatic race, although it is probable that in some breeds there is a considerable strain of this shaggy, short-legged European race, and it is possible also that African races may have been domesticated and to some extent mixed with the Asiatic species. The domesticated ass is a descendant of the African species.

The Evolution of the Horse.— The history of the evolution of the horse through the Tertiary Period or Age of Mammals affords the best known illustration in existence of the doctrine of evolution by means of natural selection and the adaptation of a race of animals to its environment. The ancestry of this family has been traced back to nearly the beginning of the Tertiary without a single important break. During this long period of time, estimated at nearly 3,000,000 of years, these animals passed through important changes in all parts of the body, but especially in the teeth and feet, adapting them more and more perfectly to their particular environment, namely the open plains of a great plateau region with their scanty stunted herbage, which is the natural habitat of the horse. In the series of ancestors of the horse we can trace every step in the evolution of those marked peculiarities of teeth and feet which distinguish the modern horse from an ancestor which so little suggests a horse that, when its remains were first found 40 years ago, the animal was named by the great palæontologist Richard Owen, the *Hyracotherium* or "Coney-like Beast." Its relation to the horse was not at that time suspected by Prof. Owen, and was recognized by scientific men only when several of the intermediate stages between it and its modern descendant had been discovered. On the other hand, this first ancestor of the horse line is very difficult to distinguish from the contemporary ancestors of tapirs and rhinoceroses, and indicates how all the modern quadrupeds have diverged from a single type, each becoming adapted to the needs of its especial mode of life.

The earliest known ancestors of the horse were small animals not larger than the domestic cat, with four complete toes on each forefoot and three on each hindfoot. There is reason to believe that the still more ancient ancestors of this and all other mammals had five toes on each foot. In the forefoot of the earliest known stage we find a splint-bone or small, slender rudiment representing the missing first digit or thumb, which no longer appears on the surface of the foot, while in the hindfoot there is a similar rudiment representing the outer or fifth digit, but no trace is left of the innermost or first digit. The proportions of the skull, the short neck and arched back and the limbs of moderate length, were very little horse-like; recalling, on the contrary, some modern carnivorous animals, especially the civets (*Viverridæ*). The teeth were short-crowned and covered with low rounded knobs of enamel, suggesting those of monkeys and of pigs or other omnivorous animals, but not at all like the long-crowned complicated grinders of the horse.

Commencing with the *Hyracotherium,* 12 stages have been recognized from as many successive formations, showing the gradual evolution of the race into its modern form, and each stage is characteristic of its particular geological horizon. Some of the stages have been found in several parts of the world, but by far the most complete and best known series comes from the Tertiary Bad Lands of the Western States. Besides the main line of descent which led into the modern horses, asses and zebras, there were several collateral branches which have left no descendants. Of some stages all parts of the skeleton have been found, of others, only the jaws, or jaws and feet, are known. We can mention only the more important stages.

1. The *Hyracotherium* is the most primitive stage known, but only the skull has been found, so that it has not been determined exactly what the feet were like. The teeth display six rounded knobs or cusps on the upper molars and four on the lower ones, and these are just be-

THE EVOLUTION OF THE HORSE.

		Formations in Western United States and Characteristic Type of Horse in Each	Fore Foot	Hind Foot	Teeth
Quaternary or Age of Man	Recent, Pleistocene	SHERIDAN; BLANCO	 One Toe — Splints of 2nd and 4th digits	 One Toe — Splints of 2nd and 4th digits	 Long-Crowned, Cement-covered
Tertiary or Age of Mammals	Pliocene, Miocene	LOUP FORK	 Three Toes — Side toes not touching the ground	 Three Toes — Side toes not touching the ground	 Long-Crowned, Cement-covered
	Oligocene	JOHN DAY; WHITE RIVER	 Three Toes — Side toes touching the ground; splint of 5th digit	 Three Toes — Side toes touching the ground	 Short-Crowned, without Cement
	Eocene	UINTA; BRIDGER; WIND RIVER; WASATCH	 Four Toes		
			 Four Toes — Splint of 1st digit	 Three Toes — Splint of 5th digit	
Age of Reptiles	Cretaceous, Jurassic, Triassic	PUERCO AND TORREJON			


Equus


Protohippus


Mesohippus


Protorohippus


Hyracotherium (Eohippus)

Hypothetical Ancestors with Five Toes on Each Foot and Teeth like those of Monkeys etc.

L. McGARIS S. F'CO.

ginning to show signs of fusing into cross-crests. The premolar teeth have only one main cusp, except the third and fourth premolars (next the molars) in each jaw, which have two and three, respectively. The only specimens which have been found were in the London Clay or Lower Eocene of England and are preserved in the British Museum.

2. The *Eohippus* is much better known. It comes from the Lower Eocene of Wyoming and New Mexico, and is very like the *Hyracotherium* except that the molar teeth have the cusps more clearly fusing into cross-crests, and the last premolar is beginning to look like one of the true molars. The forefoot of this animal has four complete toes and the splint of a fifth. The hindfoot has three complete toes and the splint of another.

3. *Protorohippus.* In these animals the splint of the first digit in the forefoot and the splint of the fifth digit of the hindfoot have disappeared, but there are still four complete toes in the fore- and three in the hindfoot. The crests on the molars are a little clearer and the last premolar has become almost like the molars, while the next to the last premolar is beginning to become so. A skeleton of *Protorohippus* shows an animal of the size of a small dog, and proportioned much like the breed known as the *whippet.* The *Protorohippus* was found by Dr. J. L. Wortman in 1880 in the Wind River Bad Lands of Wyoming, and was described by Prof. Cope and others under the name of the "Four-Toed Horse."

4. Of *Orohippus* we have only parts of jaws and teeth. A specimen of the forefoot is exhibited in the Museum of Yale University.

5. *Epihippus* (*Upper Eocene*).—Of this stage of the evolution of the horse only incomplete specimens have been found. The molar teeth have the once round cusps almost completely converted into crescents and crests, while another tooth of the premolar series has become like the molars. The toes are still four in the forefoot and three in the hindfoot, but the central toe in each foot is becoming much larger than the side toes. (This species happens to be somewhat smaller than those found in the Middle Eocene stage, but no doubt there were others of larger size living at the same time). *Palæotherium* and *Paloplotherium* of the Upper Eocene of Europe form a side branch. They were very abundant in Europe, but have not been found in the New World. On each foot they had three toes of nearly equal size, and the teeth show a rather peculiar pattern. One of these animals was thought by Prof. Huxley to be a direct ancestor of the horse, but it now is considered to be merely a collateral relative. Some species of *Palæotherium* were of large size, equal to a tapir. They were first described in the year 1804 by the celebrated Baron Cuvier from remains found in the gypsum quarries of Montmartre, Paris.

6. *Mesohippus. Oligocene* (*White River Formation*). In this stage there are three toes on each foot, a splint representing the fifth digit of the forefoot of the Eocene ancestors. The middle toe is now much larger than the side toes, which bear very little of the weight of the animal. Three of the premolars have now become entirely like the molar teeth, the crests on the crown are completely formed, and the outside crest in the upper molars has taken the shape of two crescents. In the Middle Oligocene is found *Mesohippus bairdi* about the size of a coyote, while in the Upper Oligocene occurs *Mesohippus intermedius* as large as a sheep. Of both these animals all parts of the skeleton are known.

7. *Anchitherium* (*Lower Miocene*).—This stage has been found both in Europe and in America. It is much like its predecessor, but is larger and has the crests of the teeth somewhat higher and more complete. It probably is not in the direct line of descent of the horses, but is on a side branch.

8. *Parohippus* and *Hypohippus* (*Middle Miocene*).—In *Parahippus* the tooth-crests are much higher, and the transverse ridges on the upper molars are beginning to change shape so as to become a second pair of crescents inside the outer pair. *Hypohippus* is off the direct line of descent; its teeth are like those of *Anchitherium,* by which name it has been generally called, but the animal was much larger, equaling a Shetland pony in size. A complete skeleton of the *Hypohippus* was found near Pawnee Buttes, Colorado, in 1901 by Barnum Brown, of the Whitney expedition. In the forefoot of *Hypohippus* small rudiments still remain representing the first and fifth digits, but there is no splint of the fifth, as in *Mesohippus.* The second and fourth digits still touch the ground, though lightly. The feet of *Parahippus* were much like those of *Hypohippus,* but the side toes were smaller.

9 and 10. *Protohippus* and *Pliohippus* (*Middle* and *Upper Miocene*).—In this stage the crowns of the upper molars have become much longer, the two pairs of crescents on the upper molars are complete, with two half-separated cusps within the inner pair. And the valleys between the crests have become filled with cement, so that with the wear of the teeth the edges of hard enamel are backed inside by dentine and outside by cement. In this way the surface of the tooth has a series of enamel ridges always projecting a little above the grinding surface, because the softer material on each side wears down into hollows, yet never breaking off, because they are braced so thoroughly on each side. This is a very efficient instrument for grinding hard grasses. In *Protohippus* and *Pliohippus,* especially in the former, the crowns of the teeth are by no means as long as in the modern horses; they must therefore wear more slowly or wear out at an earlier age. The feet in these two genera have but one toe touching the ground. The side toes (second and fourth digits) are complete, but much more slender than in the earlier stages, and are apparently useless, as they cannot reach the ground. In some species of *Pliohippus* they have almost disappeared. The forefoot of *Protohippus* still retains tiny nodules of bone at the back of the "wrist" (sometimes improperly called in the horse the "knee-joint"), which are the remains of the first and fifth digits.

11. *Hipparion* (*Pliocene*).—This genus, probably also a side branch of the genealogical tree of the horse family, is much like *Protohippus,* but larger and with more complication about the tooth pattern. It is common in the

European Pliocene beds and has been found in America also. The feet are still three-toed, the side toes as large as those of the older *Protohippus.*

12. *Equus* (*Pleistocene* and *Recent*).— In this stage, that of the modern horse, the side toes have entirely disappeared and are represented by splints on the fore- and hindfoot. No trace remains on the forefoot of the little nodules which in *Protohippus* represented the first and fifth digits. The crowns of the teeth are much longer than in the last stage, and of the two half-separated inner columns on the upper molars, one has disappeared, the other has increased in size and changed in form. The skull has lengthened and the animal is much larger.

13. *Hippidium* (*Pleistocene. South America*).— The feet are like those of *Equus,* except that they were short and stout. The teeth are like those of *Pliohippus,* from which it is supposed to be descended. The skull is large and long, with very long slender nasal bones. Casts of the skull and limbs presented by the Museo Nacional of Buenos Ayres, Argentine Republic, are exhibited here.

The Change in Feet and Teeth.— Along with the disappearance of the side toes in the evolution of the horse there is a considerable increase in the proportionate length of the limbs, and especially of the lower part of the leg and foot. The surfaces of the joints, at first more or less of the ball-and-socket kind, which allows free motion of the limbs in all directions, become keeled and grooved like a pulley-wheel, permitting free motion forward and backward, but limiting the motion in all other directions and increasing considerably the strength of the joint. By this means the foot is made more efficient for locomotion over a smooth regular surface, but less so for traveling over very rough ground, and it becomes of little use for striking or grasping or the varied purposes for which the feet of polydactyl animals are used.

The increased length in the lower leg and foot increases the length of the stride without decreasing its quickness. The heavy muscles of the leg are chiefly in the upper part, and to increase the length of the lower part changes the centre of gravity of the limb very little. Consequently the leg swings to and fro from the socket nearly as fast as before, since in an ordinary step the action of the leg is like that of a pendulum, and the speed of the swing is regulated by the distance of the centre of gravity from the point of attachment, as that of a pendulum is by the height of the bob. To increase the length of lower leg and foot therefore gives the animal greater speed; but it puts an increased strain on the ankles and toe-joints, and these must be strengthened correspondingly by converting them from ball-and-socket joints to "ginglymoid" or pulley joints. Additional strength, likewise at the expense of flexibility, is obtained by the consolidation of the two bones of the fore-arm (*ulna* and *radius*) and of the leg (*tibia* and *fibula*) into one, the shaft of the smaller bone practically disappearing, while its ends become fused solidly to its larger neighbor.

The increase in length of limb renders it necessary for the grazing animal that the head and neck should increase in length in order to enable the mouth to reach the ground. An example of these changes is the modern horse, in which we find the neck and head much elongated when compared with the little *Hyracotherium,* and this elongation has taken place *pari passu* with the elongation of the legs. The reduction and disappearance of the side toes and the concentration of the step on the single central toe serve likewise to increase the speed over smooth ground. The soft yielding surface of the polydactyl foot is able to accommodate itself to a rough irregular surface, but on smooth ground the yielding step entails a certain loss of speed. A somewhat similar case is seen in the pneumatic tire of a bicycle; a "soft" tire accommodates itself to a rough road and makes easier riding, but a "hard" tire is faster, especially on a smooth road. Similarly, the hard, firm step from the single toe allows of more speed over a smooth surface, although it compels the animal to pick its way slowly and with care on rough, irregular ground.

The change in the character of the teeth from "brachydont" or short-crowned to "hypsodont" or long-crowned enables the animal to subsist on the hard, comparatively innutritious grasses of the dry plains, which require much more thorough mastication before they can be of any use as food than do the softer green foods of the swamps and forests.

All these changes in the evolution of the horse are adaptations to a life in a region of the level, smooth and open grassy plains which are now its natural habitat. At first the race was better fitted for a forest life, but it has become more and more completely adapted to live and compete with its enemies or rivals under the conditions which prevail in the high dry plains of the interior of the great continents. The great increase in size, which has occurred in almost all races of animals whose evolution we can trace, is dependent on abundance of food. A large animal, as may be shown on ordinary principles of mechanics, requires more food in proportion to its size than does a small one, in order to keep up a proper amount of activity. On the other hand a large animal is better able than a small one to defend itself against its enemies and rivals. Consequently, as long as food is abundant, the larger animals have the advantage over their smaller brethren, and by the laws of natural selection the race tends to become continually larger until a limit is reached when sufficient food becomes difficult to obtain, the animal being compelled to devote nearly all its time to getting enough to eat.

Cause of the Evolution.— The evolution of the horse, adapting it to live on the dry plains, probably went hand in hand with the evolution of the plains themselves. At the commencement of the Age of Mammals the western part of the North American continent was by no means as high above sea-level as now. Great parts of it had but recently emerged, and the Gulf of Mexico still stretched far up the valley of the Mississippi. The climate at that time was probably very moist, warm and tropical, as is shown by the tropical forest trees, found fossil even as far as Greenland. Such a climate, with the low elevation of the land, would favor the growth of dense forests all over the country, and to such conditions of life the animals of the beginning of the Mammalian period must have been adapted. During the Tertiary the continent was steadily rising above the ocean-level, and at the

SKELETON FROM MIDDLE MIOCENE BEDS, NEAR PAWNEE BUTTE, COLORADO.

same time other influences were at work to make the climate continually colder and drier. The coming on of a cold, dry climate restricted and thinned the forests and caused the appearance and extension of open, grassy plains. The ancient forest inhabitants were forced either to retreat and disappear with the forests, or to adapt themselves to the new conditions of life. The ancestors of the horse, following the latter course, changed with the changing conditions, and the race became finally as we see it to-day, one of the most highly specialized of animals in its adaptation to its peculiar environment. At the end of the Age of Mammals the continents stood at a higher elevation than at present, and there was a broad land connection between Asia and North America, as well as those now existing. At this time the horse became cosmopolitan, and inhabited the plains of all the great continents, excepting Australia.

It is a question whether the direct ancestry of the modern horse is to be searched for in western America or in the little known interior plains of eastern Asia. It is also unknown why the various species which inhabited North and South America and Europe during the early part of the Age of Man should have become extinct, while those of Asia (horse and wild ass) and of Africa (wild ass and zebra) still survive. Man, since his appearance, has played an important part in the extermination of the larger animals; but there is nothing to show how far he is responsible for the disappearance of the native American species of horse.

Parallel Evolution in Other Races.—It is interesting to observe that while the evolution of the horse was progressing during the Tertiary Period in North America another group of hoofed animals, the *Litopterna*, now extinct, in South America evolved a race adapted to the broad plains of Argentina and Patagonia and singularly like the horse in many ways. These animals likewise lost the lateral toes one after another, and concentrated the step on the central toe; they also changed the form of the joint-surfaces from ball-and-socket to pulley-wheel joints; they also lengthened the limbs and the neck; and they also lengthened the teeth, and complicated their pattern. Unlike the true horse, they did not form cement on the tooth, so that it was by no means so efficient a grinder. This group of animals native to South America became totally extinct, and were succeeded by the horses, immigrants from North America, which in their turn became extinct before the appearance of civilized man.

Many of the contemporaries of the horse in the northern hemisphere were likewise lengthening the limbs, lightening and strengthening the feet, elongating the tooth-crowns to adapt themselves to the changing conditions around them, but none paralleled the horse evolution quite so closely as did the pseudo-horses of South America. But the camels in America, the deer, antelope, sheep and cattle in the Old World, progressed on much the same lines of evolution, although their adaptation was not to just the same conditions of life.

William D. Matthew,
American Museum of Natural History.

Horse, the French Coach. The prevailing characteristic of a Frenchman is his devotion to those things that make life pleasant. From an artistic standpoint he leads the world. Pleasure and horses go together. A Frenchman is instinctively a horseman. The French cavalry is without an equal in the world. Since the time of Napoleon the French government has taken charge of the breeding of horses that are best adapted for cavalry uses, and in accomplishing this purpose the government has contributed to the production of a very high-class coach horse. The cavalry horse of France is usually selected after the committee has finished their work of picking out the very best stallions for breeding purposes. Nearly every French coach stallion that stands for public service in France is owned by the French government. The French have been willing to advertise and sell their other breeds of horses, but they have been loath to part with their coach horses. The instinct of self-preservation causes the French government and the French people to keep their French coach horses at home in order to have better horses than can be found in any other country.

The breed of French coach horses has its origin from the same source as the English thoroughbred. On the one hand, the English thoroughbred surpasses in speed, while the French coach horse is superior in all of those qualities that go to make up a high-class carriage horse. Like the Percheron, the French coacher is developed in its highest state of perfection in Normandy, but he comes from the northern part, while the Perche is in the south of Normandy.

The French coach horse is about 16 hands high; his average weight is between 1,200 and 1,300 pounds. His color is as a rule bay, brown or chestnut. His outline is most pleasing. He is a fast trotter, and under the conditions of horse racing in France under saddle over a turf track a distance of 4,000 metres he holds the record. The French method of developing their trotters cultivates a very high, attractive style of action. Not only is the French coacher seen in every French city hauling the most gorgeous equipages over the boulevards surrounding Paris, but he is to be seen in the best stables throughout all of the capitals of Europe, especially in London.

The French coacher supplies the English royalty with their most useful and most attractive carriage horses.

For more than 20 years French coach stallions have been brought to America very sparingly. Where they have been crossed with the best road mares, trotting bred mares, the result has been most satisfactory. High-grade carriage horses that go into our best markets and sell for the highest prices usually have a strain of French coach blood flowing through their veins.

A perfect type of the French coach horse when standing or in action is impossible to describe in words. To fully realize his superiority, to appreciate and admire his style and magnificent high action, one must actually see him. Words are inadequate to describe him, and the most perfect picture falls far short of the most perfect horse.

John R. McLaughlin.

Horse, the Percheron. The Percheron horse is the production of the most patient care and the application of the best scientific principles of breeding. From the dawn of his-

tory the French breeders of draft horses have been most successful, and the horses they have raised have been renowned the world over.

In the 16th, 17th and 18th centuries the same rules of selection in breeding have been applied that prevail to-day. The good horses were permitted to reproduce themselves and multiply. The inferior and unsound ones were never permitted to breed. The result of this most careful selection, based on scientific principles, has given the French the best draft horse that the world produces.

In a very small portion of Normandy called the "Perche" the highest result has been attained. From this district the Percheron horse has been sent to all parts of the world with such satisfactory results that the word Percheron to-day means the ideal draft horse the world over. From the very beginning up until the present time the object of the Percheron breeders has been to produce the kind of horse that would move the greatest weight with the greatest speed.

In making their selections for breeding purposes the Frenchmen have not only picked out stallions and mares that would make the best horses, but comely appearance and pleasing outline have also in a measure been their guide, and as a result the Percheron horse to-day is not only the best draft horse in the world, but he is one of the most attractive. He is indeed a handsome horse. The prevailing color of the Percheron horse is from black to white, including all of the various gradations from black, dark gray, dapple gray, gray and white.

About 50 years ago the first Percheron stallions were imported from France to America, and those that became most famous came to Ohio. One, called Louis Napoleon, owned in Union County, Ohio, and afterwards sold to go to Normal, Ill., both here in Ohio and in his new home in Illinois, was admired by all. In a few years, when his colts began to appear, the reputation of the Percheron breed in America was so well established that hundreds and even thousands of them have been imported to America each year.

During the past hundred years the government in France has maintained a system of supervision over the horse-breeding industry. The government does not own every Percheron stallion, but every Percheron stallion must be approved by the government inspectors and must receive a certificate of approval before he can be used for breeding purposes in France. Many of the best stallions belong to the government. Many of those owned by private individuals receive a subsidy from the government if their owner will offer their services to the public.

On account of the very high tariff laws the French breeders supply nearly all of the horses used in France. The ups and downs of prosperity and depression do not affect the horse-breeding industry in that country. During the period of depression that prevailed in the United States ten years ago American breeders became very much discouraged. Most of the stallions were castrated and the best mares were disposed of, but in France these conditions did not prevail.

In '97, '98 and '99, when more prosperous conditions were brought about in this country, the demand for horses was very greatly increased. The French were able to supply the deficiency. Good stallions and mares could be found there in abundance when a surplus could not be found anywhere else in the world. Instinctively the French breeders keep their best stallions and mares, no matter what the foreign demand may be, and as long as they pursue this policy the best Percheron horses will be found in France and the best breed of draft horses in the world will be the Percheron.

JOHN R. MCLAUGHLIN.

Horse Bot-fly, a bot-fly (*Gastrophilus equi*) parasitic in horses. The adult is about .75 inch long; the wings transparent with dark spots forming an irregular band toward the centre; the body brown and very hairy, the head whitish in front, and the abdomen dark-spotted. The females (males are rarely seen) have an elongated tapering abdomen. The oblong light yellow eggs are glued, one by one, to the hairs of the forepart of the body, where they are likely to be licked off by the animal. The moisture of the tongue causes the developed larvæ to break through the shell almost instantly, and to be carried into the mouth and thence to the stomach. Many curious facts have been observed in connection with these eggs and their development, and may be found fully discussed by Osborn in his 'Insects Affecting Domestic Animals,' issued by the United States Department of Agriculture (1896). Reaching the stomach, the larvæ fasten themselves to its walls by hooks in the posterior end of the body, and great masses sometimes accumulate, seriously obstructing the pyloric outlet. They remain there, absorbing nourishment and interfering with digestion through the winter, and on the return of warm weather let go their hold, pass out through the intestines, enter the ground, pupate there for a few days, and then emerge as flies. This pest chiefly affects horses out at pasture, and can be prevented only by removing the eggs, which can easily be seen. The attempt to remove the bots from the stomach by turpentine or other drugs is a dangerous proceeding which should only be attempted under direction of a veterinarian.

Horse-chestnut, or **Buckeye,** a tree of the small family *Hippocastanaceæ* and genus *Æsculus*, represented in Europe by the horse-chestnut (*Æ. hippocastanum*), now cultivated in all parts of the world, but native to Greece, Turkey, and southwestern Asia; and three indigenous American species known as buckeyes, from the appearance of the fruit. These trees are shapely, have leaflets diverging from the stalk like fingers, and bear white or tinted flowers in large erect panicles, turning the whole tree into the semblance of a big bouquet. The fruit of the horse-chestnut much resembles a huge chestnut, and is prickly when young. In this respect the common or Ohio buckeye (*Æ. glabra*) agrees with it, but has only five leaflets in each leaf and its flowers are small and not showy. The unpleasant odor exhaled by the bark and leaves in all this genus is especially strong in this species. A more southern species, developed into fine trees in the southern Alleghanies, is the sweet or yellow buckeye (*Æ. octandra*) which with the red buckeye (*Æ. pavia*) bears smooth fruit. Though so hand-

some, rapid in growth and serviceable as ornamental or shade trees, they are otherwise of little value. The wood is light colored, soft, and useful mainly for paper pulp and small articles; it contains a large quantity of saponaceous material, so that country people use the mucilaginous sap as soap. The leaves and roots of the Ohio buckeye are poisonous. The seeds are bitter but are eaten by cattle and sheep, with the preparation of boiling in alkaline water which is necessary in Europe; and from them a flour is made especially adapted to bookbinders' and shoemakers' paste, as, besides having great tenacity, it will not be attacked by insects. In France starch is produced from horse-chestnut seeds on a large scale. The seeds are also used in the southern United States to impart a flavor of age to raw whiskey. The red buckeye has been naturalized in Europe as a park tree. California has a species of its own, Japan another, and a third grows on the Himalaya Mountains.

Horsefield, Thomas, American naturalist and explorer: b. Bethlehem, Pa., 12 May 1773; d. London, England, 1866. He was graduated in medicine at the University of Pennsylvania, and served as "medical apprentice" in the Pennsylvania Hospital from 1794–99, being the fifth interne in the hospital in the order of appointment. In October 1799 he accepted service as surgeon on the "China," about to sail for Java. He returned in the latter part of 1800, but in 1801 went again to Java for the purpose of thoroughly exploring the island, and was commissioned as regimental surgeon by the Dutch Colonial Government. From 1802 he devoted himself to the thorough examination of the flora, fauna, and geology of the island, at first under the auspices of the Dutch government, and, when possession of Java was taken by the English, under the especial patronage of Sir Thomas Stamford Raffles, the lieutenant-governor. A warm friendship, due to kindred tastes, sprang up between Horsefield and his celebrated patron, and, when the English tenure of Java ceased and Sir Stamford Raffles returned to England, Horsefield accompanied him, bringing with him the collections he had made, which were placed in the museum of the East India Company in London, of which he was presently made the curator, a position which he held for nearly fifty years until his death. Horsefield, by his explorations and writings, laid foundations for our knowledge of the natural history of the far East. He contributed while in Java many important papers to the publications of the Batavian Society of Arts and Sciences. In 1824 he gave to the world his great work entitled 'Zoological Researches in Java and the Neighboring Islands,' and from 1838–52 issued in folio parts the 'Plantæ Javanicæ Rariores.' Both works are sumptuously illustrated by colored plates. In 1856–58 he published the 'Catalogue of the Birds in the Museum of the East India Company,' and in 1857–59, with Frederic Moore, the 'Catalogue of the Lepidopterous Insects in the Museum of the East India Company.' Besides these larger works he was the author of a multitude of papers published in the 'Transactions' and 'Proceedings' of societies.

To him perhaps more than to any other single naturalist are we indebted for the first correct account of the botany and zoology of the regions with which he became familiar in his early life.

W. J. Holland,
Director Carnegie Museum, Pittsburg.

Horse-fly, Gad-fly, or **Deer-fly,** any species of the family *Tabanidæ,* usually large, robust, flies, with a broad head pointed in front and concave behind, with immense eyes, and fitting closely to the thorax. The legs are long and stout; sometimes hairy, but without stiff bristles. The females are provided with a long sharp proboscis with which they pierce the skin of animals, and are especially annoying to such short-haired kinds as horses and deer. No poison is injected into the wound, but injurious bacilli may be introduced, causing bad sores. One of the most widely distributed in the United States is the large black *Tabanus americanus.* These flies attach their eggs to grass and sticks in wet places. The larvæ find their way into water or wet earth, and are carnivorous, feeding on other insects, snails, etc. They pass the winter before pupating and emerge as flies in the early summer. To the same family belong many smaller green or yellow species of the woods more usually called deer-flies.

Horse-mackerel. The horse-mackerel, tuna or tunny (*Thunnus thynnus*), is the largest member of the mackerel family (*Scombridæ*), attaining a length of 10 feet or more and a weight of 1,000 to 1,500 pounds. It is found in all warm seas, both of the Atlantic and Pacific oceans, and wanders as far north as Newfoundland, appearing on our shores with the menhaden and mackerel. See Tunny.

Horse-power, the power of an ordinary horse or its equivalent, the force with which a horse acts when drawing. The mode of ascertaining a horse's power is to find what weight he can raise and to what height in a given time, the horse being supposed to pull horizontally. From a variety of experiments it is found that a horse, at an average, can raise 160 pounds weight at the velocity of 2½ miles per hour. The power of a horse exerted in this way is made the standard for estimating the power of a steam-engine. Thus we speak of an engine of 60 or 80 horse-power, each horse-power being estimated as equivalent to 33,000 pounds raised one foot high per minute, but this estimate is considered much too high, 17,400 foot-pounds per minute being generally considered nearer the truth. As it matters little, however, what standard be assumed, provided it be uniformly used, that of Watt has been generally adopted. The general rule for estimating the power of a steam-engine in terms of this unit is to multiply together the pressure in pounds on a square inch of the piston, the area of the piston in inches, the length of the stroke in feet, and the number of strokes per minute, the result divided by 33,000 will give the horse-power deducting one tenth for friction. As a horse can exert its full force only for about six hours a day, one horse-power of machinery is equal to that of 4.4 horses.

The motive power used in the manufacturing establishments of the United States in 1900, according to the census report, aggregated 11,300,081 horse-power, as compared with 5,954,655 horse-power in 1890, 3,410,837 horse-power in 1880 and 2,346,142 in 1870. Of the total power used in manufactures during the census

year, steam-engines furnished 8,742,416 horse-power, or 77.4 per cent of the aggregate; water wheels supplied 1,727,258 horse-power, or 15.33 per cent; electric motors, 311,016 horse-power, or 2.7 per cent; gas and gasoline engines, 143,850 horse-power, or 1.3 per cent, and other forms of mechanical power 54,490 horse-power, or five tenths of 1 per cent. Rented power was used to the extent of 321,051 horse-power, or 2.8 per cent of the total. Of this rented power 183,682 horse-power was electric and 137,369 horse-power was from other sources of energy. See POWER.

Horse-racing, a national pastime, which has been called the sport of kings because it has been one of their amusements since the earliest dawn of civilization. The racing horse is of three distinct types, the running horse, the pacing horse, and the trotting horse. For many centuries the running race has been the traditional turf sport in Great Britain and on the continent, with many varieties, such as flat racing, or racing on level ground; steeple-chasing, or racing over ground not specially prepared for the purpose, and hurdle-racing, in which the horses have to leap over obstacles purposely placed in the way. Trotting is primarily an American institution, the outcome of thoroughbred development. Late in the 19th century horse-racing made a wonderful advance in the United States and easily became the great national pastime of the country.

Early History.— Thothmes I., of the 18th Egyptian dynasty, left a papyrus letter telling of his conquest of Mesopotamia, and priding himself upon the acquisition of the racing horse (the Arab) and being the first to introduce him in Africa. Somewhat later the records tell of King Solomon buying horses from Egypt, and paying as much as $3,000 for some of them. Among the Greeks it was introduced into the Olympic games in the 33d Olympiad (648 B.C.). From Greece it was introduced into Rome, where it gained a place as one of the games of the circus. The institution of horse-races in England, where the sport has become a great national pastime, belongs to a very remote period. The first regular horse-races, however, did not take place till the reign of James I. The successors of James I. down to Queen Anne were all more or less attached to the sport. In the reign of the latter, in 1711, the York Plates were founded, and about that date the passion for betting on the turf began to be general. Under George I., the successor of Queen Anne, horse-racing became more flourishing. The two most celebrated horses of that period were Flying Childers (foaled in 1715) and Eclipse (foaled in 1764), which long had the reputation of being the fleetest horses that ever ran. From the latter are descended many of the first-class thoroughbreds of the present day. None of the English sovereigns was more devoted to horse-racing than George IV. Between 1784 and 1792, while yet Prince of Wales, he gained 185 prizes, including the Derby of 1788. Horse-racing was introduced into France from England during the reign of Louis XIV., and under Louis XV. was pursued with the utmost enthusiasm.

Breeding and Training.— The training of a running horse begins with its second year, and is a slow process, requiring great care and attention. During the period of training the horse is under the charge of a stable-boy. In the first part of the training the exercise to which the horse is subjected is comparatively gentle, but in the latter part a gallop of half or three quarters of a mile is taken every other day. Before a race takes place the powers of the horse are put to the test by its being made to run over about half a mile against an older horse, which is weighted to make up for the difference in age. The breeding of thoroughbred horses, that is, of horses which can trace an unbroken pedigree through the best sires and the best dams, is when well conducted a very profitable business. The prices given for stallions are sometimes enormous. In 1900, when the Duke of Westminster's racing stud was sold, the average price reached the high level, and the world's record price of $187,500 was brought by Flying Fox, which had won the Derby the year before. Before this, Ormonde, another Derby winner, had sold for $150,000. The large sums now given for the use of stallions in breeding studs are the cause of race-horses being withdrawn much earlier than they used to be from the turf, for as soon as they have acquired a reputation the owner of a good race-horse can make much larger sums by hiring it out for breeding purposes than he could by entering it for races. The pedigrees of all thoroughbred horses are registered in the stud-book, so that if any particular animal is omitted in that register the inference is that its pedigree is not without some blemish more or less remote. The effects of a careful system of breeding in improving the quality of horses are very marked. No pure Arabian horse can be compared in point of speed with a thoroughbred. In size and shape, too, the horses of the present day surpass those of former times, the average height of a thoroughbred now being 15 hands 3 inches, while formerly it seldom reached 15 hands. See also HORSES, AMERICAN THOROUGHBRED.

Race Meetings.— In Great Britain the chief race meetings are those at Epsom, Newmarket, Ascot in Berkshire, Doncaster, Goodwood, Liverpool, Manchester, and Leicester. Those at Newmarket are the oldest of all, dating from the reign of Charles II. The Ascot races are considered the most fashionable, being largely attended by the aristocracy, and sometimes honored with the presence of royalty. The Goodwood races, which are held in the Duke of Richmond's park in Sussex, are also a favorite rendezvous of the aristocracy. But the most popular meeting throughout the year is the Epsom, which owes its popularity partly to the proximity of Epsom to London and partly also to its being the meeting at which the Derby and the Oaks are run. At the Oaks the ladies are the chief bettors, and the bets are not thousands of pounds, but dozens of Paris gloves. The principal racing meetings in France are those held in spring and autumn at Chantilly and the Bois de Boulogne.

In the United States the season opens at the Bennings track at Washington early in the spring and closes there in the fall. Following Bennings comes the Aqueduct, and Morris Park, Gravesend and Sheepshead, the latter track being the show track of this country, occupying the same position as the Ascot of the English

turf, which is also named "The Ladies Meet." Then follows the Brighton Beach season during July and August. Although the classic events of England and France are of longer standing they cannot be said to outrank or outinterest the famous Brooklyn Handicap, founded in 1887; the Suburban (1884); the Futurity (1888); the Realization (1889), and numerous other events. There are racing parks and tracks in nearly every city in the country, and there are many famous meetings in the West and South, like the Latonia in Kentucky, the Harlem and Washington Park in Chicago, Saratoga and others.

Racing Rules.— The conditions under which the most of the races are run are the following: Every horse that takes part in a running race must be entered as a yearling, that is, before the close of the year in which it is foaled, for a horse's age is always reckoned from the 1st of January of the year in which its birth takes place. On being entered a certain sum is paid by the owner, which is called a forfeit, because it is forfeited if the horse is afterward withdrawn, or, in the language of the turf, "scratched." The racing is conducted under association rules, and in England under regulations laid down by the Jockey Club, a body instituted in 1750. The stewards of the Jockey Club have power to grant and to withdraw licenses to racing officials, jockeys, and race-courses; to fix the dates on which all meetings shall be held, and to make inquiry into and deal with all matters relating to racing. At every regular race-meeting there must be at least two stewards, with a clerk of course, a handicapper, a stake-holder, a clerk of the scales (since the jockeys of course must be carefully weighed), a starter, and a judge, each of these officials being licensed by the club.

Handicapping.— Formerly all running races were what is called weight-for-age races, that is, all the horses entered to compete were of the same age and bore equal weights, or if in certain cases there was an inequality in point of age there was also a fixed difference in the weight carried. But it was found that when races were conducted on this plan the best horses came to be known, and the inferior ones withdrew, not venturing to compete with them, so that the race resulted in a walk-over. Hence arose the practice of handicapping, that is, of adjusting as nearly as possible the weight to be carried to the previously ascertained powers of the horse, so as to reduce the chances of all the horses entered to an exact equality. In England the principal weight-for-age race for two-year-olds is the Middle Park Plate, and for the three-year-olds the principal for both colts and fillies are the Two Thousand Guineas, the Derby, and St. Leger, and for fillies only the One Thousand Guineas and Oaks. The most important handicap races are the Great Northampton Stakes, the City and Surburban and Metropolitan Stakes at Epsom, the Northumberland Plate, the Goodwood Stakes, the Ascot Stakes, the Ebor Handicap (run at York), the Great Yorkshire Stakes (run at Doncaster), the Liverpool Spring, Summer, and Autumn Cups, the Cesarewitch, Cambridgeshire, and Newmarket Handicaps (run at Newmarket).

Betting and Book-making.— The prevalence of the practice of betting in connection with horse-racing is a fact so well known that it is needless to enlarge upon it, although it will be of interest to some to explain in what manner it is conducted. Bettors are divided into two classes — the backers of horses, and the book-makers, or professional bettors, who form the betting ring, and make a living by betting against horses according to a methodical plan. Backers of horses may be again divided into those who have special information about the qualities of the horses which are to engage in a race, which enables them to back a particular horse with a certain amount of confidence; and those who have no such means of information, and accordingly back horses pretty much at random. The former class, if their information is good, have a very fair chance of success in their speculations, and the horse that wins any great race usually brings in to his owner vast sums in payment of bets, compared with which the stakes, considerable as they often are, are insignificant; but the latter class are pretty certain in the long run to lose. By the method adopted by the professional bettor the element of chance is as far as possible removed. Instead of backing any particular horse, the professional bettor lays the same sum against every horse that takes the field, or a certain number of them, and in doing so he has usually to give odds, which are greater or less according to the estimate formed of the chance of success which each of the horses has on which the odds are given. In this way, while in the event of the race being won (as is usually the case) by any of the horses entered in the betting-book of a professional bettor, the latter has always a certain fixed sum (say $5,000) to pay, he receives from the backers of the losers sums which vary in proportion to the odds given. Thus, if a book-maker is making a $5,000 book, and the odds against some horse is 4 to 1, he will, if that horse wins, have to pay $5,000, while, if it loses, he will receive $1,250. If the sum of the amounts to which the horses in a particular race have been backed in some professional bettor's book is $6,500, and if the odds against the first favorite were 5 to 2 (or $5,000 to $2,000), then the total sum received by the book-maker, in the event of the race being gained by the first favorite, would amount to $6,500, $2,000 or $4,500, so that he would suffer a loss of $500; while if a horse had won that had long odds against him (say 200 to 1, or $5,000 to $25), his total receipts would amount to $6,475, and his gains to $1,475. Very frequently the receipts of the book-maker are augmented by sums paid on account of horses which have been backed and never run at all.

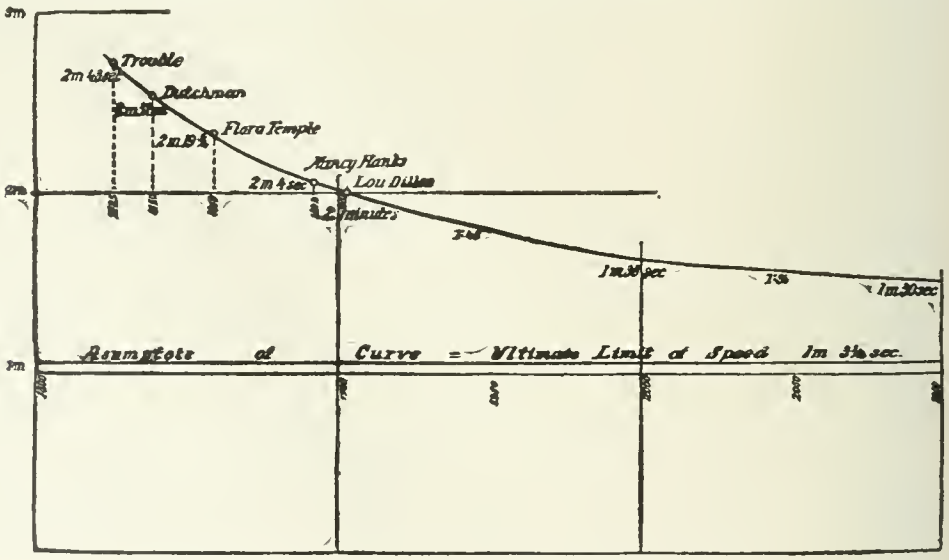
Americans Abroad.— In 1855 an American horse had never won a race abroad and an American jockey had never ridden in an English race. The first American to go to England with a stable of thoroughbreds was Richard Ten Broeck, who sailed for England in 1856, taking with him Lexington, Lecompte, the only horse that ever beat Lexington: Pryor, and Prioress. Lecompte died of influenza the first year, and Pryor soon followed. It was left for Prioress to retrieve the fortunes of the stable. Her great victory was in the Cesarewitch, a race at 2 miles, 2 furlongs, and 28 yards. There were 37 starters, the very best horses on the English turf. After one of the most exciting races ever run, Prioress, El Hakim, and Queen Bess finished in a dead heat. In the run off, the American horse won by a length in 4 minutes and 15

seconds. American successes really began in 1878, when Pierre Lorillard and James R. Keene shipped stables to England. The former's Parole won the Newmarket Handicap, defeating the English favorite, Isonomy, a horse that was called the best ever foaled on English soil. The American gelding next took the great Metropolitan, the Great Cheshire, and the Epsom Gold Cup in quick succession. Iroquois followed Parole, winning four important stakes in 1880, including the St. Leger. The subsequent invasion of England by W. C. Whitney, Clarence A. Mackey, Richard Croker and others with famous winning horses, and the successes of Sloan, Reiff, Martin and other American jockeys, have brought renown to the American turf. In 1902, American horses ridden by American jockeys took part in 561 races in England, of which they won 85, were second in 80, third in 52, and unplaced 344 times. The stakes and purses won amounted to $234,120. In 1903, up to 15 September the Americans have done even better proportionately, starting in 453 races, winning 74, second in 81, third in 47, and unplaced 251 times. The winnings amount to $259,000. American horses were second in the Oaks and third in the Derby.

Trotting.— The evolution of the trotting horse in America, and the gradual reducing of the one mile record, is a history coincident with the improvement and progress made in breeding. Beginning with the record of Trouble, who trotted a mile in 2.43 in 1826, of Dutchman (2.32) in 1839, and Flora Temple (2.19¾) in 1859, the evolution proceeds to George Wilkes, Dexter, Goldsmith Maid and the others who followed. In 1818, at a Jockey Club dinner, discussion drifted to the trotter, and a wager was made that no horse could be produced which could trot a mile in three minutes. Boston Blue was named at the post by Maj. William Jones, and the old chronicle says that he "won cleverly and gained great renown." The New York Trotting Club was organized in 1825, for the purpose of improving the speed of road-horses. The initial purses were for races of two-mile and three-mile heats. In 1835 trotting was in almost daily vogue in New York. It was not until 1845 that a mile was trotted in less than 2.30. In 1863, the American trotting horse was an unknown quantity abroad, while in 1903, American trotting stock was in demand throughout Europe. Germans, French, Russians, and Austrians have bought some of our best bred animals.

The National Trotting Association was formed in 1870 as a result of a meeting of breeders and track owners the previous year. In 1887 the American Trotting Association was formed with headquarters in Chicago, and it works with the National Trotting Association to detect and punish fraud. Some of the ablest men in the country sit on the boards of appeals, and the decisions command respect and are accepted as final. The careers and records of famous trotters like George Wilkes; Dexter; Harrietta; Axtell (2.12); St. Julian (2.11¼); Sunol (2.10½); Maud S. (2.08¾); Kremlin (2.07¾); Stamboul (2.07½); Beuzetta (2.06¾); Directum (2.05½); Nancy Hanks (2.04); Alix (2.03¾); The Abbot (2.03¼), and the mile of Major Delmar (2.00¼), Cresceus (1.59¾), and Lou Dillon (1.58½) in 1903, tell the brief but wonderful story of the trotting horse in America. See also HORSES, TROTTING.

Record Possibilities.— The gradual lowering of the trotting record from a mile in three minutes to the 1.58½ record of Lou Dillon on 24 Oct. 1903 has led many to question if a limit is ever to be reached. The mathematician has a rule to guide him in a guess at the answer to such questions, and the 'Scientific American' has prepared the accompanying chart which is of vast interest. The vertical lines represent the years in which the record has been lowered, the spaces between the lines indicating the time interval, the length of each vertical line indicating the record for that year. A curve is next sought that will pass through as many of the points as possible, or close to them, and the continuation of this curve across lines indicating future years shows the best answer to the main question that the facts warrant. If the curve



Equilateral Hyperbola Showing the Law of Trotting Improvement.

proves to be a hyperbola, it will afford confidence in the accuracy of the solution, for a peculiar property of the hyperbola is that it constantly approaches but never reaches a straight line called an asymptote, and this asymptote represents the ultimate rate of speed. With Lou Dillon at the two minute mark, a point is indicated on the chart showing this hyperbolic curve as the law of improvement. It is now possible to pass the curve of a hyperbola through the record points of Trouble in 1826, Dutchman in 1839, Nancy Hanks in 1892 and Lou Dillon in 1903. This curve will be within a few seconds of many other records in which the time was notably reduced.

The hyperbola is represented by the equation $xy = 10.000$, in which x equals the number of years since 1726, y equals the number of seconds over 63½ seconds to trot a mile. The notable records of Maud S. in 1881 and 1885, with the high-wheel sulky, are 2¼ to 3¼ seconds above the curve, which would indicate that the change to the pneumatic sulky will account for this measurement of the improvement. This curve places the ultimate limit of trotting speed at a mile in 63½ seconds, which, though constantly approached, will never be reached actually, and it indicates the minute and a half mark as two centuries away.

Horse-radish, a species of water-cress (*Roripa armoracia*), native to Europe, but now cultivated everywhere, and becomes naturalized in most parts of the world. Its basal leaves are oblong, finely crenelate and irregular in outline, and its flowers are white and showy. The roots furnish the highly pungent ingredient of a well-known sauce, prepared by grating them, adding vinegar and sealing. They have also some medical use.

Horse-radish-tree. See Ben, Oil of.

Horsefoot Crab, Horse-shoe Crab, or King Crab. This marine animal (*Limulus polyphemus*) was formerly regarded as a crustacean, and is the sole survivor of an extinct group of arthropods intermediate between the trilobites and arachnids. It belongs to the order *Xiphosura,* class *Merostomata,* and phylum *Palæopoda.* By some English authors it is regarded as an arachnid allied to the scorpion. This difference of opinion regarding its affinities is due to the generalized structure of the animal, and to the fact that its nearest allies are extinct.

The body of the horsefoot crab is sometimes two feet in length, and consists of a head and a hind-body or abdomen, the latter ending in a long spine (telson), which is elevated by the creature in defense. The head is in shape somewhat like a horse's hoof, and in burrowing it acts as a shovel, being bent down at nearly right angles to the hind-body. There are a pair of compound and of simple eyes; the mouth is on the under side, nearly surrounded by six pairs of walking legs, while on the hind-body are six pairs of broad swimming legs. There are no antennæ, jaws, maxillæ, or foot-jaws, as in the lobster. The horsefoot crab breathes by means of gills attached to the under side of the last five pairs of abdominal legs, which consist of a pile of about 100 thin broad sacs growing out, one pile on each side, from the base of the legs. The nervous system is peculiar from the nature of the brain, and the œsophageal ring; while the entire system behind the brain is enveloped by the arteries, the latter ending in remarkably fine branches. The heart is large, tubular, the liver very voluminous, and the kidneys are represented by four pairs of excretory red glands, arising from a stolon-like base. The animal is bisexual, the male differing from the female in the second pair of legs ending not in a forceps, but in a sort of hand, with an opposing thumb. The ovaries and testes are voluminous, and the sexual products, eggs and sperm, pass out through a pair of papillæ situated on the under side of the first pair of abdominal legs.

The female lays her large round eggs loosely in the sand between high and low water, spawning in May and June; in about a month they hatch, and the young, after passing late in embryonic life through a trilobite stage, assumes the form of the parent, differing in the short rudimentary caudal spine. It molts frequently, and during the process the front edge of the carapace or head splits open, enabling the animal to draw itself out of the old shell. The recently hatched Limulus is strikingly like a trilobite, but while in the latter new segments are added after birth, in Limulus no new ones are added. The young horsefoot is about 4 millimetres in length. Specimens an inch long are about a year old, and it probably requires several years to grow to the length of a foot or more.

Limulus polyphemus inhabits the eastern coast of North America from Boothbay, Maine, to the West Indies and Honduras, but is most abundant in shallow, retired, sandy, or muddy bays on the coast of New Jersey, Virginia, and North Carolina. Several other species inhabit the seas of the Eastern Archipelago, China, Philippines, and southern Japan. In the United States it is used as a fertilizer, while in the Malayan markets the animals are sold as food.

The Limuli date from the Devonian. An allied group, in shape and structure approaching scorpions, is the Eurypterida (q.v.), one of which (*Stylonurus laccoanus*) of the Devonian of New York and Pennsylvania was about five feet in length, while the British *Pterygotus anglicus* is estimated to have been about six feet in length and two feet across. It is now thought that the scorpions have descended from some merostome, which became adapted for a terrestrial life.

Alpheus S. Packard,
Late Professor of Zoology, Brown University.

Horse'heads, N. Y., village, in Chemung County; on the Erie & Central N. Y., and branches of the Delaware, L. & W. and the Northern C. R.R.'s; about six miles north of Elmira. It is in a fertile agricultural region. Its chief manufactures are creamery products, bricks, screens, doors, blinds, men's clothing, cigars, cattle-feed, shoes, and hardware. Pop. (1900) 1,901.

Horsemanship. See Riding.

Horses, American Thoroughbred. The American thoroughbred is the production of pure breeds imported from England, first during the 17th and 18th centuries. They first found their way into the Old Dominion of Virginia, where they founded a tribe of early racehorses, to which trace to-day many of the most fashionable pedigrees. From Virginia the thorough-

breds finally found their way into the Carolinas and as far south as Mississippi and Louisiana, and, upon the formation of Tennessee and Kentucky as States, the breeding of thoroughbreds became with them what might be termed an industry.

The early part of the 20th century finds Kentucky in the lead in the production of thoroughbred horses, followed next by California and then by Tennessee. Missouri and Illinois have recently greatly increased their thoroughbred holdings, while both New York and New Jersey produce a goodly number. Many of the other States take rank as fair producers of thoroughbreds, and, in fact, the breed has found its way into every section of the country, even as isolated a State as Oregon annually producing a number of thoroughbred horses.

The requirements of an American thoroughbred horse are that the pedigree contains five uncontaminated crosses, but the average pedigree traces through 16 to 18 crosses, some having as many as 25. Those reaching an origin of a Natural Barb source are considered the most fashionable, but many great racehorses have descended from lines unknown to early English or Arabian pedigrees.

Diomed, the winner of the first English Derby, imported to this country in 1799, when he was 20 years old, is classed as the greatest of early importations, and he has left a marked impress upon American pedigrees. The most successful importation of the 19th century was unquestionably Glencoe (imported in 1836), and in later days Leamington ranks the highest. In more recent years, the ranks of the American thoroughbred have been greatly increased by almost unlimited importations from England, France, Australia, and other foreign countries, and horses are produced in this country now that are of entirely foreign pedigrees, while there are numerous instances where the first few crosses are strictly foreign lines.

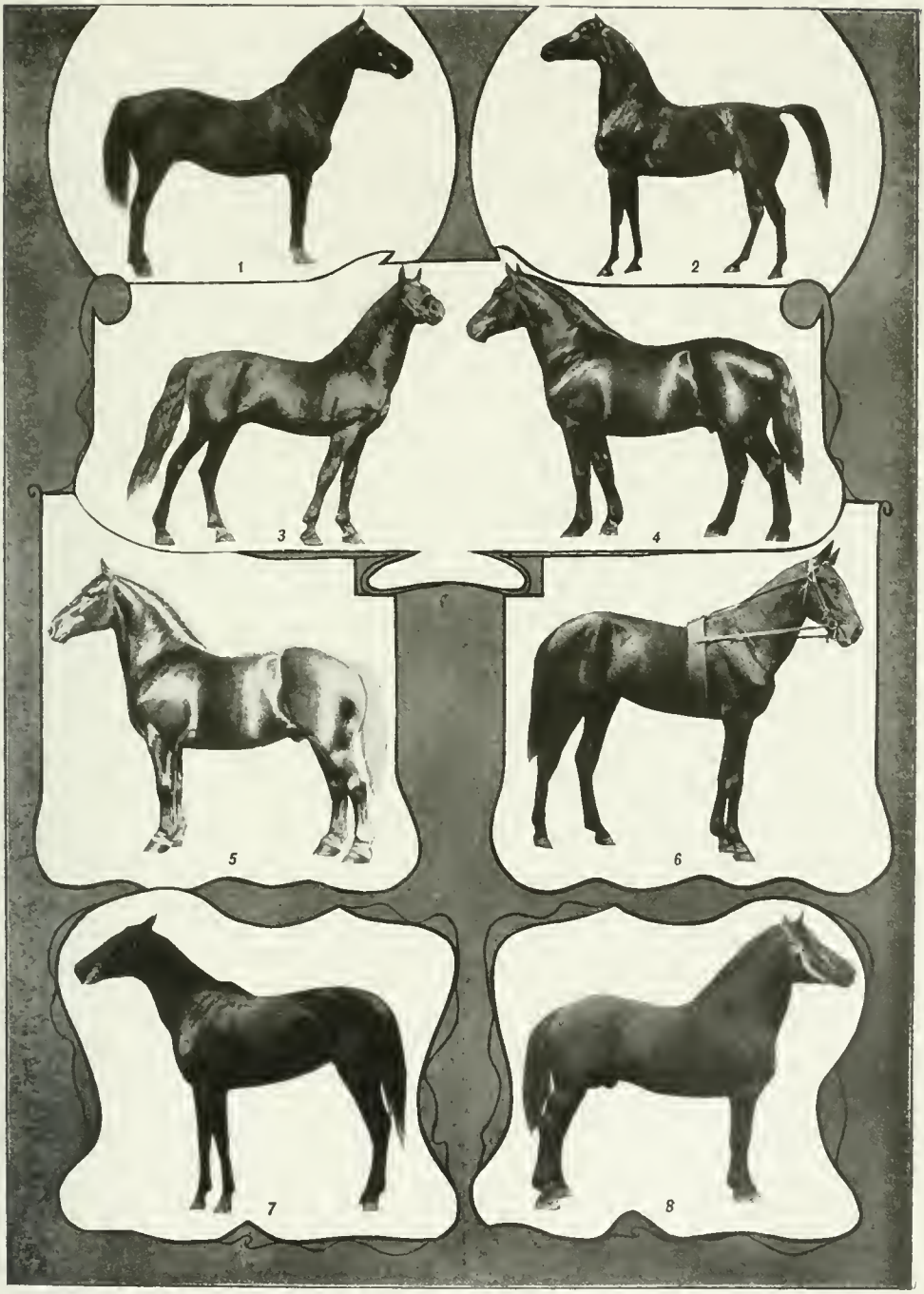
The average height of the early thoroughbred horse was something less than 15 hands, but at this time they average over 15 hands 2 inches, and weigh 150 pounds more than they did a half century ago. In individuality, too, the improvement is very marked, the types now being far superior in form to the horses of early times.

In soundness and general service the American thoroughbred has no superior, this being the result of judicious breeding and favorable rearing conditions. The statistics of the American turf (commonly known as Turf Guides) extend over a period of about 30 years, and in this time these records show that the thoroughbred horse has improved some 30 pounds, which is an equivalent of from 5 to 6 seconds to the mile. This marked improvement can be attributed to an accepted theory of breeding that like begets like, to intelligent methods of training, and to superior riding.

The most favorable condition which has proved so successful in raising the thoroughbred in this country is that he is housed less and has, at all times, access to lands covered by the finest of grasses, which brings his feet constantly into contact with moisture. The frog of the foot, being like a sponge, absorbs this moisture, thus creating a gentle pressure which spreads the hoof. A horse having bad feet naturally favors them, which has a tendency to make bad ankles and tendons on account of their not being freely used, and it is a conceded fact that "no foot, no horse."

In America the horse has been bred more for business than pleasure. The invention of the elliptic spring and the use of American hickory in the production of light vehicles for pleasure and business, together with the invention of macadam and Telford roads, turned the demand from the running to the trotting horse. The first private coach was introduced into New York in 1745; but coaches were scarce until after the Revolutionary War, and not until after 1840, when the light one-horse vehicle came into use, did the changed conditions of travel develop a harness-horse for purposes of business and pleasure. Along with the change in vehicles incident to the evolution of the trotter came as great a change in the style of harness and trappings.

About the beginning of the 19th century there came from the lines of breeding of the thoroughbred, traceable to Flying Childers, Byerly Turk, and the Darley Arabian, Messenger, a gray, stoutly built horse, of wonderful power and stamina, with a slashing, open gait, fitted to found a race of trotters. He was foaled in 1780, and became the progenitor of the trotting families in America. In 1793 Justin Morgan was foaled, sired by one believed to be thoroughbred. Three of his sons, Bulrush, Sherman, and Woodbury, became noted as the sires of horses of intelligence, courage, and speed, and the get of some of them excelled as roadsters and stage horses. From Black Hawk Morgan, sired by Sherman out of a fast trotting English mare, has come the beautiful, useful, and courageous line of Morgans. The original horse (2.40) died in 1856 at the age of 23. In 1849 was foaled Rysdyck's Hambletonian, the founder of the most noted family of trotters, sired by Abdallah, who traced to Messenger by both the sire and dam, out of a dam by Bellfounder, with Messenger crosses on the dam's side. As early as 1876 the interest in breeding and rearing trotters had become so great that fabulous prices were paid for colts, simply on the strength of their breeding. Two fillies, untrained, sold for $13,000. The three-year-old colt Steinway was sold for $13,000 in 1879. Maud S., bred at Alexander's noted stock farm in Kentucky, was sold to Mr. Bonner for $21,000 when four years old, with a record of 2.10¼, and the title "Queen of the Turf." Smuggler sold for $40,000, Pocahontas for $45,000, Goldsmith Maid for $36,000, Dexter for $36,000, and so on, until we come to Axtell, who sold for $100,000 after he had eclipsed the time of all stallions, and retired to the stud, where his service fee was $1,000. The stallion, Rysdyck's Hambletonian, was purchased with his dam for $125, and earned in the stud $205,750. Thirty-six of his get trotted in 2.30 or better, and the prices for which they could have been sold in their best days amounted to $325,000. Among them were Sentinel, George Wilkes, Jay Gould, and Administrator, all noted sires. Their united progeny was worth many thousands for stud and track uses. Some of his sons, without a 2.30 record, became successful in the stud. Alexander's Abdallah was sold for about $3,500, but he got Goldsmith Maid, who made a record of 2.14, and won on the turf close to $250,000; Almont sired 22 2.30 trotters; Bel-



1. English Running Horse.
2. English Coach Horse.
3. Morgan Trotting Horse.
4. Percheron.
5. Percheron.
6. Wilkes-Hambletonian Trotting Horse
7. American Thoroughbred.
8. Belgian Stallion.

mont got nine with records better than 2.30. So the descendants of Alexander's Abdallah have been worth to their owners hundreds of thousands of dollars. Volunteer was another who ranked among the most successful of the noted Hambletonian sires, having to his credit 23 2.30 performers. Electioneer, bought by Gov. Stanford, proved a noted sire, getting the fastest yearling, 2.36½; the fastest two-year-old, 2.21; the fastest three-year-old, 2.19½; and the fastest four-year-old, 2.18¾. The bracing climate of Palo Alto, and the methods of handling peculiar to Gov. Stanford's breeding farm, aided in these accomplishments. These are but a few of the thousands of good horses that owe success to the Hambletonian blood. The value of trotters has been measured largely by their speed, taken as a measure of ability to win future races, or as evidence of blood lines that will make the animal valuable in the stud. Success in campaigning is undoubted evidence of pluck and stamina; and the breeding and training of the trotter, and his contests on the track, have developed these qualities in so high a degree that no other class can equal him. The evolution of the trotting horse has also shown the value of a training peculiar to America as a factor in breeding.

It is pertinent to notice that in the first years of the last century running races became common in the Middle and Southern States, while a strong sentiment against racing prevailed in the Northern States. In 1820, Pennsylvania, for example, not only forbade racing, but also enacted that no person should "print or cause to be printed, set up or cause to be set up, any advertisement mentioning the time and place for the running, trotting, or pacing of any horses, mares, or geldings," etc. A similar law was in the statutes of Connecticut until within 30 years. New York passed an act to prevent horse-racing 19 March 1802, which was amended 30 March 1821, permitting the "training of pacing, trotting, and running horses" in Queens County for five years. The sheriff was required to be on hand to witness these "trials of speed," as called in the statute. This amendment was re-enacted 3 April 1826, without a time limit. In 1825 the New York Trotting Club was organized, with a view of "improving the speed of road horses." This track was probably the first trotting course in the world. The Hunting Park Association was formed in Philadelphia in February 1828, and the next year a trotting club was organized in Baltimore. These facts show a changing public sentiment, and the records begin to fall. The keeping of records became an established custom as early as 1829, when the 'American Turf Register' began. The English had not then begun to keep records, but the American custom has enabled us to mark the development of speed and establish well-defined breeds during the threescore and more years it has been in use. Wallace's 'American Trotting Register' was started in 1871 by J. H. Wallace, New York, since which time the business of breeding trotters has increased, until now it is estimated by good authority that the number of registered standard-bred trotters exceeds 120,000. In the early history of the record many animals were admitted to registry that are not now classed as standard-bred. The term "standard" indicates to-day ability of one or more ancestors to trot within 2.30.

Before the days of macadam roads and light vehicles, saddle-horses were as common as trotters are to-day. They were of no particular breeding, but traced to the thoroughbred, the Narragansett pacer, or the Scottish Galloway. Herbert suggests that they were of Spanish origin, their ancestors coming from Cuba. There is now a revival of interest in the saddle-horse as a luxury, the demand being beyond the supply. From the ideal set up, especially in Kentucky, it is safe to predict that there will soon be an improved breed of American saddle-horses.

Prior to the introduction of railroads Vermont had what Herbert called a distinct breed of cart-horses. He described them as "the models of what draft-horses should be, combining immense power with great quickness, a very respectable turn of speed, fine show, and good action." They had "none of the shagginess of mane, tail, and fetlocks which indicates descent from the black horse of Lincolnshire," and none of the curliness of mane and tail which marks the Canadian or Norman blood, and were characterized by short backs, close ribbing up and round barrels. The only other breed of American horses we have to notice is the Conestoga, which before the days of the Pennsylvania Railroad was common on the farms and highways of Pennsylvania. It seems to have descended from the stock brought by emigrants from Flanders, Denmark, and Germany. It was a mixture of several breeds, resulting in a large, patient burden bearer, held in high esteem by the Germans of that State. Although we have not originated and permanently established any American breed of draft-horses, the number of heavy horses has greatly increased, and the quality has improved. The increasing heavy business of factories, jobbers, importers, and transfer and express companies in our well-paved cities has called for a great number of powerful horses. This demand has led to the importing of heavy horses from France, England, Scotland, and Germany. The Vermont cart-horse and Conestoga draft-horse excelled the types of foreign heavy horses, as a rule; and it is to be regretted that our pride in American animals has not led our people to perpetuate and further develop these useful horses. Tens of thousands of dollars have been sent abroad since the fad of importing heavy elephantine horses became common in the Western States. The enterprising importers scoured France, England, Scotland, and Germany for the heaviest animals. They imported more than they could sell, and then adopted the plan of leasing stallions for a term of years. Since 1890 there have been many disastrous failures among this class of importers. There were, however, several importers who imported the best type of the draft and heavy coach breeds to be found abroad, establishing breeding farms not excelled in the world. The earliest importer of high-class draft-horses was Edward Harris, of Moorestown, N. J. In 1839 he imported two mares and the stallion Diligence, who was in many respects similar to the McNitt horse, but heavier and more compactly built, being a little over fifteen hands high. The next valuable importation was made by Charles Fullington, of Union County, Ohio, in the spring of 1851. He bought and brought home from France the famous Louis Napoleon, a "short-legged, closely ribbed, blocky, and compact gray, three years old." In 1853 he was sold

to A. P. Cushman, of De Witt County, Illinois, and after his colts in Union County proved his worth, a company was formed for importing other horses of his type. The author of the 'Percheron-Norman Stud-Book' says of him that he was undoubtedly the best-known and most popular French horse ever brought to America. The first importations west of the Wabash were made in 1868 by W. J. Edwards, of Chicago, in the great stallions Success and French Emperor. The latter went to Iowa as the property of Hon. J. B. Grinnell. Success was sold to the Fletcher Horse Company, of which M. W. Dunham, of Wayne, Ill., was an active member. In 1874 he purchased the entire interest of the company, establishing his celebrated importing and breeding farm at Wayne. Success's colts at the average age of two years and eight months sold at the average price of $450 per head, and in 1874 alone the sales of his get amounted to $36,000. The Clydesdale has been the strong rival of the Percheron-Norman; is popular in Canada, and has numerous representatives in the Northwest. The secretary of the American Clydesdale Association, Alexander Galbraith, says: "No importations into the United States appear to have been made until about 1870 and 1872, when John Reber, of Lancaster, Ohio, and the Fullingtons, of Union County, began the work. From that date small importations were made by various parties, the most prominent being the Powell Brothers, of Shadeland, Pa. Importations steadily increased up to 1888. To-day the largest breeder in America is Col. Holloway, of Illinois; N. P. Clarke, of Minnesota, and R. B. Ogilvee, of Wisconsin, coming next. These three breeders have among them about 175 brood-mares, and have the very cream of Scotland both in blood and individual merit. As high as $10,000 has been paid for one Clyde. Eight volumes of the 'American Clyde Stud-Book' have been published, containing 8,000 entries." The Shire horse is little esteemed in Canada, but in the American craze for heavy horses he finds admirers. There is an American stud-book of three volumes, with 4,100 entries, 3,500 of which represent imported horses. See HORSE-RACING; HORSES, TROTTING AND PACING.

MILTON YOUNG.
Lexington, Ky.

Horses, Military. The relative importance of the horse as a factor in the progress of civilization has been somewhat reduced by the introduction of steam and electricity, but mechanical devices such as the bicycle and automobile are not likely to wholly supplant the indispensable ally of man for war purposes. The value of cavalry has not, within the century, been so fully recognized as during the recent South African campaigns, where the supply of horses reached enormous proportions. The kind of horse for cavalry and artillery use is controlled by the character of service for which he is to be used. Hardy range horses are desirable in a campaign where the question of forage supply is a difficult one, but, if fully armed and equipped men of average size are to be transported and held in readiness for mounted combat with opposing cavalry, then larger and better trained horses are desirable.

The source from which cavalry horses are obtained differs in various countries. Some European nations breed and raise their remounts, while others provide the services of selected stallions gratuitously to breeders, the foals being held subject to purchase by the state. The American plan differs from the European practice and involves only the inspection of such animals as are presented by contractors. This encourages all farmers to breed a fair class of horses, and whenever the requirements of the markets increase the breeding usually increases until prices sometimes fall below a level at which colts can be profitably reared. Only a small percentage of horses raised in the United States are adapted to the requirements of cavalry service. This arises from the existence of a special and narrowly defined object to be attained, and which requires animals of particular conformation and character. The inspection of remounts for soundness and conformation is a very important duty, demanding technical training and intelligence. It requires judgment, much instruction and long practice to correctly estimate the relative value of various points of the horse and to determine whether the good qualities counterbalance the existing defects. Contractors do not usually present ideal animals, but the market from which they draw is so large that there is no serious difficulty in supplying the remounts annually required for the United States cavalry.

In European armies horses are accepted at four years of age, and sometimes under that age. It has been found in practice in the United States preferable to buy no horses under six years of age for immediate use in field service. Younger horses may be accepted during peace when there is no likelihood of immediate hard service, but they are subject to influenza or shipper's fever to a degree which often renders them unserviceable for many months. Good points in a cavalry horse are not mere matters of beauty, but shapes which, on mechanical principles, are likely to answer required ends. Cavalry horses must have certain qualifications, the most important of which are the possession of sufficient mobility to execute tactical maneuvers at varying degrees of speed and the ability to stand hard service while carrying great weight. The weight of trooper and equipment averages about one fourth the weight of the horse. Ability to carry flesh under stress of short rations is a commendable quality in a cavalry horse, since it enables him to stand hard work and to avoid a sore back. As a result of many years of experience the requirements demanded in the cavalry horse of the United States are laid down in the regulations in this language:

"The cavalry horse must be sound and well bred; gentle under the saddle; free from vicious habits; with free and prompt action at the walk, trot, and gallop; without blemish or defect; of a kind disposition; with easy mouth and gait, and otherwise to conform to the following description:

"A gelding of uniform and hardy color; in good condition; from fifteen and one fourth to sixteen hands high; weight not less than 950 nor more than 1,150 pounds; from four to eight years old; head and ears small; forehead broad; eyes large and prominent; vision perfect in every respect; shoulders long and sloping well back; chest full, broad, and deep; fore legs

straight and standing well under; barrel large and increasing from girth toward flank; withers elevated; back short and straight; loins and haunches broad and muscular; hocks well bent and under the horse; pasterns slanting, and feet small and sound." See also HORSES, RIDING AND DRIVING.

W. H. CARTER,
Brigadier-General, U. S. Army.

Horses, Riding and Driving. In the latter days of this country one can hardly go to even an insignificant town or village without finding that a number of its residents spend time and money in raising, training, and driving as good horses as their means will afford. Another striking feature of this country horsemanship is the rivalry and constant vying of each horse-fancier to excel among his fellows, and the interest manifested to-day in buying, selling and "swapping" horseflesh is typical of the American.

The county and state agricultural fairs, which now make the exhibition of horses a special feature, are largely the outgrowth of this far-reaching interest in horses. Nearly every country fair has, besides trotting and perhaps running races, a department for harness horses and breeders' competitions. As freight and passenger rates are commonly commuted by the railroads or the fair corporations, these meetings enable the farmer to see the best the country for miles around can produce, raise his standards and teach him the results to be attained by proper breeding.

The horse shows, held annually in many of our large cities, at regular seasons throughout the year, and so arranged that they may not conflict as to dates, invite competitors from all parts of the country, who exhibit what they have with fair prospects of making their expenses from the prize money won. These horse shows are fostered both as sporting and business institutions, and the best horsemen in the country form their directorates and act as judges. These large shows do much to establish the types of animals that meet with favor, and their growth and popularity has cultivated the taste and interest of the general public in horses more than any other factor.

The types of horses highly valued in the large cities and in the country are, of course, similar to a large extent. A good horse is good anywhere. Nevertheless, the requirements of a metropolitan market are much more exacting and extend to the many qualities which we will try to outline in this article. While the country is often satisfied with mere "getting there" qualities in the horse, regardless of how it is done, or perhaps a mere combination of speed and endurance, the standard of a large city calls for certain definite requisities and qualifications — "points"— which are well nigh indispensable if the horse is to command a good price.

To fill the requirements of the affluent class it is estimated that not more than 5 per cent of the horses throughout the country, including those raised with this object solely in view, can be utilized. Indeed, taste has become so fastidious that the right kind can only be found by diligent search, and prices verge into sums that 10 years ago would have been unbelievable. It must not be thought that the general run of horses in this country, or indeed that the quality of our native bred horses, has deteriorated in the past few years. Such, in the writer's opinion, is not the case. The fact is, that to fill the high requirements of the metropolitan market has become the recognized goal of all horse breeders; and it is now generally understood throughout the country that the market for the inferior horse is limited to those who can afford to pay so little that the breeder is not compensated for his care and outlay in breeding anything but the best. The general introduction of trolleys and electric vehicles has been an important factor in curtailing the market for horses that are merely "serviceable" and has reduced it to a competitive point that is unprofitable.

The high qualifications for the metropolitan market have reduced the available horses to such a small number that expert buyers search this country and the Dominion of Canada from one end to the other. Buying as cheaply as possible, so thorough has been the scouring of the country that the prices paid would seem fabulous to the seller if the cost alone of raising the horse were taken into consideration. The buyer must also assume the risk and expense of transportation to market.

The "points" for which the breeder is striving are well defined, but the individual may vary so much in combining them that the interesting feature of personal taste remains as the determining factor in selecting horses for personal use.

Heavy-Harness Horse.— The term "heavy-harness horse" is a general one. Under it may be classed anything from the 12 hand pony for basket-phaeton or village cart, through the various types suitable for the runabout, gig, brougham, victoria and other vehicles that fashion prescribes for various uses, to the 16–1 hand carriage horse for pulling the capitalist's omnibus.

The importation into this country, since 1883, of English hackneys and the exhibition of them has undoubtedly done much to educate the public to a type of carriage horse. While no disparagement is intended to the standard bred trotting horse, whose origin, indeed, is allied to the hackney — although his later history is somewhat different — the serviceable, short-backed, straight-legged and intelligent horse now the standard for metropolitan use is nevertheless nearer the hackney type than the old style American trotter. It should be stated, however, that very few either of the trotters or hackneys of 25 years ago would generally fill the requirements of the harness horse to-day. A type having been once well established, however, horses filling the requirements can be selected from carefully bred trotters as well as from hackneys, and one breed is often mistaken for the other, such is their closeness in resemblance and the result of breeding with particular ends in view. The elements to be taken into consideration in the harness horse are as follows: Conformation, manners, action, speed, color, size and age. Conformation ranks first in point of importance, but manners are an absolute essential also. These two although somewhat variable must be present in any horse required for harness; the others vary considerably according to the type and weight of the vehicle to which the horse is to be harnessed and the purchaser's personal taste.

The elements in the order of their importance from a purely selling point of view are:

1. Conformation as to head and neck. This is probably the first feature the average purchaser will look for. The horse should possess a small head, delicately molded nostrils and a small tapering muzzle. His jaw-bones should be well apart so that when the head is reined in they will not interfere with his breathing. He should have good sized eyes, well separated; a narrow forehead or small eyes being general indications of lack of intelligence, nervousness or a tendency to fright or bad temper. The ears should be small and well apart. The neck should be gently tapering and well cut out in the throat, and the so-called "crest" from which the mane grows should have the slight convexity which indicates strength, maturity and condition. The neck should be set on sloping shoulders, so that the head will be naturally held erect, turning upward from the forward line of the trunk nearly perpendicular. A tapering neck is an indication of breeding and fineness as distinguished from the coarseness of draft blood and the common horse in ordinary use.

2. Conformation as to legs. The general requirements are that all four legs shall be approximately straight and not too long. A moderately short-legged horse is generally preferred, both for looks and service, to one that depends upon long legs for height. The forelegs should be perpendicular when the horse is standing erect, bones flat, but not heavy or coarse. The hind legs, when in a natural position, should be so formed that a plumb line dropped from posterior point of the haunch will be nearly tangent at the point of the hock, the rear line of the leg below the hock being approximately parallel to the plumb line. The thighs should be moderately heavy at the height of the lower line of the trunk. The modern idea is that the horse's buttocks should be round and muscular viewed from behind. The pasterns of all four legs should be springy and long rather than short.

3. In general. The horse should be "close-coupled"; in other words, there should not be too much space between the last rib and the quarter. His trunk should be round and just fleshy enough so that his ribs may be felt — not seen. Standing on level ground the height of his withers and croup should be about the same. The trunk, directly under the withers, should be deep and the chest from the front view broad, giving room for the heart and lungs and an appearance of power. The belly should be well picked up beneath the kidneys with a gentle, convex, upward curve from between the front legs — not enough, however, to produce the waspy effect sometimes seen in horses otherwise well formed. The back should be short, lending to the trunk an appearance of compactness and solidity. The quarters should not fall away back of the kidneys more than an inch or so to the root of the tail. The tail, if set well forward of the posterior line of the horse's haunches, is generally admired, and in this position will be carried at the proper angle naturally.

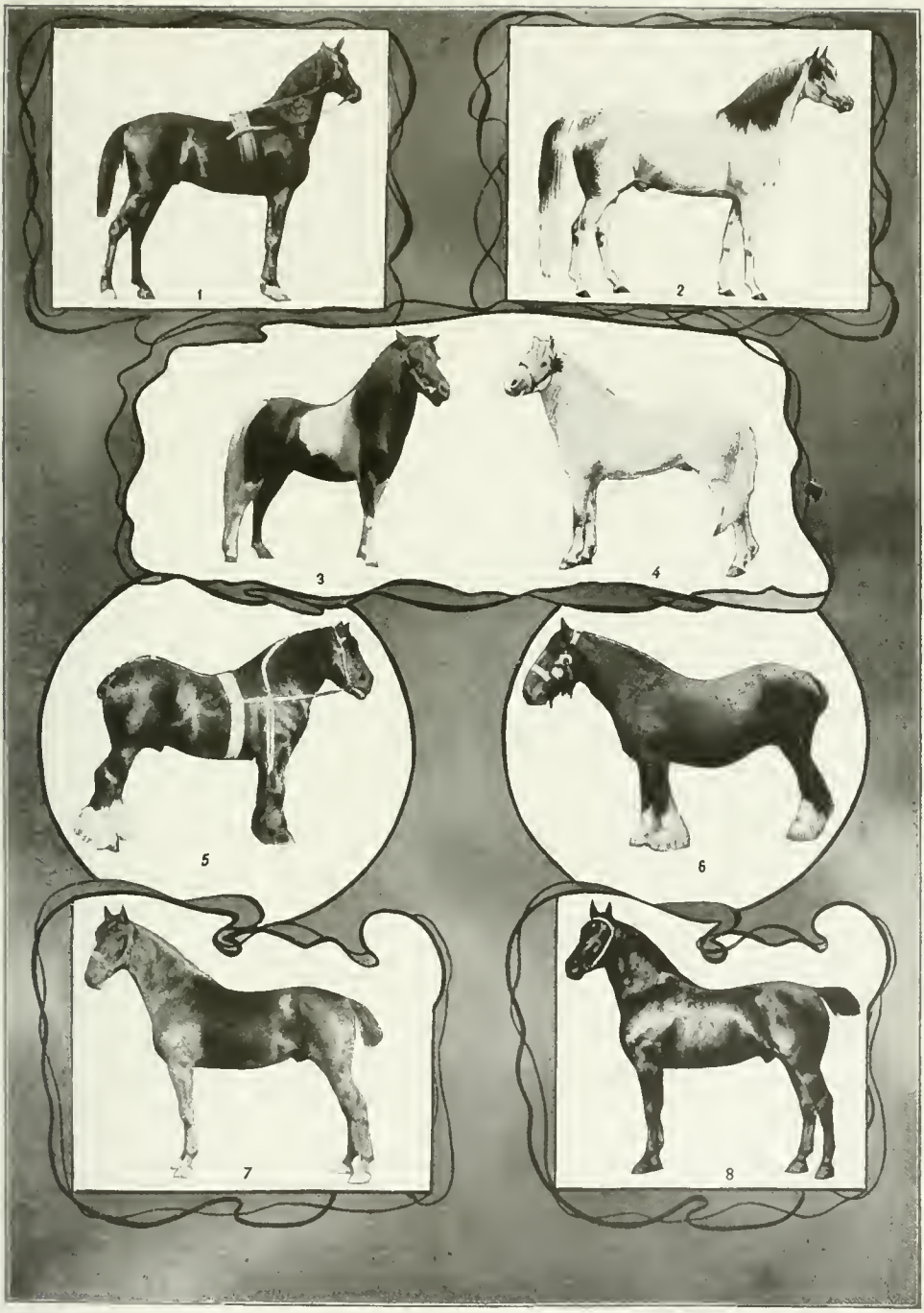
Under the subject of *Manners*, full technical treatment should be sought in various books relating to horse training and breaking. We will endeavor to point out, however, to what extent manners in a harness horse is supplemental to ordinary training; to treat the subject fully being like attempting to describe what a gentleman should do under all circumstances. A few salient points will perhaps give a fair indication of the general subject.

The well-mannered horse should be so trained that when bitted his head is carried almost vertical, and close to his neck, which will be gently curved; the head and neck taken together being straight with the line of direction in which he is traveling. This position is not only graceful but gives the driver the utmost command over him. He should "fill his collar" without urging, but be light mouthed and susceptible to the slightest hint from the reins, voice or whip. He should be afraid of nothing and possess sufficient intelligence so that after first acquaintance with motor vehicles, railroad trains and other startling objects, he will pay no attention to them.

Into this subject therefore the question of natural disposition necessarily enters, as without a sensible but willing and high-strung disposition, it is impossible to produce a fashionable carriage horse. The horse should be trained to back and turn for the voice or with the slightest pressure of the reins without manifesting any disposition to shake his head or bore upon the bit. Plunging, rearing or trickiness must be absolutely eliminated, so that he is safe for a lady to drive through crowded city streets. He should be broken single, double and tandem, and to the saddle for convenience sake, and should be ready at any moment to serve in any one of these capacities.

All this mannering constitutes a supplemental or post-graduate education, for the horse as delivered from the country is broken, but commonly utterly devoid of manners. To accomplish this a training extending over a period of as much as three months is often necessary even with a horse that would be considered thoroughly broken in the country; and after mannering him as to how he shall carry his head and respond to the driver, it is necessary, so perfectly must the horse be trained to suit the metropolitan purchaser to spend a week or more in thoroughly accustoming him to city pavements and sights. It is almost superfluous to state that many horses cannot be brought to this high state of perfection, but the question of manners enters very largely into the price consideration, and the schooling should be carried on to as high a point as the disposition of the individual will admit.

While *Action* is not absolutely indispensable, it is nevertheless the feature that many amateur horsemen will look for first, often neglecting much more important points to secure the flashiness of the high actor. Many dealers say, "Give me action and I can sell anything." Without going to this extreme, it is undoubtedly true that high action will cover many sins, and if a horse will only "get his head up and act" he is apt to be salable. Without action speed seldom attracts the city purchaser, and while it is undeniable that high action, except with careful driving and stable attention, will often cripple a horse on hard pavements who might otherwise go sound for years, the average high-price buyer not only asks for clean, straight action, but verges to the danger point in its height. The expert will seek horses having action both in



1. Pure Arabian.
2. Arabian Stallion.
3. Shetland Pony.
4. Welsh Mountain Pony.
5. English Shire Stallion.
6. Clydedale Gelding.
7. French Coach Horse.
8. English Hackney.

front and behind, as he knows that without hock action, little, if any, speed will be produced, the propelling force lying in the power of the thighs. He will look at the horse going, coming and sideways, first to see that the horse neither toes in, paddles or interferes in front; second, to see that he keeps his hocks close together as they pass, and consequently does not "straddle" or place his hind legs at the extreme forward stride outside of the line taken by his fore legs, or interfere by brushing either fetlock joint; third, that he does not forge and that his action is even when looked at from the side, each leg advancing at a stride the same distance and height as the corresponding leg on the other side.

The only gait admissible in the heavy harness horse is a trot. Pacing, racking, single-footing, or any gait other than a square line trot, by whatever term it may be called, have no place in the metropolitan market. The horse should strike out straight from the shoulder in front, the whole leg straightening at the instant the hoof touches the ground, the hoof striking flat. The straightened foreleg then passes under the body of the horse and is rolled up when it leaves the ground, the hoof nearly touching in extreme cases the point of the elbow joint. While still "folded" the arm bone reassumes the position for the next forward stride. As indicated above, the action of any single leg and hoof should be in a single longitudinal vertical plane. Some writers have endeavored to demonstrate, by projecting upon a longitudinal vertical plane the arc described by the forward point of the hoof from the time the horse picks up his foot from the ground until he touches it again, that the ideal action thus projected would form a symmetrical arc of an ellipse. While it is conceivable that such may be the case, it is practically impossible to determine slight variations from this ideal, and if the horse acts high, clean and straight without interference or forging he will not generally be open to criticism.

The modern buyer looks more and more nowadays for strong hock action, which means that the horse will cover ground and retain much of his action regardless of the amount of weight behind him.

While *Speed* is not a very important element in horses for carriage use, it would be a truism to state that people like to go fast, and of two individuals equal in other respects, the purchaser will prefer the horse that has the most "step." A discriminating dealer will commonly aim to secure horses that can go a mile under ordinary circumstances in 3½ minutes, and if possible in 3 minutes. This is, ordinarily, quite fast enough for salability, and the horse that will "road" steadily at 10 to 12 miles an hour and can increase the speed a little for a short spurt, fills the market requirements pretty fully.

In *Color*, modern fashion prescribes bays, chestnuts and browns, a dark seal brown being perhaps the most popular. Golden chestnuts are also popular, and blood bays are in high favor. Very few purchasers will consider a white or black horse, regardless of any number of other good qualities. Grays, except of the dark dapple variety, are rarely used, except in a cross-matched pair, and then only as a matter of personal fancy. In a road coach four, however, they are approved by the best authorities.

The amount of white on a horse is a matter of personal taste, many people liking white fetlocks and a star, stripe or blaze on a chestnut or bay's head, others preferring solid color. Bays are generally most popular with black points, but in general it may be stated that the horse possessing too much white will not please. One or two white legs, with white extending a short way to the knee or hock, will not be objected to, but it can be stated positively that, except for a leader or wheeler in a road coach team, where a showy effect is desired, there should be no white upon the body of the horse.

A sleek, shiny coat is a recommendation for any horse, as it usually bespeaks condition and breeding.

The question of *Size* is one that is a matter of personal taste primarily, and secondly, one of suiting the vehicle to which the horse is to be harnessed. The salable horse for ordinary city use is rarely under 14½ hands, and in the opinion of most judges should not exceed 16¼ hands. For a lady's phaeton a small team with considerable substance and not usually less than 14½ hands in height is required, and for a heavy omnibus sufficient weight and strength are usually secured in the horse whose height does not exceed 16 hands. The most salable size for horses in general use is about 15–2½ hands. Most buyers will restrict their purchases to horses between 15–1 and 16 hands, unless the animal is very remarkable in other respects, because customers for extremes in size are few in number, and such horses are consequently less readily salable.

A word should be said as to the *Age* of the marketable horse. It is pretty well understood that colts suitable for heavy harness do not attain maturity and maximum strength until they reach the age of five or six years, and the ordinary purchaser will prefer the six-year-old horse. From seven to 10 years the horse is at his best. While some horses hold their good qualities and are serviceable up to an extreme age of perhaps 20 years,—in the city horses rarely stand the strain of travel on hard pavements for many years without showing signs of usage sufficient to render them unsalable, except at small prices.

Horses kept for the show-ring and therefore not subject to usage on hard pavements exemplify the fact that there is little or no advantage *per se* in the young horse. Indeed, the horse may be at his best at the age of 10 years, and many of the blue ribbon winners of the past few years are even somewhat older.

The Saddle Horse.— Neglecting the subject of chargers and hunters, the former having but a limited market and being generally subject to army specifications, and the latter constituting too large a subject for discussion in an article of this character, and of more interest abroad, especially in England and Ireland, than in America, we shall say a few words of the saddle horse, presenting as briefly as possible some of the facts which should be borne in mind in supplying the market.

The conformation of the saddle horse will not be found to differ very materially from the carriage horse, and many private owners, who do not feel able or warranted in stabling horses for saddle purposes only, will find a combination horse for saddle and harness use a possi-

bility. A saddle horse is not improved in gait by being harnessed to a vehicle, particularly a heavy one, in fact is impaired thereby, but moderate driving to light vehicles will not incapacitate him wholly for the saddle.

In a "park hack" we should look for somewhat substantial conformation. As in a carriage horse, depth of girth should be sought and the back should be short, all the distance possible, however, separating the forelegs from the hind, the horse having much of his length in his shoulders and quarters. The croup should be long, so that, taken in combination with high and prominent withers and heavy shoulders, the saddle will have a good seat and be prevented from slipping forward. As in the hind legs reside the seat of propelling power the thighs should be long and muscular, and some people prefer the hocks well bent. The pasterns should be somewhat longer and have more spring than in the harness horse.

As in the harness horse the saddle horse should be about the same width in front as behind. Many will not object, however, to a horse slightly wider behind than in front, as the claim is made that, in a gallop, the hind legs will better pass outside of the forelegs; but, under no conditions should the horse be wider in front than behind. He should have a moderately long and upright neck and a prominent crest, as this is the muscle that supports his head, and the neck should be arched. With this combination a horse will usually carry his head erect without support from the reins, and the rider will have better control and feel that he has something in front of him.

The manners of a saddle horse is an element worthy of particular notice. Besides the qualities and disposition valuable in a harness horse, primarily he must possess a high degree of intelligence and be absolutely fearless; and he needs a further education to make him "bridle wise." By this term is indicated response to the slightest pressure of the rein on either side of the neck, so that the horse turns readily by the lateral movement of the rein hand. This allows the rider one hand free for use or emergency.

As to gait and action, the horse should have a fast walk, so that when ridden in company he will keep up without breaking into a jog. The trot should be even, springy and regular, so as not to jolt the rider. Extreme action is not a necessary feature, but the horse should possess enough action to be noticeable in company; and high action is not a detriment if unaccompanied by pounding. An easy canter and gallop are necessities, and particularly is this true of the horse intended for long rides or to be used in the country. These gaits should be accomplished with a maximum of forward motion and a minimum of rocking.

Types and sizes of saddle horses vary greatly according to personal taste and the weight to be carried. Some desire a short-legged, thick-set cobby horse for weight-carrying, while those of lighter build may prefer a taller horse of less substance and more speed. Above all things the horse should be free and willing, as no man desires, or will tolerate, a horse needing constant urging.

Breeding.— A word or two as to breeding may not be inappropriate, as the requirements of the market are so exacting that every breeder should take them into consideration, in order to produce and raise as large a percentage of marketable horses as possible.

Much has been written upon the subject of horse breeding and genealogy in America, and careful investigation reveals much shallow erudition. The results of recent research have shed sufficient light upon this subject to show that much of the published matter as to the ancestry of the American trotter will not bear close investigation. Heretical as it may seem, the history and origin of the Hambletonian strain of blood, which for years has been held in high esteem among breeders throughout the country, we believe is open to reasonable doubt as to its authenticity. It does not seem unlikely that some of the breeders, in their desire to create a lineage for their horses, drew on their imagination for the breeding of the ancestors. After many years of assumption that the published facts were correct, grave doubt is now cast upon the breeding of some of the original stock. Perhaps, therefore, the less we attempt to demonstrate results by referring to the lineage of the standard bred trotting horse the safer.

Of the other breeds of this country perhaps the best known are the Morgans and Clays, but generally speaking, such numerous and often careless crosses have been tolerated that these breeds in anything like purity of blood have mostly disappeared. In the author's opinion, up to a recent date, the breeder in America has sought speed to the detriment of action, even going so far as to make conformation a secondary element.

A word should be said about the Hackney. Much confusion has resulted temporarily, and probably only temporarily, from the placing on the market of so-called Hackneys, which are such only in conformation and not in the action and speed which are characteristic of the Hackney of honest blood. This breed lends itself exceedingly well to the requirements of the heavy harness horse when proper individuals are used in the stud. Although at present there are but few such individuals in this country, the Hackney dates back in England to the 18th century. It was originally a cross between the shire or English cart horse, an animal somewhat coarse but of much substance, power and action, and the sleeker thoroughbred of delicate conformation and high strung temperament. So well has this breed been cultivated, to the elimination of the coarser individuals by a few reputable breeders in this country, that it is not difficult for the careful judge to discriminate.

Recently, American breeders have achieved extremely satisfactory results by crossing hackney stallions with clean-limbed, nicely turned trotting-bred mares, and while this cross is one that breeders claim should not be carried beyond one generation for fear of the infusion of cold blood in the offspring, a single cross certainly produces a large percentage of good marketable stock. This cross commonly combines high action and much substance with speed and breedy appearance.

As most scientific breeders now acknowledge, the main fact of all breeding is that it is a matter primarily of individuals, good lineage counting for little in the produce if the breeding stock do not themselves fill all the requirements

desired. Not only should care be taken to use proper individuals, but if a slight fault exists in either parent — no horse being absolutely perfect — the other should be selected especially proficient in what the one lacks.

Back of the standard bred trotting horse, Morgan, Hackney and French coach horse — another imported breed — stand practically the same Arabian ancestors, and as all are to-day bred with one end in view, the choice of one breed as against the others is a matter of selecting the individual best filling requirements.

If the main purpose be to breed for that market which is the most profitable, that of the heavy harness horse, it seems to the author that, instead of horses becoming standard by performance on the track if they became standard by performance in the show-ring all the qualities desired as well as speed would be more properly conserved. Of course, many practical difficulties, some of which would defeat the very ends sought, stand in the way of such a movement unless it were conducted by the government. A stud book formally conducted by the government and authentically recording the lineage and performances of stock, so that the history of a strain and the results of crosses might be generally published and read, would be of immense value to the horse breeder and to the government itself by raising the quality and value of the horses raised both for domestic use and export.

An interesting commentary on the subject of the harness horse and an evolution well worth notice is the gradual elimination of the unreliable small dealer in the metropolis; in fact, the market is fast falling into the hands of the comparatively few reputable dealers who endeavor to conduct their business on broad commercial lines. The purchasing public are beginning to recognize that it is best for their interests to patronize such dealers as can rather afford to take a loss on an unsound or unsafe animal by giving him away than to sell him under a misrepresentation and make a financial gain at the expense of reputation. This fact is not only an assurance that the interest manifested in the horse in our large cities will not decrease, but the business being in good hands that many who have in the past been slow to venture into this field of pleasure and sport can now enter into it as beginners without a long, unsatisfactory and expensive experience as a preliminary. See also Horses, American Thoroughbred.

Arthur Man,
Sec'y Standard Coach Horse Co., New York.

Horses, Trotting and Pacing. The harness racing horse has two gaits, namely, the trot aand the pace. They were both originally the connecting link between the walk and the gallop, but by development and careful training have come to take the place of the latter so far as extreme speed in harness is concerned. The term "diagonal gait" is applied to trotting because the horse employing it raises simultaneously a front and hind foot at opposite sides of the body. In pacing the front and hind feet on the same side move together, and this is best expressed as the "lateral gait." No one has yet been able to explain why a horse goes at one or other of these gaits when urged from the walk and guided by the rein to keep from the gallop.

The history of harness racing in America is practically contemporaneous with that of the Republic of the United States. After the Revolution the development of speed in the horse had its attractions here as in Europe. At first the running gait was the only one considered, but the importation of an English sire called Messenger marked the beginning of a new era. He was brought over in 1788 and landed at Philadelphia. Though descended from stock that inclined to the gallop and practically a thoroughbred, this horse was more inclined to the trot. What is more remarkable he transmitted this habit or instinct to so marked a degree that he made a great reputation in the New World through the superiority of his progeny over all other breeds. So "Imported Messenger," as he was popularly known, was the patriarch of the American trotter, and nearly all of the immense troop of harness racers in this country to-day trace descent to him. His death in 1808 near Oyster Bay, N. Y., was looked upon as a national calamity, and he was buried with military honors, the funeral being attended by prominent horsemen from all the neighboring States. As this horse was the founder of a notable family and represents a type in some respects separate and distinct from others of the *genus equus* it seems unfortunate that no portrait or drawing of him was ever made. There is a pen picture which in some measure atones for this, and is worth quoting. It describes Messenger as of a gray color, standing full 15 hands 3 inches in height, with a thin mane and tail, ears larger than most well bred horses, but erect and lively.

At the time of Messenger's death the limit of speed at the trot was in round numbers a mile in three minutes. The saddle was chiefly in vogue for this gait as well as running, but the employment of a vehicle with two wheels followed the building of better roads. According to J. H. Wallace, an authority on the thoroughbred, a chestnut horse trotted at Philadelphia in a sulky 25 Aug. 1810, one mile in 2:48½ for $600. The horse was fourteen years old and barely 15 hands high. There is an earlier feat now accepted as authentic of a horse called Yankee, trotting a mile in 2:59 in 1806 on Harlem Lane, a favorite driving place for New Yorkers. The breeding of these first champions of the sulky remains in obscurity, but it was not long before the descendants of Imported Messenger began to do greater things. Topgallant, who is credited with three miles in 8:11 and easily the best trotter of his day, was inbred to Messenger, his sire and dam both being by the potent English stallion. Screwdriver, who went three miles to saddle in 8:02 a year before this, was another of the stars descended from Messenger, as was Dutchman, another long distance trotter, who went his three miles under saddle in 7:32½; but the most famous of the Messenger brood in the nearer generations was Lady Suffolk. She was the first queen of trotters, her reign being a long and undisputed one from 1838 to 1852. She enjoys the special distinction of being the first trotter to score as fast as 2:30 for a mile in harness. Following Lady Suffolk there were a few lesser lights that improved slightly on her best record, but her real successor as a conqueror of time was Flora Temple. She was foaled in 1845, her turf career

beginning in 1852. Five times this wonderful mare reduced the figures that represented the speed limit, her greatest effort being 2:19¾. Then came the mighty Dexter, who reduced the record to 2:17¼. His public career was cut short when Robert Bonner purchased him and took him to New York for his private driving on the road. Goldsmith Maid came out in 1871 and clipped a fraction from Dexter's mark. She was foaled in 1857, made her debut at 10 years and continued to fill engagements in races and against time up to 1877. Rarus managed to improve Goldsmith Maid's record a trifle during a very creditable career. The gelding St. Julien eclipsed him a year after by a full second. Then a new queen appeared in Maud S., and between this fleet pair was a lively duel for the championship. The figures were improved by fractions of a second until the mare reached 2:10¾ in 1880, which proved too much for the gelding. After his surrender another candidate appeared in Jay Eye See. Meantime Maud S. had got down to 2:10¼, but Jay Eye See enjoys the distinction of being the first to touch the even 2:10. This was in 1884, and then the mare showed that she was the better horse by compassing the track in 2:09¾, and again in 2:08¾.

The greatest mechanical aid to the harness horse that has yet been devised came into use during 1892. This was the application of the ball-bearing axle first applied to the bicycle, with the pneumatic tire and a wheel of about 28 inches diameter. Its first public trial was in a race at Worcester, Mass., early in May, where its manifest advantage enabled a slow horse to fairly play with a field of faster competitors. None of the prominent trainers had seen this new contrivance, and it was not until well along in July when they awoke to a full realization of its merits. The writer was privileged to see and try this sulky with its frictionless gear before it had come into general use, and on exploiting it with a conservative opinion that a horse could go at least two seconds faster than if hitched to the high wheel sulky, was informed by Budd Doble, the leading reinsman of that day, that he was the victim of a hoax. Less than three months after this same Doble had driven Nancy Hanks to one of these smooth running machines a mile in 2:04, or nearly five seconds faster than the record of Maud S. This material reduction was only the beginning of a new era in speed, as four other trotters have taken advantage of this appliance and earned the championship in turn. Alix only clipped a quarter of a second from the mark set by Nancy Hanks, but she did this after a hard race campaign that took away from her real ability. It was six years before this resolute overworked mare had to surrender the crown, when in 1900 the Abbot trotted in 2:03¼. He had previously won his spurs in several creditable races, but his successor and conqueror, Cresceus, proved to be a much more remarkable representative of his kind. Starting at three years this Hercules among trotters met and defeated older and more seasoned campaigners in his colthood, scoring 2:11¼ in the eighth heat of a winning race. Then each successive season found Cresceus able to add to his laurels until in 1901 he earned the championship twice. His record of 2:02¼ was followed by the famous match against The Abbot at Brighton track, Brooklyn, N. Y., 15 August, when, in the presence of an immense crowd, many of whom came hundreds of miles to see this battle of the giants, Cresceus was the victor. It was no light task at first, as The Abbot forced him to go in 2:03¼, the fastest mile by nearly two seconds ever scored in a trotting race. Besides these feats Cresceus has lowered many other records, including the one for two miles which he placed at 4:17 late in 1902. During the season of 1903 he again battled against time, and after his previous championship record had been several times beaten by Lou Dillon and Major Delmar this stout warrior trotted in 1.59¾ at Wichita, Kan., in October 1903.

Before this great feat his star was momentarily eclipsed by the advent of the long expected and much desired two-minute trotter. So suddenly has this new marvel appeared, and so rapidly has she reached the goal that hitherto seemed unattainable that the world at large cannot fully appreciate the merit of what Lou Dillon has accomplished. To begin with, she is the youngest of all the champions, being but five years old. What is even more remarkable, her turf life extends over little more than 12 months, and up to last June she had never filled a public engagement. Yet within a few weeks this marvelous mare has smashed records and on 22 Aug. 1903 she electrified the country by a mile in two minutes. This was done over the track at Readville, near Boston, where six years before the pacer Star Pointer scored the first mile ever made faster than "even time." An analysis of Lou Dillon's unparalleled flight for a trotter shows that she was rated with great skill. At the Brighton track just a week before she had gone a first quarter in 28¾ seconds, and a half mile in 59 seconds, a killing rate, which destroyed any chance she had of finishing in time to break the record. Profiting by this experience her driver and those who handled the two gallopers hitched to separate carts that accompanied her as pace makers, did much better work at Readville. This is shown by the time at the various quarters, which was 30¼, 30½, 30¼, and 29 seconds, respectively. While a full meed of praise is always due to the man or horse that does something better than what has previously been achieved, it is only fair to state that Lou Dillon has enjoyed special advantages in her preparation for record breaking. She was first trained in the winter of 1902 on the track at Pleasanton, California, her native State, and on the death of her breeder and owner this year was brought to Cleveland and sold at auction. The purchaser, C. K. G. Billings, of Chicago, got a rare bargain at $12,500, and being strictly an amateur he promptly canceled all engagements previously made for this promising mare. She then received special training for miles against time, and not only astonished the world by her mile in even time at Boston, but a few days later drew the old-style sulky with high wheels, in 2:05 at Cleveland, clipping three seconds and three quarters from the record Maud S. made nearly 20 years before. Later on, at Memphis, Lou Dillon added to her fame by another mile in 1:58½ to sulky, and one to wagon in exactly 2 minutes. She also defeated Major Delmar in a race for the Memphis Gold Cup, and being only in the heyday of her power,

it is within the realm of possibility that she will pass the mark for pacers. This now stands at 1:56¼, made by Dan Patch at Memphis, 22 October 1903.

The following table gives the names of all the record makers among the trotters, and shows how the figures have been reduced from 2:30 to 2:00:

Lady Suffolk, gr. m. foaled 1833, by Engineer 2d, dam by Don Quixote. Driven by David Bryan, Beacon Course, Hoboken, N. J., Oct. 13, 1845, 2:29½.

Pelham, b. g. foaled 1837, pedigree not traced. Driven by William Whelan, Centreville, N. Y., July 2, 1849, 2:28.

Highland Maid, b. m. foaled 1847, by Saltram; dam Roxanna, by Hickory. Driven by F. J. Nodine, Centreville, N. Y., June 15, 1853, 2:27.

Tacony, ro. g. foaled 1844; by Sportsman; dam not traced. Union Course, N. Y., July 14, 1853, 2:27.

Flora Temple, b. m. foaled 1845, by Bogus Hunter; dam Madam Temple, by Terry Horse. Driven by Hiram Woodruff, Union Course, East New York, N. Y., Sept. 2, 1856, 2:24½.

Flora Temple. Driven by James D. McMann, Centreville, N. Y., Aug. 9, 1859, 2:23½.

Flora Temple. Driven by James D. McMann, Centreville, N. Y., Aug. 9, 1859, 2:22.

Flora Temple. Driven by James D. McMann, Cincinnati, Ohio, Oct. 7, 1859, 2:21½.

Flora Temple. Driven by James D. McMann, Kalamazoo, Mich., Oct. 15, 1859, 2:19¾.

Dexter, br. g. foaled 1858, by Hambletonian; dam Clara, by American Star. Driven by Budd Doble, Riverside Park, Boston, Mass., July 30, 1867, 2:19.

Dexter. Driven by Budd Doble, Buffalo, N. Y., Aug. 14, 1867, 2:17¾.

Goldsmith Maid, b. m. foaled 1857, by Alexander's Abdallah; dam Ab. by Abdallah. Driven by Budd Doble, Milwaukee, Wis., Sept. 6, 1871, 2:17.

Goldsmith Maid. Driven by William H. Doble, Mystic Park, Boston, Mass., June 9, 1872, 2:16¾.

Occident, br. g. foaled 1863, by Doc; dam Mater Occidentis, pedigree not traced. Driven by George Tennet, Sacramento, Cal., Sept. 17, 1873, 2:16¾.

Goldsmith Maid. Driven by Budd Doble, East Saginaw, Mich., July 16, 1874, 2:16.

Goldsmith Maid. Driven by Budd Doble, Buffalo, N. Y., Aug. 7, 1874, 2:15½.

Goldsmith Maid. Driven by Budd Doble, Rochester, N. Y., Aug. 12, 1874, 2:14¾.

Goldsmith Maid. Driven by Budd Doble, Mystic Park, Boston, Mass., Sept. 2, 1874, 2:14.

Rarus, b. g. foaled 1867, by Conklin's Abdallah; dam Nancy Awful, by Telegraph. Driven by John Splan, Buffalo, N. Y., Aug. 3, 1878, 2:13¾.

St. Julien, b. g. foaled 1869, by Volunteer; dam Flora, by Harry Clay. Driven by Orrin Hickok, Oakland, Cal., Oct. 25, 1879, 2:12¾.

Maud S., ch. m. foaled 1874, by Harold; dam Miss Russell, by Pilot Jr. Driven by W. W. Bair, Rochester, N. Y., Aug. 12, 1880, 2:11¾.

St. Julien. Driven by Orrin Hickok, Rochester, N. Y., Aug. 12, 1880, 2:11¾.

St. Julien. Driven by Orrin Hickok, Hartford, Conn., Aug. 27, 1880, 2:11¼.

Maud S. Driven by W. W. Bair, Chicago Driving Park, Chicago, Ill., Sept. 18, 1880, 2:10¾.

Maud S. Driven by W. W. Bair, Homewood Park, Pittsburg, Pa., July 13, 1881, 2:10½.

Maud S. Driven by W. W. Bair, Rochester, N. Y., Aug. 11, 1881, 2:10¼.

Jay Eye See, bl. g. foaled 1878, by Dictator; dam Midnight, by Pilot Jr. Driven by Edwin Bither, Providence, R. I., Aug. 1, 1884, 2:10.

Maud S. Driven by W. W. Bair, Cleveland, Ohio, Aug. 2, 1884, 2:09¾.

Maud S. Driven by W. W. Bair, Lexington, Ky., Nov. 11, 1884, 2:09¼.

Maud S. Driven by W. W. Bair, Cleveland, Ohio, July 30, 1885, 2:08¾.

Sunol, b. m. foaled 1886, by Electioneer; dam Waxana, by Gen. Benton. Driven by Charles Marvin, Stockton, Cal., Oct. 20, 1891, 2:08¼.

*Nancy Hanks, br. m. foaled 1886, by Happy Medium; dam Nancy Lee, by Dictator. Driven by Budd Doble, Chicago, Ill., Aug. 17, 1892, 2:07¼.

Nancy Hanks. Driven by Budd Doble, Independence, Ia., Aug. 31, 1892, 2:05¼.

Nancy Hanks. Driven by Budd Doble, Terre Haute, Ind., Sept. 28, 1892, 2:04.

Alix, b. m. foaled 1888, by Patronage; dam Atlanta, by Attorney. Driven by Andy McDowell, Galesburg, Ill., Sept. 19, 1894, 2:03¾.

The Abbot, b. g. foaled 1893, by Chimes; dam Nettie King, by Mambrino King. Driven by Ed. Geers, Terre Haute, Ind., Sept. 25, 1900, 2:03¼.

Cresceus, ch. h. foaled 1894, by Robert McGregor; dam Mabel, by Mambrino Howard. Driven by George H. Ketchum, Cleveland, Ohio, July 26, 1901, 2:02¾.

Cresceus. Driven by George H. Ketchum, Columbus, Ohio, Aug. 2, 1901, 2:02¼.

Lou Dillon, ch. m. foaled 1898, by Sidney Dillon; dam Lou Milton, by Milton Medium. Driven by Millard F. Sanders, Readville, Mass., Aug. 24, 1903, 2:00.

Lou Dillon. Driven by M. F. Sanders to high wheel sulky, Cleveland, Ohio, September 12, 1903, 2:05.

Cresceus. Driven by George H. Ketchum, Wichita, Kan., Oct. 19, 1903, 1:59¾.

Lou Dillon. Driven by M. F. Sanders, Memphis, Tenn., Oct. 24, 1903, 1:58½.

*First champion mile to bicycle sulky.

The progress and development of the lateral or pacing gait has kept side by side with trotting. Before Lady Suffolk had opened the door for the 2:30 list, the pacer Drover had gone a mile in 2:28. For over a century the lateral gait has kept a second or more ahead of the diagonal one. Dividing the century, since speed in harness for a mile was first considered, into two decades we are able to compare the two gaits and note the progress of each by the following table. The names of pacers are in italics:

	1800-1810.		
Yankee, b. g.		Harlem, N. Y.	2:59
	1810-1820.		
Boston Horse, ch. g.		Philadelphia, Pa.	2:48½
Bolton Blue, bl. g.		Jamaica, N. Y.	3:00
	1820-1830.		
Topgallant, b. g.		1829—3 miles	8:11
Bowery Boy.		1829—2 miles	5:04½
	1830-1840.		
Edwin Forrest, bl. g.	(to saddle)	1834	2:31½
Sally Miller, b. m.		1834	2:37
Drover, b. g.		1839	2:28
	1840-1850.		
Lady Suffolk, gr. m.		1845	2:29½
Moscow, b. g.		1845	2:30
Pelham, b. g.		1849	2:28
James K. Polk, ch. g.		1845	2:27
	1850-1860.		
Flora Temple, b. m.		1859	2:19¾
George M. Patchen, b. h		1859	2:26¼
Ethan Allen, b. h.		1858	2:28
Pocahontas, ch. m.		1855	2:17¼
Pet, ro. g.		1852	2:18½
	1860-1870.		
Dexter, br. g.		1867	2:17¼
Goldsmith Maid, b. m.		1869	2:19½
George Wilkes, br. h.		1868	2:22
George M. Patchen, b. h.		1860	2:23½
Ethan Allen, b. h.		1860	2:25½
Billy Boyce, b. g.	(to saddle)	1868	2:14¼
	1870-1880.		
St. Julien, b. g.		1879	2:12¾
Rarus, b. g.		1878	2:13¼
Goldsmith Maid, b. m.		1874	2:14
Smuggler, br. h.		1876	2:15¼
Sleepy Tom, ch. g.		1879	2:12¼
Rowdy Boy, bl. g.		1879	2:13¾
	1880-1890.		
Maud S., ch. m.		1885	2:08¾
Jay Eye See, bl. g.		1884	2:10
St. Julien, b. g		1880	2:11¼
Axtell (3 yrs.), b. h.		1889	2:12
Maxie Cobb, b. h.		1884	2:13¼
Phallas, b. h.		1884	2:13¾
Johnston, b. g.		1884	2:06¼
Gold Leaf (4 yrs.), ch. m.		1889	2:11¼
Little Brown Jug, b. g.		1881	2:11¾
Brown Hal, br. h.		1889	2:12½
	1890-1903.		
Lou Dillon, ch. m.		1903	2:00
Cresceus, ch. h.		1903	1:59¾
Major Delmar, b. g.		1903	2:00¼
Cresceus, ch. h.		1901	2:02¼
The Abbot, b. g.		1900	2:03¼
Alix, b. m.		1894	2:03¾
Nancy Hanks, br. m.		1892	2:04
Azote, b. g.		1895	2:04¾
Directum, bl. h.		1893	2:05¼
Stamboul, br. h.		1892	2:07½
Arion, b. h.		1893	2:07¾
Kremlin, b. h.		1892	2:07¾
Martha Wilkes, b. m.		1892	2:08
*Lou Dillon,		1903	2:05

*Sunol, b. m.	1891	2:08¼
*Palo Alto, b. h.	1891	2:08¾
*Direct.	1891	2:06
Dan Patch, br. h.	1903	1:56¼
Prince Alert	1903	1:57
Star Pointer, b. h.	1897	1:59¼
John R. Gentry, b. h.	1896	2:00½
Prince Alert, b. g.	1902	2:00
Joe Patchen, bl. h.	1897	2:01¼
Robert J., b. g.	1894	2:01½
Mascot, b. g.	1892	2:04
Hal Pointer, b. g.	1892	2:04½
Direct, bl. h.	1892	2:05½

*Made to high wheel sulky.

In the matter of breeding, reference has already been made to the fact that the imported horse Messenger, who played so important a part in the generation of harness horses, was of running stock. His descendants that have influenced this type more than any others were Rysdyck's Hambletonian and Mambrino Chief. The former was the son of Abdallah, whose sire Mambrino was by the English Messenger. This same Mambrino was also the grandsire of Mambrino Chief, so that his blood more than that of any of the get of Messenger has been potent in the production of the numerous fast exponents of the two harness gaits. Bellfounder, another English horse, brought over to Boston in 1823, had also much to do in founding the American trotter. His origin seems to be obscure, but he was probably of the type known as the Norfolk Roadster, from which the hackney has sprung. The most famous of his progeny in the first generation was the Charles Kent Mare, the dam of Rysdyck's Hambletonian. At least 75 per cent of what are called "Standard bred" trotters trace to this sire, and as none of the rest of Abdallah's get amounted to much there is every reason to believe that this daughter of imported Bellfounder had the inherent quality which made the Hambletonian strain so valuable. Every one of the champion trotters that succeeded Flora Temple are descended directly from this horse, Dexter himself being one of his sons.

To show how the "fast list," as it is called, has increased since the day of Lady Suffolk and Drover, it may be stated that up to the close of 1902 there were 18,548 trotters with records of 2:30 or better, and 9,713 pacers credited with marks of 2:25 or better. In each case these figures represent what is known as "standard" speed at the respective gaits. See HORSE-RACING.

CHARLES ARNOLD MCCULLY,
Secretary New York Trotting Association.

Horseshoe Falls. See NIAGARA FALLS.

Horstmann, Ignatius F., American Roman Catholic prelate: b. Philadelphia, Pa., 16 Dec. 1840. In 1857 he was graduated from the Central High School, and afterward attended Saint Joseph's College, Philadelphia. Desirous of studying for the priesthood, he went to the Preparatory Seminary of Glen Riddle in 1859, and in 1860 entered the American College, Rome, where, after completing his course, he was ordained priest by Cardinal Patrizzi, 10 June 1865. In 1866 he took in Rome the degree of doctor of theology, and in the same year returned to Philadelphia and accepted the chair of mental philosophy in the diocesan seminary of Saint Charles Borromeo, continuing to hold the same position in the new seminary at Overbrook. In 1877 he became pastor of Saint Mary's Church, Philadelphia, and in 1885 was named chancellor of the archdiocese. On 29 Nov. 1891 Leo XIII. appointed him to the vacant see of Cleveland, Ohio, and he was consecrated bishop 25 Feb. 1892. The diocese now (1905) has a Catholic population of 300,000; 296 priests; 287 churches; 1 seminary; 166 parochial schools; 7 orphanages; 9 hospitals, and several charitable institutions.

Horticulture, the art of growing plants, flowers, and vegetables for aiding in sustaining life, maintaining health, and for ornamental purposes. While as an art it is the highest type of work which pertains to the cultivation of the soil, its principles are based on many branches of science. Plant physiology, chemistry, and physics play important roles in every branch of this work and the application of their laws, directly and indirectly, constitutes the more essential features of the art.

Adopting Bailey's plan of division (Annals of Hort., 1891), horticulture may be discussed under four heads: (1) Pomology or fruit-growing; (2) olericulture or vegetable-growing; (3) floriculture or the growing of flowers and plants for ornamental and other purposes; (4) landscape gardening, or the growing of plants and the grouping of them for the purpose of enhancing the beauty and value of landscape.

In no country in the world has pomology or fruit-growing made such advances as in America. In the early history of the country fruit-growing was of necessity given minor attention. The clearing of the wilderness and the opening of new territory always involve attention to purely utilitarian projects first; hence there is little record of systematic or extensive fruit planting in this country prior to the beginning of the 19th century. Naturally, fruit was planted by the very earliest settlers, but this was done more as an effort to supply individual needs than as a means of profit. Thus, in the middle of the 16th century the early Spanish settlers made plantings of fruits in Florida and elsewhere, and early in the 17th century the English did considerable in the matter of planting fruits in Maryland and Virginia and elsewhere in what is now the eastern United States. Grapes especially received early attention, and numerous attempts were made to establish vineyards of European sorts in different parts of America. None of these early attempts, however, was very successful; and when it was found that the European kinds were so poorly adapted to the conditions of the regions then occupied by settlers, attention was turned to the improvement of our native forms. There is probably no more striking example of what can be accomplished by careful horticultural work than the results secured in the improvement of our native forms of American grapes. From the wild types so abundant in our native woods have come practically all of the fine table and wine varieties that are grown in the United States and Canada east of the Rocky Mountains to-day. The work mentioned did not involve any questions of fruit-growing on an extensive scale such as we find now. Nearly every farm in those early times had fruit grown upon it, partly for home use and partly for sale if there was produced more than was required for home consumption. With varying changes caused by the increase in population, the improvement in living conditions, and the demand for more fruits, fruit-growing progressed, until about 50 or 60 years ago it began to take on a new aspect. It

was at this time that fruit culture in its broadest sense showed marked development as an independent commercial industry; hence in looking back we find the beginning of such important lines of work as commercial apple, pear, peach, and grape growing, commercial small-fruit-growing, etc. With the advancement of this work came the gradual development of horticultural sections or the localization of horticultural work in certain special localities where experience had shown that the best results were secured in the matter of production, marketing, etc. The peach districts of Delaware, Maryland, New Jersey, Michigan, Connecticut, and Georgia, the grape districts of New York and Ohio, and the apple region of western New York are examples of this movement toward centralization or specialization. With the further increase of population, especially in cities, the improvement in transportation facilities and better knowledge as to climatic and soil conditions, more and more centralization and specialization resulted. With the growth of the fruit interest of the Pacific coast and of Florida and other portions of the South, new features were added to the entire work. Thus has been developed commercial pomology as we find it to-day in this country, involving (1) the production of fruits of high quality, and (2) the harvesting, packing, storing, and transportation of such fruits to market so as to secure the highest prices with a minimum expenditure of outlay for the work. Still further involved in these questions are, of course, other important ones, such as tillage, pruning, spraying, etc., which it is not necessary to discuss here.

According to the figures of the 12th census, the value of all fruits produced in the United States for 1899 was, in round numbers, $131,000,000. Of this amount the orchard fruits had a value of $83,000,000, grapes $14,000,000, small fruits $25,000,000, and sub-tropical fruits $8,000,000. The great fruit districts are shown by the fact that of the $131,000,000 of fruit produced, California furnished $28,000,000 worth, New York $15,000,000, Pennsylvania $10,000,000, Ohio $9,000,000, Michigan $6,000,000, Illinois $5,500,000, Missouri $4,500,000, and Indiana $4,500,000, all in round numbers. The exportation of American fruits to foreign countries is rapidly assuming important proportions. For the fiscal year 1902 the total value of fresh, dried, and canned fruits and nuts exported from the United States was $8,719,344. With the rapid development of fruit-growing in this country there has been felt the need for careful systematic studies of the many varieties in cultivation and offered for cultivation. Systematic pomology, therefore, is an important branch of the work, and is being given special attention by the General Government and by the various State experiment stations and agricultural colleges.

Olericulture or vegetable gardening is an important branch of horticulture, and from time immemorial the art has been practised both for pleasure and for profit. Vegetable gardening proper does not include the growing of such crops as Irish potatoes, sweet potatoes, sugar-beets, shell beans, etc., where the same are produced in large quantities and are handled as ordinary farm produce. Vegetable gardening proper, as we understand it, embraces market gardening, truck-growing, and the growing of vegetables under glass. No sharp lines can be drawn between any of these industries, as they merge in many cases one into the other. Growing vegetables, as already indicated, has long been practised and was a feature in nearly every home in the early days of the country. With increasing population and the consequent demand for more luxuries and more variety, gardens began to expand, and thus was developed the work of market gardening in the vicinity of the larger cities. Although market-gardening and truck-farming merge closely into each other, market-gardening proper, as a rule, is held to apply to the growing of vegetables for the local market, while truck-growing and truck-gardening imply the shipment of produce to a considerable distance, either by rail or in other ways. Truck-growing proper, on a large commercial scale, has developed practically within the last 25 years and owes its rapid growth largely to the improved transportation facilities and the rapid extension of railroads north and south along the Atlantic coast. The trucking interests proper were an outgrowth from the market garden work in the vicinity of New York. Gradually this work was pushed out to Long Island, and thence it spread to the lands adjacent to Chesapeake Bay, where fast sailing boats made it possible to bring the produce quickly into the markets of the larger cities. The work at first centralized at points where good harbors made regular steamship service available, but rapidly extended south along the lines of the Atlantic coast railways, and now has reached important developments in Virginia, North Carolina, South Carolina, Florida, and other Southern States. There is also another important truck region which has developed along the lines of the Illinois Central Railway in the Mississippi Valley, the crops grown in this region being shipped to the cities north and from them disseminated to large towns and cities, both east and west. More recently there have been large developments in this line in eastern Texas and southern and central California, each region now shipping early vegetables northward and eastward to the extent of thousands of carloads annually. The development of the winter growing of vegetables in the South and elsewhere has to some extent modified the methods of producing crops in the North, especially where glass is used. There is still, however, important work of this nature in progress in the vicinity of all large cities, particular attention being given to the growth of vegetables in greenhouses and under frames. According to figures secured by the writer in 1899, there were at that time 4,500,000 square feet of glass devoted to the growing of vegetables. The value of the establishments aggregated $2,250,000; the wholesale value of the annual product amounted to $2,250,000, and the retail value to $4,500,000. The number of men employed in this work — that is, the growing of plants under glass — was 2,250. According to the figures of the 12th census there were devoted to the growing of vegetables for market in 1899, 1,175,200 acres, and the market value of the product was $67,399,348. There were devoted to the production of vegetables for home use 940,370 acres, yielding a product valued at $46,477,087. This includes only miscellaneous vegetables, and does not cover such crops as Irish potatoes, sweet potatoes, onions, sugar-beets, etc. Thus it appears that, exclusive of glass, there were devoted to the growing of vegetables for the market and for

the home 2,115,570 acres, giving an annual product valued at $113,876,435.

The development of floriculture in America has been coincident with that of vegetable gardening and pomology, excepting, of course, that flowers, being more or less of a luxury, were the last to receive special attention. Flower gardens, to a certain extent, formed a part of nearly all the home surroundings of the early settlers. See article Floriculture in America.

Landscape gardening literally means the creation of landscape pictures with plants. The pictures may be formal or they may be natural; that is, they may deviate widely from the bits of beautiful scenery which nature so lavishly bestows, or they may attempt to copy these bits of nature or perchance improve upon them by modifying them to meet the immediate surroundings. The picture created may be a matter of taste. Hence, in one country and in one place we find extreme formality, grotesque figures, and various-colored foliage beds forming a part of these pictures, while monstrous forms carved from shrubs and evergreen trees may form another part. Again we see the true lover of nature copying as closely as possible nature's own landscape, which is, after all, true landscape gardening. A bit of lawn, a fringe of foliage, and a clustering group of trees may be all that is required to form this picture, but it is a natural picture, and if harmony is kept in view the results are always charming. The art has long been practised, and its various types and modifications are to be found in our public parks and in private grounds throughout the country. There has been a growing interest in landscape gardening in America in recent years, owing chiefly to the advanced ideas set forth by such men as Downing and Olmsted, who have done much to create an appreciation and love for the purely natural in this work. More recently a still broader conception has been given to landscape effort, and work in this direction has been made to cover important matters connected with the relation of landscape surroundings to buildings, the proper arrangement of roads, etc. Thus we have had developed the field of landscape architecture, which is a broader term than landscape gardening. The landscape architect makes a study of his problem and works out a scheme of operation involving everything that may be connected with it. The landscape gardener may be called upon to carry out part of this scheme, but the architect proper will also be involved.

The literature on horticulture is exceedingly voluminous, covering many writings and textbooks, special papers, reports, etc. The more important standard American pomological works are Downing's 'Fruit and Fruit Trees of America,' Barry's 'Fruit Garden,' and Thomas's 'American Fruit Culturist.' In vegetable culture, Henderson's 'Gardening for Profit,' Bailey's 'Forcing Book,' and Rawson's 'Market Gardener' are standard works. Of the American publications on landscape gardening may be mentioned: Downing, 'Landscape Gardening'; Parson, 'Landscape Gardening'; Long, 'How to Plant the Home Grounds'; Waugh, 'Ornamental Gardening.' The most useful work on horticulture recently issued is Bailey's 'Cyclopedia of American Horticulture,' published in four volumes, the last of which appeared in 1902.

B. T. Galloway,
U. S. Department of Agriculture.

Hor'ton, Robert Forman, English Congregational clergyman and author: b. London 18 Sept. 1855. He was educated at New College, Oxford, and in 1879 he was made a fellow of New College, and lecturer on history. In 1880 he became the pastor of the Congregational church at Hampstead, and in 1893 pastor of the Lyndhurst Road church there. In 1893 he delivered the Lyman Beecher lectures at Yale; in 1903 he was chairman of the Congregational Union of England and Wales. His writings include 'History of the Romans' (1885); 'Inspiration and the Bible' (1887); 'The Teaching of Jesus' (1895); 'Oliver Cromwell' (1897); 'Women of the Old Testament' (1897); 'The Commandments of Jesus' (1898); 'England's Danger' (1898); 'The Pastoral Epistles' (1901); 'The Trinity' (1901).

Horton, Samuel Dana, American publicist: b. Pomeroy, Ohio, 16 Jan. 1844; d. Washington, D. C., 23 Feb. 1895. He was graduated from Harvard in 1864, and from the law school in 1868, and also studied abroad. He began the practice of law in Cincinnati, but devoted himself mainly to the study of monetary questions, spending much time abroad; he was one of the first to advocate the establishment and maintenance of an international ratio between gold and silver. He was a recognized authority on all questions concerning coinage, was secretary of the international monetary conference at Paris in 1871, and a delegate from the United States at the conference of 1881; shortly before his death he went to Washington at the request of the administration for a conference concerning the financial situation. His writings include 'Silver and Gold and their Relation to the Problem of Resumption' (1876); 'The Silver Pound and England's Monetary Policy since the Restoration' (1887); 'The History of the Guinea' (1887); 'Silver in Europe' (1890).

Hosack, hŏs'ak, **David,** American physician and author: b. New York 31 Aug. 1769; d. there 23 Dec. 1835. He was graduated from Princeton College in 1789, and concluded his medical studies in Philadelphia in 1791. In 1795 he was appointed professor of botany in Columbia College. In 1796 the chair of materia medica was assigned to Hosack, who held it with that of botany until 1807, when he accepted the department of materia medica and of midwifery in the College of Physicians and Surgeons. He held at different times several public trusts, as physician to the New York hospital, and the Bloomingdale asylum, resident physician of the city of New York, etc. He was among the original projectors of the New York Historical Society, of the Horticultural Society, and of the New York Literary and Philosophical Society. He was the author of 'Annals of Medicine' (1793); 'Hortus Elginesis' (1808); and numerous papers on medical subjects.

Hosea, hō-zē'a, the first in order among the minor prophets of the Old Testament, but more probably the third in order of time. Nothing is known of his life, except what can be gathered from the introduction to his prophecies, namely, that he was the son of Beeri, and that his ministry belonged to the reigns of Uzziah,

Jotham, Ahaz, and Hezekiah, kings of Judah, beginning probably about the end of the reign of Jeroboam II., king of Israel. His prophecies are addressed almost equally to both kingdoms. His book was admitted into the canon after the Babylonish captivity. He has represented in the three first chapters of his book, the guilty violation of their covenant with God by an allegory, very common among the Hebrew poets, of a marriage covenant which the wife has violated, referring to the covenant which God had concluded with the Israelites. The remaining chapters treat of the same subject, under different figures, with reproaches, exhortations, and threats; he predicts the approaching exile of his countrymen, and the consoling promise of the final return of an improved people forms the conclusion of this prophetical book. He is remarkable for his laconic style, hastening from image to image, and from reflection to reflection. The stream of a powerfully excited fancy forces him irresistibly onward. Hence he does not exhibit the roundness, grace, and harmony which characterize the other prophets.

Hosiery, hō'zhėr-ĭ, a word properly applied only to the making of hose or stockings, but used as a general term for all kinds of knitted articles. The materials used for the purpose are cotton, linen, and wool, the last of which is sometimes mixed with cotton or silk. Silk is also frequently used alone. Since 1841 the Jacquard loom, and similar looms have been employed in the manufacture of articles of hosiery. See *Knitting; Textiles,* under KNIT-GOODS,

Hos'mer, Harriet, American sculptor: b. Watertown, Mass., 6 Oct. 1830. She early showed skill as a modeler in clay, and after receiving a general education studied anatomy in a medical college at St. Louis. Her first work, a reduced copy of Canova's Napoleon, was followed by an ideal head of Hesper (1852). She went to Rome in 1852 and studied under John Gibson, the English sculptor. About this period she produced ideal busts of Daphne and Medusa, and in 1855 completed her first life-size figure, Œnone. To the same year belongs Puck, which gained her a great reputation in the United States, and the next year she executed a Will-o'-the-Wisp. The statue of Beatrice Cenci in the public library of St. Louis was finished in 1857, and her colossal statue of Zenobia in 1859. Her next work was a statue of Benton, the Missouri statesman, a bronze cast of which was erected in Lafayette Park, St. Louis. Other works are: Sleeping Faun, exhibited at Dublin in 1865 and at Paris in 1867; a statue of the Queen of Naples as the Heroine of Gaëta; a monument to Abraham Lincoln; and Waking Faun.

Hosmer, James Kendall, American librarian and biographer: b. Northfield, Mass., 29 Jan. 1834. He was a professor in Antioch College, Ohio, and the University of Missouri, in 1874–92, was professor of English and German literature in Washington University (St. Louis, Mo.), and in 1892 became librarian of the public library of Minneapolis. Among his works are: 'The Color Guard' (1864), a record of experiences as a private in the Civil War; 'The Thinking Bayonet' (1865), a novel; 'History of German Literature' (1879); 'Life of Samuel Adams' (1885); 'Life of Sir Henry Vane' (1888); 'A Short History of Anglo-Saxon Freedom' (1890); 'How Thankful was Bewitched' (1894); and a 'Life of Thomas Hutchinson' (1896).

Hos'pital, an institution for the treatment of sick, injured or infirm persons, supported in most cases by voluntary contributions, but in special instances from the funds of the government, state or civic municipalities. Hospitals are of various kinds: medical; surgical; for the reception of incurables; for consumptives; for the deaf, dumb, and blind; for the aged and infirm; for the care and treatment of the insane; emergency and field hospitals for the care of wounded in battle, etc. Modern hospitals are so constructed and their interior is so arranged as to enable a limited staff of physicians and nurses to attend to the wants of the greatest possible number of patients with a view to the most speedy recovery.

The site selected for a hospital should be on high ground; the soil should be clean and dry, free from damp ravines and undrained marshy ground, and the drainage should be ample. If possible it should not be surrounded by other buildings than those belonging to the hospital itself. The structural arrangements should be such as to secure perfect, free circulation and sunshine. The size of the wards depends on the number of patients to be therein maintained and having a capacity of 3,000 cubic feet for each inmate. The disciplinary and economical disposition in a hospital requires that each nurse should have the patients allotted to her under constant observation and personal supervision and that the arrangements are so constructed that the greatest number of patients can be attended and nursed by a given number of nurses. From 20 to 32 beds have been taken as a basis for ward construction. In some hospitals there are wards of one and two beds for cases of unusual gravity. The general form of ward construction is governed by the question of renewal of air and the superficial area allowed to each patient, for on this depends the distance of the sick from each other, the facility of changing the beds, cleanliness and many other important features. In a ward 24 feet wide, with a window for every bed or two, a 7 foot 6 inch bed space along the outer walls is sufficient. That would give 90 superficial feet per bed, which must however be increased in pernicious fevers, surgery and lying-in cases. In the Herbert hospital the smallest allowance is 99 feet per bed. The ceilings should be 12 to 14 feet high. With a view to economize heat in winter and to keep the wards cool in summer the walls should be hollow and all walls ceiled. The walls should be of an impervious polished surface, easily cleansed with soap and water. All corners should be rounded off and no cracks are to be tolerated, since they fill with impurities. Plaster, wood, paint and varnish all absorb organic impurities. The safest arrangement for walls is plaster, lime-whited or painted, which should often be scraped off or renewed.

The floors and woodwork throughout should be of oak, closely jointed, oiled and waxed, rubbed and polished. Confine the woodwork to absolute necessity. The forms of windows must be adapted to facilitate the entrance of light, as a factor to promote health, to promote ventilation, to facilitate nursing and to allow the patient to read in bed. In order to give cheerfulness to the ward and to renew the air easily,

the windows should be inserted opposite each other; should extend to 2 feet 6 inches from the floor to within a foot of the ceiling. One cubic foot of window glass to every 50 or 55 cubic feet of space will afford a well lighted, cheerful ward.

The ward offices are those necessary for facilitating the nursing and administration, as the nurses' rooms, ward scullery, bath-rooms and lavatories.

They should all be well ventilated and lighted and all fittings finished in light color so that dirt can be at once detected. The nurses' room should command a view over the whole ward. The lavatory table should be constructed out of an impervious material, as slate or marble, with a row of sunk porcelain basins supplied with hot and cold water. The bathtubs should be porcelained iron. The toilets and urinals should invariably be placed against an outer wall, supplied with a siphon carrying a sufficient water capacity to thoroughly flush the basins. For the floor of these quarters, cement, marble or slate is preferable, and the walls are to be lined with glass, white-glazed tiles, marble, slate or Parian cement.

The administration building, that is, for offices, reception rooms, lodging the staff, operating rooms, kitchen, store-rooms, dispensary, etc., should always be subordinate to the question of the accommodation of the sick. In hospitals where a school is to be established, the necessary lecture rooms, laboratories and amphitheatre should be kept entirely separate from the sick; the morgue and dissecting rooms should be as far removed as possible. The consensus of professional opinion is opposed to the present plan of constructing large edifices for hospital purposes; that the benefits they confer are greatly diminished by the risk of hospital diseases — fevers of certain forms, erysipelas, pyæmia, etc., and which when once installed are most difficult and often impossible to eradicate. A system of cottage and hut construction, any of which could easily be destroyed and replaced, should the emergency demand, has been seriously advocated, but found impracticable because of the great expense and administrative difficulties. The profession to-day favors a system of construction known as the "pavilion plan," which can be called a compromise measure between the large block edifice and the cottage and huts. According to this system the wards are separate and distinct from the administration building and should be arranged to form pavilions, one story high, never more than two, and they should always surround the administrative blocks. This mode of construction is both applicable to large and small establishments. The Royal Infirmary of Edinburgh, the Herbert hospital of Woolwich, the New York hospital, the United States Marine hospital of San Francisco are among the best examples of the pavilion style. There should be free circulation of air between the pavilions, and the space between them should be exposed to the sunshine. The arrangements should be of a character to allow a covered communication between the wards, and each pavilion should have its own broad stairway.

The pavilion and general construction of the administrative building should be made quite subservient to the accommodation for the sick and should never interfere with the light and air of the wards.

Hospitals or asylums for inebriates, likewise hospitals for those addicted to the use of opium and other narcotics, have lately been established throughout the United States. Fever hospitals are maintained in all communities to secure isolation in infectious diseases, and hospital ships and floating hospitals are extremely valuable to promote complete isolation in cases of virulently infective disorders, such as smallpox (q.v.), etc. Children's hospitals are often provided with swimming tanks, indoor and outdoor playing, large ball and tennis grounds and in fact any and everything to promote healthy exercise and pastime for the inmates.

Military and naval hospitals, establishments for the care of sick and wounded soldiers and seamen, exist in all civilized nations. They are either temporary or permanent and if the former located in the immediate vicinity of the scene of operation. Hospital ships are ships fitted out as hospitals in all expeditions beyond the sea. They serve either as stationary hospitals or, if the sick accumulate sail home, or to the nearest station. See also QUARANTINE; RAILROAD HOSPITALS.

Hospitallers, charitable brotherhoods who devote themselves to tend the sick in hospitals. The name is specially applied to an order of knights, the Knights of Saint John. See ORDERS, RELIGIOUS.

Host, or **Hosta Sacra** (sacred host), in the liturgy of the Roman Catholic Church, the body of Christ present in the sacrifice of the Mass under the appearance of bread. The Latin word *hostia* denotes that which is offered in sacrifice; hence in the Mass, where the victim is the same who offered himself on the cross, "the cup" is no less the *hostia* than is "the bread"; but usage has sanctioned the appropriation of the word host to the latter. In the canon of the Mass, the priest, in offering the consecrated elements to God the Father, speaks of both the "bread" and the "cup" as *hostia*; and in the ancient Spanish missal (the Mozarabic) occurs the phrase "this host of bread and wine." But the word *hostia* is also employed to signify specially the bread before consecration; and this usage has its sanction in the Roman liturgy itself and in the rubrics of the Missale Romanum. In the rubric of the *ordo missæ* the altar-bread before consecration is called *hostia,* and after consecration it is called *hostia consecrata.* "Host" in the former sense, that is, the "altar-bread," is, in the Latin Church, a circular wafer made of fine wheaten flour mixed with water only, and it is unleavened. Usually the wafers are stamped either with an image of Christ crucified or with the letters I H S. They are of two sizes, a larger one which the celebrant himself receives (a host of this size is also reserved for the benediction (q.v.) of the Blessed Sacrament); and a smaller size for administration to those who may communicate at the Mass, or to the sick in their houses. The hosts destined for this use are kept in the pyx (called also *ciborium*), a silver vase gilt inside, and deposited in the tabernacle of the altar. As long as the host is thus reserved in the tabernacle the sanctuary lamp is kept alight before it. The Eastern churches in communion with the See of

Rome, except the Maronite and Armenian churches, retain the use of leavened bread in the Eucharist.

Hostage (French, *ôtage;* Latin, *obses;* Low Latin, *obstagius*), a person left as pledge or surety for the performance of the articles or conditions of a treaty. The taking or giving of hostages is now scarcely known in the relations of modern communities, but was formerly almost universal, and many questions in the law of nations arose out of the practice. Writers on international law have discussed how far the rights of conquerors extend over hostages, what circumstances may release them from their obligation, and what effect their escape will produce on the treaty proposed by the contracting parties. In modern civilized warfare hostages are not usually interchanged.

Hos'telry. See HOTEL.

Hot-bed. See HORTICULTURE.

Hot Springs, Ark., city and county seat of Garland County, and one of the most famous sanatoriums of the United States; in the southern centre of the State, 55 miles southwest of Little Rock and 397 miles from Saint Louis; on the Choctaw, O. & G., and Little Rock & H. S. W. R.R.'s. The location is 600 feet above sea-level and lies principally at the easterly base of the mountain complex known as the Ouachita Range, the nearby peaks of which are oftentimes called the Ozark Range — in a valley between two rocky and heavily wooded ridges called West Mountain and Hot Springs Mountain, 400 feet higher — and in its sheltered situation has a mild and pleasant climate. Lat. 34° N.; lon. 93° W. Through the valley runs the Hot Springs Creek starting two miles above; and into this the water from 47 hot mineral springs — originally 73, but many merged artifically or run dry — springing from vents in the gray volcanic tufa near the base of the Hot Springs Mountain on the east. Forty-four are in use or usable; the others rise in the bed of the creek. The former yield 830,000 gallons a day; contain large amounts of calcium and magnesium carbonates, and the presence of lithium, iodides and bromides, etc.; the total mineral matter in solution is between 275 and 280 parts per million and the results, as to the percentage composition of the mineral matter in each hot spring, are very much the same. The waters are prescribed for bathing and drinking and have remarkable curative properties. De Soto, it is said, sought to explore them as the veritable fountain of youth. The ordinary tub bath is the principal feature of treatment, but vapor, shower and plunge baths are also used. People suffering with consumption of the lungs; those afflicted with dilation of the heart; very old people, whose arteries are atheromatous; and paralytics, when their condition is the result of organic central lesions, should not bathe. Relief or cure may be expected in rheumatic, syphilitic, and numerous other conditions. The surgeon-general of the United States army, in an official circular of information issued by the War Department, says:

> The various forms of gout and rheumatism, after the acute stage, or inflammatory stage, neuralgia, especially when depending upon gout or rheumatism, metallic or malarial poisoning; paralysis, not of organic origin; the earlier stages of locomotor ataxia; chronic Bright's disease (the earlier stages only), and other diseases of the urinary organs; functional diseases of the liver; gastric dyspepsia, not of organic origin; chronic diarrhœa; catarrhal affections of the digestive and respiratory tracts; chronic skin diseases, especially of the squamous varieties, and chronic conditions due to malarial infection.
>
> In all forms of dyspepsia and in ulcers of the stomach and intestines the actual bathing which the diseased surfaces receive from the hot water drank materially aids in hastening cures.

As many as 90,000 patients and pleasure seekers visited here in 1902–3. The temperature of the springs varies from 97° to 147°. All issue from a space something over a quarter of a mile long and 200 to 300 feet up the slope, some 10 acres in all. By treaty with the Quapaw Indians in 1818 and by act of Congress in 1832, four sections (2,529 acres) became a reservation, and the springs are in the centre. Dunbar and Hunter of the Lewis and Clark expedition visited the place in 1804 and settlement was made in 1807. After 1832 numerous attempts were made to enter the lands, and title to property involved many years of contention and "shot-gun right." In 1870 Congress authorized suits against the United States in the court of claims. In 1876 title was held to be in the United States by the Supreme Court. Justice Field of the Supreme Court, in an opinion, said: "From the protracted litigation to which it has given rise the Hot Springs reservation is famous in the history of land titles of the country." And Justice Bradley: "The title to a well-known watering place in the State of Arkansas, called the Hot Springs, has been contested by a number of claimants for nearly half a century." In 1877 Congress created a commission to adjudicate squatter rights, giving right of purchase from the United States and to lay off the town. Under this act the Hot Springs were reserved by the United States to prevent monopoly or injury, and 911 acres are used as permanent parks. The government has expended nearly a million dollars in arching the creek, erecting the Army and Navy hospital (open to soldiers and sailors of the Civil War), and in developing and beautifying a system of parks not yet finished. These parks are covered with forest trees, and some are thoroughly fitted up for public enjoyment. Large sums have been spent on boulevards, walks, artificial lakes, landscape gardening, and handsome marble hot-water fountains scattered plentifully through the city. The grand entrance to Hot Springs Mountain, from Central Avenue, is a noble architectural feature, and the initial point of 15 miles of fine drives around the summits of Hot Springs, North and West Mountains.

With one exception, the springs are all enclosed in solid masonry, and the water is conducted by protected pipes into reservoirs near the base of Hot Springs Mountain or to the 23 bath-houses on and off this reservation. The exception is left open and accessible to the public. The government maintains a free bathing establishment for the indigent at which over 10,000 bathe annually, over 90 per cent being benefited. The prices of baths and fees of attendants are fixed by the Department of the Interior, with severe penalties for deviation. A rental of $30 per annum is collected for each tub; 716,053 baths were administered in 1902–3. A handsome city has grown up to house the guests and permanent residents. Along the front of the reservation bath-houses and on the slope of Hot

Springs Mountain is a fine park of 100 acres, with the most elegant buildings facing it. The creek is covered in, and sidewalks and roadways built over it. Several of the hotels, as the Arlington, Eastman, Park and Majestic, are among the largest and best appointed in the country.

Hot Springs received its city charter in 1876. It has a biennial mayor and a council. Being a pleasure resort, as well as a health resort, it has a large itinerant population. Large quantities of novaculite rock, "Arkansas" and "Ouachita," are quarried in the surrounding mountains, and 5,000 bales of cotton are marketed annually. The country abounds in cold springs, some of which have remarkable curative properties, notably Mountain Valley and Potash-Sulphur, 10 and 7 miles distant from Hot Springs; these are efficacious in conditions affecting the kidneys and intestinal tract. Pop. (1870) 1,276; (1880) 3,554; (1890) 8,086; (1900) 9,973.

CHAS. D. GREAVES,
Prest. School Board, Hot Springs, Ark.

Hot Springs, S. D., city, county-seat of Fall River County; on Fall River, the Fremont, E. & M. V. and the B. & M. R.R.'s; about 100 miles south of Deadwood. It is the trade centre for stock, lumber, and mining interests. The water-power is used for several manufactories, a stucco-mill, board and planing-mills, and machine shops. It has thermal and medicinal springs, and is the seat of the Black Hills College (M. E.), opened in 1890, and the State Soldiers' Home. Pop. (1900) 1,319.

Hotch'kiss, Benjamin Berkely, American inventor: b. Watertown, Conn., 1 Oct. 1826; d. Paris, France, 14 Feb. 1885. He was in early life a machinist and turned his attention to the invention of deadly weapons, among them the Hotchkiss magazine gun and the Hotchkiss machine gun, adapted for use in the fighting-tops of warships. In 1870 he established a factory at Paris. His guns were widely used by navies and armies until supplanted by other devices. He also improved heavy ordnance and projectiles.

Hotchkiss Gun. See MACHINE-GUN; ORDNANCE.

Hotel, or Hostelry, an inn or public tavern. The palatial hotels that have sprung up since the introduction of railways are too well known to require notice. One point of difference between the European and the American systems is that under the former, except in the case of a *table d'hôte*, the charge is for each dish ordered, while under the American plan a fixed price is charged for every meal. The modern French word is still used for the house of a rich or distinguished man, or for a public building, such as the *Hôtel de Ville*. See HOTELS IN AMERICA.

Hotels in America. The public house, or hotel, was established in the early days of the colonies to afford accommodation for those who might be compelled to journey from one place to another. As roads were poor, in those days, and stage transportation was slow, many of these houses were opened along the principal roads, or turnpikes, and the majority of these so-called inns bore such names as "King's," "Queens," "The Red Lion," etc. As public opinion changed, however, and the colonies inaugurated their revolt against the Crown, there was a corresponding change in the names of these hotels which brought them into closer harmony with the spirit of the times. From being mere public houses, wherein beds and food might be obtained by travelers, they became the meeting places of patriots, so it was but natural that the portrait of Washington, or of some other great American, should have taken the place of that of George III., and other royal personages, on the swinging signs before these doors. As time passed and the patriotic spirit rose to greater heights, these inns became the scenes of many events that brought them into the closest relation with the progress of the Revolutionary period and with the formative days which followed the declaration of peace. There was, for example, the City Tavern, in Philadelphia (1775), at which General Washington was frequently a guest; the Bunch of Grapes Tavern, Boston, where he enjoyed that "elegant dinner provided at public expense, while joy and gratitude sat on every countenance and smiled in every eye" (28 March 1776); the True American Inn, at Trenton (1777); Arnold's Tavern, Morristown; Sufferin's Tavern, Smith's Clove, N. Y.; the Buck Tavern, near Philadelphia; Smith's Tavern, Smith's Clove, N. Y. (1779); the tavern at East Chester, N. Y., where he was ill (1780); the Fountain Inn, Baltimore (1781); Day's Tavern, Harlem, where he stopped with Governor Clinton (1783); Fraunces Tavern, New York, where, in the assembly-room, he bade farewell to the men who had followed his fortunes so faithfully; Mann's Hotel, Annapolis, from which he proceeded to Congress on the day when he resigned his commission, and the City Hotel, Alexandria, where he was afterward entertained by the Alexandria Lodge, of which he was a member. The tavern at East Chester, where Washington stayed, during his illness, was erected soon after the beginning of the 17th century. At one time Lafayette was entertained in the house, and, for a season, it was practically the seat of the national government, President John Adams having taken refuge at East Chester during the yellow fever epidemic at Philadelphia, then the federal capital. This tavern now stands within the New York city limits, and the rooms which have the greatest historic interest still preserve the same appearance which they had in those old days.

Among the other taverns of the country which are rich in historic memories, but which were not directly associated with the career of the first President, were the Catamount Tavern, at Bennington, Vt.; George Burn's Coffee-House, in New York, long the lounging place of the British officers, although privately frequented by the Sons of Liberty during the occupation of the city by the British; the Tun Tavern, Philadelphia, the house in which the first Masonic lodge in America was organized; the City Tavern and the Bird in Hand, at Richmond, Va., and the Rose Tree Inn, at Media, Pa.

The first hotels in this country were conducted on the so-called American plan, which provided a fixed price for a day and for each fraction of a day. In those times $1 a day was considered a "good round price," and taverns were ordinarily so small that one which was provided with 20 rooms was regarded as a most commodious house. The rooms were usually comfortable, however, and were neatly, if

plainly furnished with strongly-made furniture. Carpets were rarely found, although hand-woven rag-rugs frequently appeared on the floors. Meals, which were served at fixed hours only, were announced by the ringing of a bell or gong, and all guests were expected to respond as quickly as possible. The table was abundantly supplied with dishes that were both substantial and palatable, the cooking being done by the wife of the landlord, with such assistants as the patronage of the inn might authorize, and while meat dishes predominated, game was so plentiful that its appearance attracted no comment.

At this time in the history of the American public house there were comparatively few inns that made an extra charge for wines. Instead decanters of liquors and of some favorite wine, like Madeira, port, or sherry, frequently stood upon the tables, and from these the guests served themselves freely. There were no printed bills of fare in these days, but practically all the food to be served was placed on the table at one time. Guests helped themselves, some slight assistance being given by the waiter who stood at hand. When Congress met in New York, in 1789, the members found accommodations chiefly in the boarding-houses which abounded in the neighborhood of the Battery — on lower Broadway, in Cedar street, and in Maiden Lane. It is rather amusing to note that people from other parts of the country complained about the "high prices" that were charged at the taverns and boarding-houses in New York, for that was the time when the "board of the Congressmen was paid out of the common treasury, to which every citizen of the United States contributed his share." In reply to this charge of exorbitant prices it was stated that board in New York "ranges from $3 to $7 per week," and one house was cited as furnishing "from 7 to 9 dishes a day, with 4 sorts of liquor."

The most important American taverns in 1795 were located in New York, Philadelphia, Baltimore, and Boston. The best New York taverns were Fraunces', opened in 1762, and formerly known as the Queen Catherine, one of the largest inns during the Revolutionary period, as it contained some 30 rooms; the City Hotel, which was erected on the site of the George Burns' Coffee House, in 1793, and which was not only the meeting place of the fashionable City Assembly, but was patronized by the so-called "Three Hundred" of that day; Bunker's, the Washington Tavern, and the Tontine Coffee House, on Wall street.

The National Hotel, in Washington, which was for many years the home of the most eminent public men of the nation, was opened in 1827. In 1829, the Tremont House was opened in Boston, and for years it was noted as being the grandest hotel in the land, if not the most elegant public house in the world. Prior to that time the principal hotels in Boston had been the Eastern Stage House, Doolittle's City Tavern, and the Lamb Tavern.

It was about that time, or, to be exact, in 1830, that Delmonico opened the first high-class restaurant in New York. High as his prices were, when compared to those which prevailed elsewhere, epicures and persons of fashion flocked to his support and the enterprise prospered from the day of its inception. In 1833, the United States Hotel, in New York was opened; in 1834, the Louisville Hotel, and, in 1835, the Galt House, also at Louisville, all of which immediately became noted as fine houses. The United States Hotel, at Boston, which has since been greatly enlarged and is still standing, was opened in 1835, while, about this time, the old Washington Hotel, at Portland, Me., which had been established since 1823, also took the name of the United States. The Rockingham, at Portsmouth, N. H., once the home of Governor Langdon, was opened in 1834, but, like other hotels of that time it was not particularly commodious in the modern sense of the word. In fact, up to 1836, there were comparatively few hotels in the United States that were capable of accommodating as many as 200 persons. In 1836, the Astor House, in New York, was opened. Built of massive granite, and furnished with all the conveniences of that day, it was a fitting rival to Boston's Tremont House. Barnum's Hotel, at Baltimore, which was opened at about this time, eclipsed the best houses which had hitherto been built in that city, while the opening of the St. Charles Hotel, at New Orleans, in the same year, was an event which was heralded from one end of the land to the other. Situated in the centre of the "American" portion of the city, its stately portico built in the style of a Corinthian temple, made it, next to the Capitol, at Washington, the most imposing structure in the land. It was also one of the best appointed and most commodious houses in America, having accommodations for more than 700 persons. The original buildings were burned in 1851, but it was almost immediately rebuilt, and it continued to enjoy its position as the centre of southern hotel life, until the outbreak of the Civil War. In 1894, the structure was once more burned, but it has since been rebuilt, and still ranks as one of the best hotels in America.

The Charleston Hotel, at Charleston, had the distinction of being the only hotel in the country that had been burned to the ground on the same day on which it was opened. This was in 1839, but as it was rebuilt at once, it was again opened in 1840, and afterward becoming the favorite resort of Calhoun and other great southern statesmen. When the Planter's House, at St. Louis, was opened in 1841, it justly prided itself upon being "the largest hotel west of the mountains." It had 215 well-furnished rooms, a classic ball-room with a floor-space "8,911 square feet more than the celebrated Tremont House, in Boston," while the china and cutlery, all of which was made in England, bore the name of the house. Charles Dickens, who stopped there in 1842, spoke favorably of the hospitality of this hotel in his "American Notes." The Massassoit House, at Springfield, Mass., one of the celebrated New England hotels, and the New York Hotel, were both opened in 1848. The Delevan House, at Albany, was opened in 1845. The year 1847 will always be a memorable one in the history of the American hotel, for it marks the date of the opening of the Revere House, Boston, a house which, under the management of Paran Stevens, soon became the pattern which all other hotels in this country sought to imitate.

Up to 1855, the principal hotels in Philadelphia were the Mansion House, the United States,

the Washington City, and the Girard House, and it was in that year that the Burnett House, at Cincinnati, was opened with 250 bed-rooms, besides many drawing-rooms, and especially spacious corridors. The Eagle Hotel, at Richmond, where Lafayette had stopped in 1824, was burned in 1840, and the Exchange and Ballard's were afterward opened. The Clarendon and the Irving House, in New York, were opened about 1850. The first Tremont House, at Chicago, which for some time was the leading hotel in that city, was opened about this time, while the Battle House, at Mobile, the St. Louis Hotel, at New Orleans, and the St. Nicholas and the Metropolitan, in New York, were opened about 1852. All were large houses, and were conducted upon an expensive scale, while the two New York houses were particularly conspicuous in having introduced "bridal chambers" and other novelties.

In 1854, the Brevoort and the Everett were opened, on the European plan, in New York; the famous Parker House, in Boston, also on the European plan, was opened in 1855, while the Fifth Avenue Hotel, in New York was finished in 1859. It was the first hotel to introduce a passenger elevator.

Willard's Hotel, at Washington, was the focus of many thrilling scenes and events during the Civil War, and among the houses that were opened during the next few years were the Lindell and Southern hotels, at St. Louis; the Albemarle, Hoffman, St. James, and Grand, in New York, and the Arlington, at Washington. The Gilsey House, which was opened in 1871, in New York, at once took rank as one of the best European-plan hotels, while the Windsor House, in New York, began the successful career that ended so disastrously in the fire of 1899, in 1873. The Brunswick, in Boston, and the Palmer and Grand Pacific, both in Chicago, were opened about this time, while the Palace Hotel, at San Francisco, one of the most famous and palatial houses in the far west, began to receive guests in 1875.

The last two decades of the 19th century were conspicuous, not only for the sudden increase of new and more splendid hotels, but also for the enlargement and improvement of those already built, in every part of the country, while, in such a brief review of the hotel business, it is impossible to name all the hotels worthy of mention that have been built during the past 25 or 30 years, it may justly be said that the revival of interest in the making of new and better houses extended from the Atlantic to the Pacific, and from our northernmost boundary to the Gulf. Beginning with the Vendome and Young's, at Boston, the list would include the Narragansett, at Providence; the Grand Union, Park Avenue, and Murray Hill, in New York; the Lafayette and Stratford, at Philadelphia; the Rennet, at Baltimore; the De Soto, at Savannah; the Kimball, at Atlanta; the Iroquois, at Buffalo; the Hollenden, at Cleveland; the Grand, at Cincinnati, and the Cadillac and Russell, at Detroit. Later came the Auditorium, at Chicago; the Plankinton, at Milwaukee; the Ryan, at St. Paul; the West, at Minneapolis; the Coates House, at Kansas City; Brown Palace Hotel, at Denver; the Portland, at Portland, Oregon, and the Tacoma, at Tacoma. The impetus to the hotel business, which began some 30 years ago, however, has continued up to the present time for the last few years have witnessed the construction of many new and finer hotels than any that had hitherto been built, among them being the Imperial, the Savoy, the Holland, the Waldorf, the New Astor, and the St. Regis, while one of the most unique experiments in the hotel line was the establishment of the Martha Washington, a hotel exclusively for women, which is now being successfully operated, also in New York.

The watering-place and summer-resort hotels also represent an important and rapidly increasing branch of the business. At the beginning of the 19th century there were a few inns at places like Saratoga, while a tavern at the White Mountains was built by Crawford in 1803. In 1822, the Catskill Mountain House was opened, and, by 1840, there were good houses at Trenton Falls and Delaware Water Gap. Twenty years later, Newport, Nahant, the White Mountains, Lake George, Satatoga, Niagara, Cape May, Old Point Comfort, and the Virginia springs, all had good hotel accommodations, but, since that time this branch of the business has grown to such an extent that splendid hotels are now located on almost every available spot on the coast from Maine to Florida, while the Adirondacks, the Catskills, and many interior resorts have accommodations for guests that can compare favorably with the best hotels in the country. At such hotels the American plan usually prevails, as it does to a considerable extent throughout the smaller cities and towns. In the large cities, however, the European plan, which fixes a price for the room, and which charges for extra service and for each item on the bill of fare, has become more popular, for while, in some instances, the two plans are combined, it is the European plan that is generally followed by the large hotels. Moreover the charges at the best hotels are about twice as great as they were in 1850.

When compared with the palatial hotels of to-day even the fine houses like the Tremont and the Astor House were primitive in their construction and management. The modern hotel is equipped with running water and set basins in every room; many rooms also have water-closets and baths with exposed plumbing; everywhere there are open grates and steam heat, improved ventilation, elevators for both passengers and baggage, electric bells, telephones, and every possible device to prevent fire, or to assure the safe escape of guests in case of a conflagration. Utensils and machinery have also multiplied greatly during the past few years, for the best hotels now run a thoroughly up-to-date laundry, an electric lighting plant, apparatus for the distilling of water, and the most elaborate cold-storage conveniences, often including an individual ice-making plant, while, among the other necessary conveniences of every well-equipped hotel one may mention the reading, writing, and music rooms; the coat, package, and baggage rooms; the barber shop, with its manicuring, boot-blacking, and other accessories; the billiard-room; telephone, telegraph, and ticket offices; the book and newsstand; the stenographers and typewriters, and the carriage and messenger services, not to mention a score of other details that are just as imperative a necessity. It is no uncommon

thing to-day to find single hotel structures valued at $3,000,000 or $4,000,000, equipped with furnishings costing many hundred thousand dollars.

A conservative estimate of the number of hotels in the United States, in 1905, exclusive of those in process of erection, places the number at 44,250. Of these about 3,750 are summer or winter resort hotels, 3,000 are family, or private hotels, while the balance are commercial houses. These hotels now give employment to no less than 3,250,000 persons, and the amount of capital invested in the business is undoubtedly in excess of $6,000,000,000.

Hottentots, hŏt'ĕn-tots, an African race, the aboriginal occupants of the south end of that continent, near the Cape of Good Hope. The name now given to the whole race was that of the tribe in the immediate vicinity of the Cape of Good Hope, with which the Dutch settlers first became acquainted. The origin of the name is unknown. They are, when young, of remarkable symmetry; but their faces are ugly, and this ugliness increases with age. The complexion is a pale olive, the cheek-bones project, the chin is narrow and pointed, and the face consequently is triangular. The lips are thick, the nose flat, the nostrils wide, the ears large and lobeless, the hair woolly, and the beard scanty. The women in early life are often models of proportion, and their gait by no means deficient in grace. Their bloom, however, is transient, for, marrying at twelve or thirteen, after the first child they lose their grace and proportion, and soon become hideous. Both sexes are distinguished by excessive incurvation of the spine. When the Dutch first settled at the Cape the Hottentots were a numerous nation, and occupied a territory of 100,000 square miles. They had abundance of horned cattle and sheep; and it is supposed that the seven tribes into which they were divided made up together a population of at least 200,000. At the present day this race is nearly extinct within the wide territory which formerly belonged to it. They may amount to about 20,000. The Koras or Korannas (shoe-wearers), south of the Kalahari Desert, still remain a favorable specimen of the Hottentot race. They are taller, stronger, and more cleanly than some of the other tribes. Most of them possess cattle; those who do not, soon degenerate into Bushmen. On the eastern frontier of the colony are still some remnants of the Gona or Gonaqua tribe; but they have nowhere preserved their ancient usages and purity of blood, but are much mixed with the Amakosa Kafirs. The Namas, who are the purest type of Hottentots now existing, dwell in Namaqualand, in German Southwest Africa. The Namas are a pastoral people almost exclusively. Their dwellings are low, rude huts, surrounded by fences. Many of them have been Christianized. The Hottentots generally are very indolent and lethargic.

Hottentot's-bread. See ELEPHANT'S-FOOT.

Houdon, Jean Antoine, zhŏn ăn-twăn oo-dŏn, French sculptor: b. Versailles 20 March 1741; d. Paris 15 July 1828. Having gained the first prize for sculpture in the royal academy at Paris, he visited Italy, passed 10 years in Rome in the study of the antique, and finished, among other works, the statue of St. Bruno in the church of St. Maria degli Angeli. Returning to Paris, he executed admirable busts of Rousseau, Diderot, D'Alembert, Franklin, Turgot, Mirabeau, Gluck, and many other distinguished men; statues of Voltaire and Tourville; the celebrated 'Diana' for the empress of Russia; and other works, which placed him in the first rank of French sculptors. In 1785 he accompanied Franklin to the United States, to prepare the model for the statue of Washington ordered by the State of Virginia, and passed two weeks at Washington's residence at Mt. Vernon for that purpose. The statue, bearing the sculptor's legend, "*Fait par Houdon, citoyen Francais,* 1788," now stands in the hall of the capitol of Virginia at Richmond. Among Houdon's later works is the celebrated statue of Cicero in the palace of the Luxembourg.

Hough, hŭf, Emerson, American author: b. Newton, Ia., 28 June 1857. He was graduated from the State University of Iowa in 1880, traveled extensively in the wild portions of the West, was for several years a writer in Chicago, and there became in 1899 western manager of the New York periodical 'Forest and Stream.' His publications are: 'The Singing Mouse Stories' (1895); 'The Story of the Cowboy' (1895); 'The Girl at the Half-way House' (1900); and 'The Mississippi Bubble' (1902).

Hough, George Washington, American astronomer: b. Montgomery County, N. Y., 24 Oct. 1836. He was graduated at Union College in 1856; appointed astronomer at the Cincinnati Observatory in 1859, and the following year became astronomer and director of the Dudley Observatory, Albany, N. Y. In 1879 he became director of the Dearborn Observatory and professor of astronomy at the Chicago University; and later accepted a similar position at the Northwestern University. He has invented several astronomical instruments and has discovered more than 600 double stars. He has written 'Annals of the Dudley Observatory' (1866–71).

Hough, Walter, American ethnologist: b. Morgantown, W. Va., 23 April 1859. He was graduated from the West Virginia University in 1883 and since 1885 has been connected with the ethnological department of the United States National Museum, becoming in 1895 assistant curator. He has published several important professional monographs.

Hough, Warwick, American jurist: b. Londoun County, Va., 26 Jan. 1836. He was graduated from the University of Missouri in 1854, subsequently studied law and was admitted to the bar in 1859. In January 1861 he was appointed adjutant-general of Missouri, as such issuing the general order under which the State military organizations went into camp on 3 May. He was for a short time secretary of state in Missouri, resigning in 1863 to enter the Confederate service, and serving on the staffs of General Polk and other Confederate commanders. For a few years after the war he practised law in Memphis, Tenn., but afterward returned to Missouri, establishing himself in Kansas City. He was a judge of the Missouri supreme court 1874–84, for two years of that period serving as chief justice of the State. In 1884 he removed to St. Louis, where he has continued in the active practice of his profession.

Houghton, hō'tŏn, **Henry Oscar,** American publisher: b. Sutton, Vt., 30 April 1823; d. North Andover, Mass., 25 Aug. 1895. He was apprenticed to a printer in Burlington, Vt., and later entered the University of Vermont, where he was graduated in 1846. Going soon after to Boston he became a member of the printing firm of Bolles & Houghton at Cambridge in 1849, and founded later the 'Riverside Press.' In 1864 he entered the book publishing firm of Hurd & Houghton, now the widely known house of Houghton, Mifflin & Co.

Houghton, how'tŏn, **Richard Monckton Milnes,** Baron, English poet: b. Fryston Hall, near Pontefract, Yorkshire, 19 June 1809; d. Vichy, France, 11 Aug. 1885. He was educated at Oxford and was long prominent in Parliament as a moderate Conservative. He was raised to the peerage in 1863. He was the author of several volumes of verse and prose, including a 'Life of Keats' (1848).

Houghton, hō'tŏn, Mich., a village and the county-seat of Houghton County, 94 miles northeast of Marquette; on the south bank of Portage Lake, and on the Copper Range, Mineral Range, and Duluth, S. S. & A. R.R.'s. Portage Lake is connected with Lake Superior at the south by the Portage River and at the north by a ship-canal by means of which steamers avoid the detour around Keweenaw Point.

Industries, etc.— Houghton is the centre of the rich mineral district in the peninsula of Keweenaw, the total output of which was in 1901 nearly 150,000,000 pounds. The larger part of the copper export of the region is shipped from this port. There is also considerable lumbering, manufacture, and commerce, and the shipping interests are important. The various industries have about 1,000 employees.

Public Institutions, Buildings, etc.— It is the seat of the Michigan College of Mines, which was founded in 1885 and occupies a fine structure. There are Episcopal, Methodist Episcopal, Catholic, and Presbyterian churches. Mention should also be made of the county court-house. The two banks have a combined capital of $250,000 and deposits of about $3,000,000.

History and Government.— Houghton was first settled in 1851. Its government is by a president and a council of six members elected biennially, three in each year. Pop. (1903) 4,000.

Horace J. Stevens,
Editor of the 'Copper Handbook.'

Houlton, hōl'tŏn, Maine, town, county-seat of Aroostook County, in the eastern part of the State; on the Canadian P. and the Bangor & A. R.R.'s; about 145 miles northwest of Eastport. It is the trade centre for a large lumbering region, and in the near vicinity there is quite an acreage of good agricultural lands. The chief manufactures are flour, butter, starch, foundry and machine-shop products, lumber, woolen goods, and furniture. It has a large slaughter-house and planing- and molding-mills. It is the seat of Ricker Classical Institute, a Baptist school. It has a town public library. Pop. (1900) 4,686.

Houma, hoo'ma, La., town, parish-seat of Terrebonne Parish; on the Bayou Terrebonne, and the Southern Pacific R.R.; about 72 miles southwest of New Orleans. It is situated in an agricultural region where the principal crops are rice, sugar-cane, and grain. The canning of oysters is one of the important industries; it has a large moss-factory and lumber yards. From 1890 to 1900 the increase in population was over 100 per cent. Pop. 4,686.

Hound, a dog that hunts by scent, a definition which excludes the greyhound (q.v.). It is difficult to determine from what stock the English hound has originally sprung, but the old "Southern hound" or talbot was most probably the source of the various hounds now known, among which the bloodhound, foxhound, beagle, harrier, dachshund, turnspit, otterhound and boarhound (now known as Great Dane) are the principal varieties. The mastiff (q.v.) ought also to be included in this group. See Dog.

Hour-glass, a species of chronometer or instrument for measuring time. It consists usually of two hollow bulbs placed one above the other, and having a narrow neck of communication. Dry sand is introduced in quantity sufficient nearly to fill one of the bulbs and fine enough to pass freely through the orifice of the connecting neck. The quantity of sand is adjusted to the time which the glass has been constructed to indicate. In the case of an hour-glass the sand in the upper bulb takes an hour to pass into the lower bulb; and so on for any other definite division of time. This instrument is always subject to slight error in its indications of time, owing to the expansion and contraction of the glass by changes of temperature, and by the variations of dryness in the sand. The hour-glass was commonly used in churches during the 16th and 17th centuries to regulate the length of the sermon, and in some places it continued in use down to the beginning of the 19th century.

Houris, hoo'- or how'rĭz, the "black-eyed" nymphs of Paradise, whose company, according to the Koran, is to be one of the rewards of the faithful. They are described as most beautiful virgins endowed with perpetual youth. They dwell in beautiful gardens, by flowing streams, and the very meanest of the faithful will have at least 72 of them.

Housatonic, hoo-sa-tŏn'ĭk, a river which has its rise in the Berkshire Hills, in the western part of Massachusetts, and flows south, through Connecticut, into Long Island Sound. Its course of about 155 miles is through a hilly, mountainous country, noted for its scenic beauty.

House, a place of abode of a family or individual. The common expression, "a man's house is his castle," is in most instances true. Except in criminal cases a man can hold his house against all comers. No sheriff can break open his door to arrest him, or seize his goods for debt, except by a writ, affidavit, or search-warrant. But the house is no protection where there has been a criminal offence. Breaking into a house with the intent to rob is burglary, and to set fire to a house constitutes arson. A man may defend his house against trespassers and thieves attempting forcible entrance, even to the killing of the intruder, if it can be shown that he has used no greater force than was absolutely necessary.

House-boat, a combination of boat and house, used largely as pleasure craft on rivers, canals, and lakes, in Great Britain and the United States. The houseboat had its origin in England about 1860. Its growth there has been comparatively slow. It was transplanted to this country late in the 19th century, and at first found favor with only a select few; but as soon as its advantages became manifest it began to develop rapidly, and advanced to a most remarkable state of perfection. A "house-boat" is not a boat with two, three or four decks and a number of staterooms, but a commodious, comfortable craft arranged for the accommodation of a family party, a company of bachelors or any suggestible combination of people. It might be likened to a suite of apartments afloat.

The house-boat in England has been particularly a Thames attraction and is seen to the best advantage at Henley. In 1903 there were several hundred of these floating houses on the water of the Thames. The price of a house-boat ranges from $300 to $25,000. But a comfortable craft, containing saloon, kitchen and four bed-rooms, may be purchased for $2,000. The Thames season lasts from June to September, and is at its height in July and August. A large house-boat may be hired for the season, including Henley, for $1,000.

In the United States the house-boat is seen most frequently during the summer months on the Hudson River, the St. Lawrence River, and Long Island Sound. The American vessels are even larger than the English boats and more expensive. They are constructed on approved plans, and contain every possible comfort and convenience that may be found in the best equipped dwelling or suite of apartments ashore. There are spacious sleeping rooms, larger than the staterooms on ocean steamers, a cosy sitting-room, a parlor, a library, a reception room, all the necessary storerooms, a lavatory, a cook's galley and, in fact, everything that a well-ordered household might demand. The properly constructed house-boat has a promenade deck and a high rail encloses it so that children may play about the deck with the utmost freedom and safety. The more pretentious are lighted with gas supplied from a naphtha gas-making machine, or electric light, with the energy supplied by storage batteries.

The great charm of the house-boat is the power that its occupants possess to move it from one place to another. On dry land when a man or a family does not fancy a place he or they move away and leave the house behind. On the house-boat they take their house along with them, and they can go wherever navigable water exists. The boat can be anchored in mid-stream or moored to a pier. No persons can interfere with the privacy of those on board. It is their own floating castle. When they are tired of one place they can go to another, and they have the advantage over their land-living friends that they not only take their house along, but all their belongings, and without the aid of the baggage master.

A typical American house-boat is the Idler, owned by a New York gentleman and used about Alexandria Bay, in the St. Lawrence River. The cabin has a dozen or more windows of goodly size; there is a saloon and opening from it a dining-room. The kitchen, store-rooms and quarters for a servant or two are "aft." The promenade deck has hammocks, steamer chairs, camp stools, rugs, tables, books, work baskets, and flowers; here the family live, move, and have their being for three quarters of the time spent on the boat. Among the well known house-boats on the St. Lawrence, are the Nydia, Mavis, River God, Bohemia, Amaryllis, Merrivale, and Summerholme.

On the Mississippi River, Ohio River and other large streams in the Western States the house-boat is utilized for business as well as for pleasure, and floating grocery stores, photograph galleries, and dry goods and notion shops are not uncommon. There is on the Mississippi at least one floating theatre built on the house-boat plan, and hundreds of small families have adopted a rudely constructed inexpensive type of boat for permanent residences.

House-Boat on the Styx, A, a humorous book by John Kendrick Bangs (q.v.) published in 1895. It purports to be an account of the doings and conversations of a company of literary ghosts assembled in a house-boat managed by Charon. Among the ghostly personages represented are Shakespeare, Raleigh, Dr. Johnson, and many more of various degrees of renown.

House-cricket. See GRYLLIDÆ.

House-finch, A familiar garden finch (*Carpodacus frontalis*) of California, grayish, with the head, neck and breast scarlet-carmine. It represents a group of beautiful and interesting Pacific Coast and Mexican finches also known as linnets and burions.

House-fly. See FLIES.

House Industry, a modern system of labor in which the workmen carry to their homes raw materials and other goods to be manufactured within their own houses. In New York and other large cities this form of labor particularly applies to the Polish Jews, who are employed to the number of many thousands by the manufacturers of coats, cloaks, and other wearing apparel. The abuses of house industry have become notorious under the name of the sweat-shop system, which will be found described more in detail in the article FACTORIES AND FACTORY INSPECTION.

House of Lords. See PARLIAMENT.

House of Representatives, the branch of most State legislatures, and of Congress, which has the more numerous members, elected from smaller districts, and in some cases for shorter terms. It is very commonly termed the "lower house" or "popular branch," implying a misunderstanding at once of its origin and functions. The House, for instance, is commonly supposed to be related to the Senate as the British House of Commons is to the House of Lords, and to have been modeled on that relation; the former is wholly untrue and the latter largely so. The House of Commons represents popular constituencies, the House of Lords represents only itself; the former is the less dignified theoretically, in practice it has not only more power but all the power; the individual members of the former have mostly less power than those of the latter, but as a body they are incomparably more powerful. None of these things is true about the House and Senate of Congress. Both rep-

resent constituencies and the public equally; both are not only theoretically but practically equal — the Senate's power of confirming appointments and treaties being fully balanced by the House's power of impeachment, of originating revenue bills, and electing a President if the electors fail of a choice. Nor are the members of either as individuals presumptively superior in power to those of the other. The actual superiority of the Senate is due to the longer terms, which give the older members a parliamentary experience before which the mass of raw members of the House bow; to the seats being the subject of eager competition among the ablest politicians, so that the average public position is higher; and to the lesser membership and smaller number of new bills, which enable it to preserve more independence of the chairman's tyranny than the House. Still, a certain glamour always surrounds the latter as the "popular branch"; partly due to the fact that, owing to its great number and short terms, popular movements are more quickly transformed into legislative action than in the Senate. In this respect alone the idea is correct: a party intrenched in the Senate has often boasted that no matter what the majority of the people wished it could not be dislodged for at least eight years, or the time of two presidential elections, in which anything might happen.

In its formation, the model in the State legislatures was simply to follow the old colonial form of council and assembly, itself not copied from Parliament but an independent development; and in Congress the model was partly those legislatures and doubtless partly Parliament — the political theory of "checks and balances" being more potent, however, in defining the distribution of powers than in creating the forms of the houses. The actual form of Congress was a compromise, without which the Union could not have been formed. The large States were averse to being outweighed by the small, and wished for a two-chambered body, with representation in each proportionate to population; the small ones were determined on a single-chambered one, with each State having one vote. The present arrangement was the suggestion of the Connecticut members; a final item of the compromise was that the senators should vote individually and not by States, so that a State should only have its power on condition of keeping its members in place. For the general functions of the House, and its relations present and prospective to the Senate, see CONGRESS.

The members of the House, according to the Constitution, must be 25 years of age, seven years citizens of the United States, and residents of the States which send them; by act of 25 June 1842 they must be chosen from districts formed of contiguous territory (but see GERRYMANDER for the observance of this). This put an end to electing on general ticket, but there is no provision that the representatives shall be residents of their districts, and the people have a perfect right to choose them in the British fashion, from any part of the State. What prevents this is not law, but the intense local particularism which, even in State senatorial districts made up of several towns, insists on passing the office around among the towns; at bottom, the American conviction that public office demands no training. The number of members is fixed by Congress after each new census.

A quorum of members is a majority of those actually chosen. The House organizes by having the clerk of the last House call the new members to order, and if a quorum is present he calls the roll for a vote on choice of Speaker. The members choose their seats in turn as their numbers are drawn by lot. The principal officers are the Speaker, clerk, sergeant-at-arms, doorkeeper, postmaster, and chaplain. (For the Speaker's powers, see CONGRESS.) The sergeant-at-arms is the constable. The symbol of his authority is the mace, made on the pattern ordered by the House 14 April 1789; a Roman device, ebony fasces, of which each rod ends in a spear-head, bound at the ends and in the middle with silver bands, and on the end a globe surmounted by an eagle with outspread wings. The House is governed by Jefferson's Manual of Parliamentary Practice, plus its standing rules and orders and the joint rules of the two houses.

House of the Seven Gables, The, a novel by Nathaniel Hawthorne (q.v.).

House Snake, or **Milk Snake,** a variety of *Lampropeltis doliatus,* the corn-snake (q.v.) of the South, found abundantly in most parts of the northern half of the United States westward to the Rocky Mountains. The dorsal scales are not at all keeled and the ventral plates often exceed 200 in number; the ground-color is gray with three series of rounded black-bordered brown blotches, and the belly checkered with black and white; a length of 4 feet is sometimes attained. This is a handsome and mild-tempered colubroid snake, very abundant in farming districts, where it frequently enters houses, but probably in search of mice rather than for the purpose of drinking milk, as is popularly believed. It is an expert climber, often ascending porches and vines attached to the walls of houses. As usual, the eggs are deposited in a hole dug in a sandy field.

House Sparrow. From the circumstances of the chief importations into this country having been from England this species, the *Passer domesticus* of ornithologists, is almost exclusively known in the United States as the English sparrow, although it is distributed quite as plentifully throughout most parts of Europe. The appearance and general habits of this familiar and ubiquitous bird require no description. The presence of the house-sparrow in America is a most noteworthy instance of the folly of disturbing the proper "balance of Nature" by the thoughtless introduction into new regions of vigorous species which are relieved from the restraining influences of those checks that usually operate in their original habitats. The motives which led to its importation seem to have been two-fold: the desire to combat the plague of measuring-worms (*geometridæ*), with which the parks of many of the eastern cities were affected, and the sentiment which moved many of our foreign born citizens to look with favor upon the introduction of a familiar bird of the fatherland. The importations began in 1850, when the directors of the Brooklyn Institute, led by the Hon. Nicolas Pike, liberated 8 pairs in that city, followed by larger numbers in 1852

and 1853. The following year saw their introduction into Portland, Me. Within the next 15 years direct importations were made to the eastern seaboard, the city of Philadelphia liberating 500 pairs in 1869 in her parks, which were carefully nurtured by a paid caretaker. During the next decade small lots were set free in nearly every State of the Union, including those on the Pacific coast. Thus, purposely distributed by man, carried in grain cars on the railroads and aided by its remarkable hardiness, fecundity, boldness and adaptability, the house-sparrow has in 50 years spread to practically all parts of this country, except a few remote and isolated regions, and to many parts of British America. It keeps close to the abodes of man and has become extraordinarily abundant in many large cities and towns, where it acts as a scavenger and befouls the buildings with its droppings and slovenly nests. Because of its presence and pugnacity many smaller native birds have withdrawn from the parks and open spaces, and it has in many other ways become a nuisance, though it does not altogether lack virtues. In its relation to agriculture little that is favorable can be said of the English sparrow. About three fourths of its food consists of grain, much of which is obtained by raids on the fields and store houses; serious injury is also done by its attacks on flower and leaf buds and on all kinds of fruits. On the credit side may be mentioned the relatively small quantity of insects and the considerable quantity of weed seeds devoured. Consult, Gentry, 'The House-Sparrow at Home and Abroad' (1878); Barrows, 'The English Sparrow in North America' (1889).

Housing Problem. See TENEMENT HOUSE, *Reform.*

Hous'man, Laurence, English author and illustrator: b. London 14 July 1867. He has illustrated 'The Goblin Market'; 'Weird Tales'; 'The Were Wolf'; 'Jump to Glory Jane'; and other books, his work being mostly engraved on wood by his sister Clemence. He is the author of 'The Writings of William Blake' (1858); 'A Farm in Fairyland' (1894); 'The House of Joy' (1895); 'Green Arras' (1896); 'All Fellows' (1896); 'Gods and Their Makers' (1897); 'The Field of Clover' (1898); 'The Little Land' (1899); 'Rue' (1899); 'The Seven Young Goslings' (1899); 'Bethlehem' (1902), and 'Love Letters of an Englishwoman' (1901), which appeared anonymously and was attributed to various writers of the day.

Houssa, how'sä, or **Haussa,** Central Soudan, a former important negro kingdom, north of the junction of the Benue and Niger rivers. After internecine divisions it was succeeded by a Mohammedan Fulah empire in 1802, and is now incorporated in Nigeria. The name is perpetuated by a negritic race and language distributed far beyond the ancient Houssa boundaries. The race is distinguished as able traders and craftsmen, and the language, for its euphony, simplicity and literary adaptability.

Houssaye, Henri, ŏñ-rē oo-sā, French historian: b. Paris 24 Feb. 1848. He was educated at the Lycée Napoléon, fought with distinction in the Franco-German war, became an editor of the 'Revue des Deux Mondes' and the 'Journal des Débats,' and was chosen president of the Société des Gens de Lettres. In 1864 he obtained election to the French Academy, which in 1873 awarded the Thiers prize to his 'Histoire d'Alcibiade.' He published in three parts—'1814,' and '1815' (2 vols.)—a study of Napoleon's downfall, which enjoyed wide sale in France, and is considered one of the best extant works on the subject.

Houston, hūs'tŏn, **Sam,** American soldier and statesman: b. Lexington, Va., 2 March 1793; d. Huntsville, Tex., 25 July 1863. Leaving home when a boy he crossed the Tennessee River and took up his abode with the Indians, by whom he was kindly received, and with whom he lived after their own fashion for several years. Oolooteka, one of their chiefs, adopted him as his son. In 1811 he returned to his family, and to maintain himself opened a school. In 1813 he enlisted as a common soldier in the United States army, was promoted ensign, and fought under Gen. Jackson against the Indians at the battle of Tallapoosa, in March 1814. In November 1817 he was appointed a subordinate Indian agent to carry out the treaty with the Cherokees just ratified. In the following winter he conducted a delegation of Indians to Washington. On arriving he found that complaints had been made against him to the government on account of the zeal with which he had exerted himself to prevent the unlawful importation of African negroes through Florida, then a Spanish province, into the southern States. He was acquitted of all blame, but conceiving himself to be ill treated he resigned his commission in the army, and returning to Tennessee settled in Nashville and began the study of law. In 1819 he was elected district attorney, and in 1821 was chosen major-general of militia. Two years later he was elected to Congress; re-elected in 1825, and in 1827 was chosen governor of Tennessee.

In 1829, for reasons unknown, he resigned his office, separated from his family, and deserting civilization, went to Arkansas, where his former Indian friends, the Cherokees, had removed. He was kindly received and for years remained with the Indians. In 1832 he went to Texas and at the outbreak of the Mexican war was elected commander-in-chief of the Texan army.

After the massacre of the Alamo, the Mexican President-general Santa Anna was defeated by Houston at the battle of San Jacinto, 21 April 1836. Santa Anna was captured by the Texans and the independence of Texas was achieved. On 23 July a general election for president, vice-president, and members of Congress of the republic of Texas was ordered to take place on the first Monday of the following September. Houston was solicited to be a candidate, but declined; but as the day of election approached the popular feeling in his favor became so manifest that he had no alternative but to accept. He was elected by a large majority and was inaugurated 22 Oct. 1836. One of his first acts was to liberate Santa Anna, who had been kept in captivity, and to send him to Washington to confer with the president of the United States. He next opened negotiations with the United States government for the annexation of Texas to the Union, but the measure encountered such strong opposition in the United States that it did not succeed till several years later.

Texas became one of the United States in

1845, and Houston and Rusk were the first senators sent to Washington. Houston was re-elected at the end of his term in 1853, and remained in the Senate till March 1859. As a senator he was opposed to the Kansas and Nebraska bill, against which he made one of his most elaborate speeches, in which he declared that the repeal of the Missouri Compromise was a flagrant breach of faith, which would involve the country in interminable agitation and difficulty. He was prominently mentioned in 1854 as a presidential candidate of the "Know-Nothing" party. He was elected governor of Texas 1 Aug. 1859, but was deposed for adherence to the Union in 1861. See Williams, 'Sam Houston and the War of Independence in Texas' (1893).

Houston, Texas, city and county-seat of Harris County, at the junction of White Oak and Buffalo bayous; the highest inland point in the State permanently accessible by water from the Gulf of Mexico. Buffalo Bayou, which furnishes an outlet to the sea, 50 miles distant, has been navigated from the earliest days of the city's history, and is being widened and deepened by the Federal government at a cost of $4,000,000 so as to admit of the passage of the largest ocean-going craft.

Houston was settled shortly after the battle of San Jacinto, which was fought on 21 April 1836, within a few miles of its location. The city was named after Gen. Sam Houston (q.v.). It was made the seat of government for the Republic of Texas, and so remained until 1840.

Government.— Houston was first incorporated under an act of the Texas Congress passed 29 Dec. 1837. It now has a charter granted by special act of the legislature in 1903. Under the charter a mayor is its chief executive officer, and 12 aldermen (two for each of the six wards into which the city is divided) constitute the legislative division of its government. The mayor and the aldermen are elected for two years as are also the city treasurer, the city tax assessor and collector, the city attorney, the city health officer, the street commissioner, the chief of police and the judge of the corporation court, which has jurisdiction of police cases. The cost of Houston's city government, including the amount appropriated out of the general revenue fund for the public schools, ranges between $600,000 and $650,000 per annum. The city owns a sewer system with 37½ miles of conduits. The city has about 36 miles of paved and otherwise improved streets. The city maintains a paid fire department at a cost on an average of $60,000 per annum. The cost of police protection averages about the same.

Public Buildings.— Houston's chief buildings are the city-hall and market-house, the Central fire station, the Binz office building, the Commercial National Bank building, the Stowers building, the Houston Post building, the High School building, the Mason building, the Carnegie Library building, the First Presbyterian Church house, the Christ Episcopal Church house, the Waddell building, the Kiam building, and a provided-for Federal building to cost $500,000 and the Rice Institute building for the erection and maintenance of which an endowment of between $4,000,000 and $5,000,000 has been left. The William M. Rice Institute was founded in the year 1892 by the late William Marsh Rice, of New York. This institute contemplates the establishment and maintenance of an industrial or polytechnic school for males and females, designed to give instruction on the application of science and art to the useful occupations of life. It establishes and maintains a free library and reading rooms, and galleries of art.

Education.— The city has 20 public schools (including a high school for whites and one for negroes), and 26 private schools — and one Carnegie library building. The city's school affairs are managed by a board of seven trustees appointed by the mayor with the approval of the city council. The schools are maintained by direct appropriation from the general revenue fund and get from $80,000 to $1,000,000 from that source annually. In addition they receive each year from the State a per capita apportionment of the State school fund which runs from $4.50 to $5.00 for each pupil between the ages of 7 and 17.

There are 5 Baptist, 5 Catholic, 3 Christian, 2 Christian Science, 3 Episcopalian, 2 German Methodist (North), 5 Methodist (South), 1 Methodist (North), 1 Cumberland Presbyterian, 5 Presbyterian and 2 non-denominational churches for whites, besides one Episcopalian chapel and two missions, a Salvation Army barrack and a Spiritualist association. The negroes have 29 churches of all denominations. The city's eleemosynary institutions consist of the Bayland Orphans' Home, the De Pelchin Faith Home, the Florence Crittenton Rescue Home, the Sheltering Arms Home of Christ's Episcopalian Church and an Infants' Home for foundlings. The city has one public park and zoological garden valued at $80,000.

The city has six national banks with a combined capital stock of $1,450,000; an average surplus of $900,000 and average undivided profits of $500,000. Their deposits range around $11,000,000 in amount and their loans around $7,000,000. In addition there are three private banks with combined resources of $3,000,000. Bank clearings in excess of $600,000,000 are annually effected through the city's clearing house.

Trade and Commerce.— In point of trade and commerce Houston distributes more groceries, hardware and machinery than any other city in the State. It is the most important spot cotton market in the world, barring Liverpool, 1,927,607 bales, or a little less than 19 per cent of the entire crop of the United States, constituting the volume of its transactions in the staple for the year 1903, said transactions involving an approximate outlay of $86,742,315. Houston is also the principal lumber market of the Southwest. In sugar Houston is second to New Orleans only, while in rice, a comparatively new industry in Texas, it ranks as one of the four principal markets west of the Mississippi.

More produce, fruit and feed stuff is consumed and distributed in Houston than in any other city in the Southwest.

Transportation.— Houston's pre-eminence as a commercial centre is due to its supply of transportation facilities. In 1856 these consisted, aside from a navigable outlet to the sea, of 56 miles of railroad. In 1861 its rail lines extended a distance of 357 miles, there being but 462 miles of railroad in the entire State at that time. And this ratio has been pretty well preserved until 1903 when 6,500 miles of rail-

SAMUEL HOUSTON.

road, or more than one half the State's mileage were operated by 14 lines for which Houston is an initial point and which during that year moved 16,000,000 tons of freight, or about three fifths of the tonnage which went toward making up the total of the State's railroad business. These 14 lines with their immediate system connections give Houston 30,000 miles of direct rail facilities. In addition to this Houston enjoys direct rail and barge connection with a second steamship line to New York which has tri-weekly sailings from Galveston. By reason of its location at the head of ocean navigation on Buffalo Bayou, Houston enjoys water rates on freight from defined territories as well as from the Atlantic seaboard and finds itself in a most advantageous position for the distribution of merchandise of all classes. Freight to the value of $25,000,000 is annually exported and imported on barges and other craft navigating Buffalo Bayou and plying between Houston and Galveston.

Manufactures.— Houston has 507 industrial plants in operation in the city, an increase of 141 per cent during the last decade. There are $8,000,000 invested in manufacturing enterprises with products to the value of $12,000,000 in 1903. Manufacturing has been stimulated to a great extent by the discoveries of petroleum and the development of the rice industry. The rapid growth of the sawmill and lumber products business — the most important in the State — 85 per cent of which is carried on within easy reach of Houston and in a section for which the city is the natural market has also contributed to the same end. Chief among Houston's manufacturing concerns are the cotton oil refineries of which there are five. These represent an investment of $1,250,000 and annually, on an average, convert 144,000 tons of cotton seed into products bringing $3,168,000 in the markets of the world, in the aggregate. Here are also the general car shops of the Atlantic division of the Southern Pacific and allied lines and the division car shops of three other railroad companies. The city has 35 miles of electric street car lines.

Population.— (1890) 27,557; (1900) 44,663; (1903) 65,000.

R. M. Johnston,
Houston Daily Post.

Hovey, Alvin Peterson, American soldier: b. Mount Vernon, Ind., 1821; d. Indianapolis 23 Nov. 1891. He studied law, and was admitted to the bar in 1843; was appointed successively circuit judge, judge of the supreme court, and United States district attorney. He was a major of Indiana volunteers, and afterward major-general during the Civil War. In 1866 he was made minister to Peru; was elected to Congress in 1886, and became governor of Indiana in 1888.

Hovey, Charles Mason, American horticulturist: b. Cambridge, Mass., 26 Oct. 1810; d. Boston 2 Sept. 1887. He was the first to introduce a pistillate strawberry, known as "The Hovey," a variety that marks the beginning of strawberry culture in the United States. He edited the 'Magazine of Horticulture' for many years, and was the author of 'Fruits of America' (1880).

Hovey, Richard, American poet: b. Normal, Ill., 4 May 1864; d. New York 24 March 1900. He was graduated at Dartmouth 1885, went abroad and led a bohemian life, being in turn actor, journalist, dramatist and poet, and finally lecturer on English literature in Barnard College, New York. His verse was of the idealistic school and marked with the influence of Ibsen and Maeterlinck. His works are: 'Launcelot and Guenevere' (1880); 'Taliesin: a Masque' (1900); 'Seaward: an Elegy' (1893); 'The Laurel' (1897); 'Along the Trail' (1898); and with Bliss Carman (q.v.) wrote 'Songs from Vagabondia' (1893); and 'More Songs from Vagabondia' (1896).

Howard, Blanche Willis. See Teuffel, Blanche Willis Howard, Baroness Von.

Howard, Bronson, American playwright: b. Detroit, Mich., 7 Oct. 1842. Preparing for college he turned to journalism instead of entering Yale, and from 1867 to 1872, was employed on the New York *Tribune, Evening Mail* and other newspapers. In 1864 he had written a dramatic piece called 'Fantine,' which was produced in Detroit, but his first important play was 'Saratoga,' produced by Augustin Daly in 1870, and the first of a long list of successes, which gave him a foremost position among American playwrights. Among his plays are: 'The Banker's Daughter' (1878); 'Young Mrs. Winthrop' (1882); 'The Henrietta' and 'Met by Chance' (1887); 'Shenandoah' (1889); 'Aristocracy' (1892); 'Peter Stuyvesant' (with Brander Matthews); etc.

Howard, Catharine, fifth queen of Henry VIII.: b. about 1520; d. 13 Feb. 1542. She was a granddaughter of the second duke of Norfolk.

Howard, Guy, American soldier: b. Augusta, Maine, 16 Dec. 1855; d. 21 Oct. 1899. He was a son of Gen. O. O. Howard (q.v.) and entered the United States army in 1876 as a second lieutenant. He was promoted chief quarter-master, with rank of lieutenant-colonel 11 Aug. 1898; was assigned to duty in Manila under Gen. Lawton; and had charge of the transportation for Lawton's advance movement. While on the gunboat Oceania he was attacked by Filipino insurgents, and fatally shot.

Howard, John, English philanthropist: b. probably Hackney 2 Sept. 1726; d. Kherson, Russia, 20 Jan. 1790. In 1773 he was appointed high sheriff of Bedfordshire, when the subject of prison discipline came under his notice; and finding many abuses in the management of jails, he resolved to devote his time to investigation of the means of correcting them. With this view he visited most of the English county jails and houses of correction, and in March 1774 laid the result of his inquiries before the House of Commons. In 1781 and 1782 he made a tour through the northern parts of Europe, including Denmark, Sweden, Russia, and Poland. In 1783 he visited Spain and Portugal, and again surveyed the prisons of his own country. At the same time was published a complete edition of his 'State of the Prisons,' with all the supplementary matter. A new subject now engaged his attention, namely, the management of lazarettos, and the means of preventing the communication of the plague and other contagious diseases. In 1789 he published 'Account of the Principal Lazarettos in Europe.' In 1789 he proceeded through

Germany to St. Petersburg and Moscow. Prisons and hospitals were everywhere thrown open for his inspection as a friendly monitor and public benefactor. Consult: Howard's 'Correspondence' (1855); and 'Lives' by Dixon (1849); Stoughton (1853).

Howard, John Eager, American soldier: b. Baltimore County, Md., 4 June 1752; d. 12 Oct. 1827. He joined the army under Washington at Middlebrook, N. J., in the spring of 1777, and subsequently fought at Germantown and Monmouth. In 1780 he joined the army under Greene, and in the battle of Cowpens (1781) he displayed great gallantry, and the bayonet charge of the Maryland troops under his command, whereby the enemy were thrown into confusion, turned the fortune of the day and secured victory to the Americans. For his services in this battle he received from Congress a silver medal. In 1788 was elected governor of Maryland, a position which he filled for three years. From 1796 to 1803 he represented Maryland in the United States Senate. He was a candidate for the Vice-Presidency in 1816.

Howard, Oliver Otis, American general: b. Leeds, Maine, 8 Nov. 1830. He was graduated from Bowdoin in 1850, and from West Point in 1854. He was then assigned to the ordnance department of the regular army, served in Florida against the Seminoles, and was professor of mathematics at West Point 1857–61. At the outbreak of the Civil War he entered the volunteer service as colonel of the 3d Maine regiment. He was in over 20 important battles; in 1861 he was at the battle of Bull Run, and was afterward made brigadier-general of volunteers; in 1862 he served in the Virginia campaign, and at the battle of Fair Oaks lost his right arm. He commanded at the battles of Antietam and Fredricksburg; in 1863 was appointed to the command of the 11th Army Corps and led them at the battles of Chancellorsville and Gettysburg. When the 11th Corps was united with the 12th he was given command of the 4th Corps of the Army of the Cumberland, but was shortly afterward transferred to the command of the Army of the Tennessee, which was the right wing of Sherman's army on his "march to the sea." In 1864 he was appointed brigadier-general in the regular army, and in 1865 made commissioner of the Freedmen's Bureau, which he conducted very efficiently; 1869–73 he was president of Howard University (q.v.), established in Washington for the higher education of the negro. In 1874 he was placed in command of the Department of the Columbia, and there conducted four campaigns against the Indians, including that against the Nez Percés tribe. In 1881 he was superintendent at West Point, and subsequently in command of the Departments of the Platte and of California; in 1886 he was promoted to the rank of major-general, and assigned to the Department of the East, where he remained until his retirement in 1894. In 1895 he founded the Lincoln Memorial University, Cumberland Gap, Tenn. He has written: 'Donald's School Days' (1879); 'Chief Joseph, or the Nez Percés in Peace and War' (1881); 'General Zachary Taylor' (1892); 'Isabella of Castile' (1894); 'Fighting for Humanity'; and 'Henry in the War.' Consult: L. C. Holloway, 'Life of General Howard.'

Howard Memorial Library, established in 1889 in New Orleans, La., is one of the few complete reference libraries in the United States. It was founded by Annie Turner Howard, whose gift of site, building, and endowment amounted to nearly $350,000. The plans for the building were made by Henry Hobson Richardson (q.v.). In addition to the 45,000 volumes of the best books on all subjects, it contains special and nearly complete collections on the history, description, and literature of Louisiana and the Gulf States. It has a dictionary card catalogue.

In the spacious and handsome reading-room are many fine bronzes, including the Houdon bust of Washington, from a life mask. This bronze is on a pedestal which brings the face to the correct height. This library is of great service to students of all the educational institutions of the Southern States, and also to writers on special subjects pertaining to the Gulf States.

WILLIAM BEER,
Librarian of Howard Memorial Library.

Howard University, a coeducational institution, situated in Washington, D. C., established by the United States government in 1867. It was named for Gen. O. O. Howard, who was head of the Freedmen's Bureau, and had much to do with the foundation of the school. The university is supported by Congressional appropriation, except the medical department, which is maintained by tuition fees, and this is the only department in which tuition is charged. The departments are preparatory, collegiate, medical, agricultural, dentistry, pharmacy, pedagogy, theology, law, music, and agriculture. An industrial department provides instruction in trades for students in the preparatory and English courses. The pupils in this department have practice under competent workmen, in printing, carpentry, bookbinding, and tinsmithing. The university is well known for its work in the higher education of the negroes of the United States. The school has property valued at about $1,000,000, and a general endowment fund of $175,000.

Howe, Andrew Jackson, American eclectic surgeon and author: b. Paxton, Mass., 14 April 1825; d. Cincinnati, Ohio, 16 Jan. 1892. Educated in Leicester Academy and Harvard College, from which he graduated in 1853. Attended medical lectures at Jefferson Medical College, Philadelphia; College of Physicians and Surgeons, and the New York Medical College of New York city, and Worcester Medical Institute, graduating from the latter in 1855. He was demonstrator of anatomy in his alma mater in 1855–6; professor of surgery in Cincinnati College of Eclectic Medicine and Surgery, 1856–9; demonstrator and professor of anatomy in Eclectic Medical Institute of Cincinnati, 1859–61; professor in same of surgery, from 1861 to 1892. He wrote 'A Treatise on Fractures and Dislocations' (1873); 'Manual of Eye Surgery' (1874); 'Art and Science of Surgery' (1876); 'Operative Gynæcology' (1890); 'Conversations on Animal Life,' and 'Miscellaneous Papers,' published in 1894, after his death. He was president of the National Eclectic Medical Association in 1882–3.

ELIAS HOWE,

INVENTOR OF THE SEWING MACHINE.

JULIA WARD HOWE.

Howe, Edgar Watson, American novelist and editor: b. Treaty, Ind., 3 May 1854. At the age of 12 he entered a printing office, and when only 19 was publisher of the 'Golden Globe' in Golden, Col. Ten years later he became proprietor and editor of the Atchison (Kan.) *Daily Globe.* He has written: 'The Story of a Country Town' (1883), which attracted considerable attention; 'The Mystery of the Locks' (1883); 'A Moonlight Boy' (1887); 'A Man Story' (1888); 'An Ante-Mortem Statement'; 'The Confession of John Whitlock'; etc.

Howe, Elias, American inventor: b. Spencer, Mass., 9 July 1819; d. Brooklyn, N. Y., 3 Oct. 1867. He lived with his father, who was both farmer and miller, till 1836, working upon the farm and in the mill and attending the district school during the winters. He then learned the trade of a machinist, and experimented in inventing a sewing-machine. The model was completed and the patent issued 10 Sept. 1846. A patent was also taken out in England, but from this the inventor realized nothing. After constructing four machines in the United States, he visited England in 1847, remaining two years. He returned to Boston entirely destitute, and resumed his trade for the support of his family. From this period until 1854 he was involved in expensive lawsuits, when the principal infringers of his patents acknowledged his rights, and arranged to manufacture sewing-machines under licenses from him. He served as a private in the 17th Connecticut volunteers during the Civil War. He was the recipient of the Legion of Honor cross and many medals.

Howe, Henry, American publisher and historian: b. New Haven, Conn., 16 Oct. 1816; d. 1893. He entered the publishing business in 1839, and while conducting this business began historical researches in New Jersey and New York. He later moved to Ohio, where he continued his historical studies, and published subscription books. His writings include: 'Memoir of Eminent Mechanics' (1839); 'The Great West' (1851); 'Travels and Adventures of Celebrated Travelers' (1853); 'Adventures and Achievement of Americans' (1858); 'Our Whole Country' (1861); 'Over the World' (1883); and 'Historical Collections' of three States, New Jersey, New York and Ohio.

Howe, John, English Puritan divine: b. Loughborough, Leicestershire, 17 May 1630; d. London 2 April 1705. He was frequently styled "The Platonic Puritan" and is ranked as the greatest of the Puritan clergymen. He was an eloquent preacher and a powerful controversialist, but fortunately free from animosity or theological bitterness. Among his works, 'The Living Temple'; 'The Blessedness of the Righteous'; and 'The Oracles of God' have been especially valued. See 'Life' by Rogers (1836).

Howe, John Ireland, American inventor: b. Ridgefield, Conn., 20 July 1793; d. Birmingham, Conn., 10 Sept. 1876; was at first a physician, but in 1830 invented a pin-making machine. This he perfected later and it was the means of revolutionizing the pin manufacture.

Howe, Joseph, Canadian statesman: b. near Halifax, Nova Scotia, 13 Dec. 1804; d. Halifax, 1 June 1873. He learned printing and in 1827 became connected with the 'Acadian' and in 1828 editor and proprietor of the 'Nova Scotian.' He contributed several remarkable articles to this paper, called "Western and Eastern Rambles" and the papers "Legislative Reviews." He was elected to the Provincial Parliament in 1836. He favored free common schools, one Provincial University and complete, responsible government and it was mainly due to his efforts that Nova Scotia finally received such government. He was a member of the Executive Council in 1840 and Speaker of the Assembly the same year. In 1846 he succeeded in making himself a popular power in the province and turned it over to the Liberals. Howe opposed confederation in the old assembly and even went to London to lay a petition before the throne against "the assertion of Federal supremacy," but lost his fight. He served as secretary of state for the provinces in the Dominion cabinet and superintendent of Indian affairs (1869–72), and later was a member of the Dominion Parliament for Hants County, Nova Scotia. He returned to Halifax in 1873 as lieutenant-governor, but only lived a few months to enjoy it.

Howe, Julia Ward, American author and philanthropist: b. New York 27 May 1819. In 1843 she married S. G. Howe (q.v.) of Boston, and immediately became active in philanthropical work. With her husband she edited the 'Boston Commonwealth,' one of the ablest anti-slavery papers, to which she contributed leading articles, essays, poems, letters, and witty comments. At the same time she also wrote for the New York *Tribune,* and the 'Anti-Slavery Standard.' Since the Civil War she has been active as writer and speaker in other social and philanthropic work, particularly in the agitation for woman's suffrage and for prison reform. She was one of the founders of the New England Women's Club, the first organization of its kind in America; she was delegate to the World's Prison Reform Congress in London (1872); and was president of the women's branch of the New Orleans Exposition (1884). She has also preached occasionally in Unitarian pulpits. She has been president of the Boston Authors Club from its foundation in 1899. Her writings include: 'Passion Flowers' (1854); 'Words for the Hour' (1856); 'Later Lyrics' (1866); 'A Trip to Cuba,' and 'From the Oak to the Olive,' two books of travel: 'The World's Own' (1855), a drama; 'Sex and Education' (1874); 'Modern Society' (1881); 'Is Polite Society Polite?'; 'Life of Margaret Fuller' (1883); and 'Reminiscences' (1899). Her best known poem is 'The Battle Hymn of the Republic' (in 'Later Lyrics'), written early in the Civil War, while she was visiting the camps around Washington. It was set to the music of 'John Brown's Body,' and immediately became popular with the soldiers.

Howe, Mark Antony de Wolfe, American editor and author: b. Bristol, R. I., 28 Aug. 1864. He was educated at Lehigh and Harvard universities, and on leaving college entered the editorial office of 'The Youth's Companion,' Boston. In 1893–5 he was assistant editor of the 'Atlantic Monthly,' and since 1899 has been corresponding editor of 'The Youth's Companion.' He has published: 'Shadows,' verse (1897); 'American Bookmen' (1898); 'The Memory of

Lincoln' (edited) (1899); 'Phillips Brooks' (1899); 'Boston: the Place and the People' (1903). He has edited the series of 'Beacon Biographies' from 1899.

Howe, Richard, Earl, English admiral: b. London 8 March 1726; d. 5 Aug. 1799. At 14 he shipped as a midshipman on board the Severn in which he sailed with Anson for the Pacific, and passed through the usual gradations of the service under that admiral till 1745, when he obtained the command of the Baltimore sloop-of-war, in which he took part in the siege of Fort William, during the last Jacobite rebellion. In 1756 he served in the Channel fleet; in 1758 reduced Cherbourg. In 1759 he defeated a French squadron under De Conflans, and for two years (1763–5) occupied a seat in the board of admiralty. In 1776, as commander-in-chief in North America, he acted against the American forces and against D'Estaing, who commanded a superior French fleet. He sailed to the relief of Gibraltar in 1782 and was successful in spite of the combined fleets of France and Spain. On the outbreak of war with France in 1793 he took the command of the British fleet, and on 1 June 1794, obtained a decisive victory off Ushant for which he received the thanks of Parliament. He was made admiral of the fleet in 1796. His name is one of the highest among those of the famous naval commanders of Great Britain. He greatly improved the service by the introduction of a new system of tactics.

Howe, Robert, American colonial soldier: b. Brunswick County, N. C., 1732; d. there 12 Nov. 1785. He was a member of the assembly and of two provincial congresses, and took a prominent part in the preparation for the Revolution. At the outbreak of the war he was given a command and aided in driving the British out of Virginia; was promoted to the rank of major-general and commanded in the South. In 1778 he was repulsed by the British and compelled to evacuate Savannah; though then deprived of command he was afterward acquitted by the court-martial by which he was tried for the loss of the city. In 1780 he commanded at Charleston; in 1783 assisted Washington in putting down a mutiny; and in 1785 was elected to the North Carolina legislature, but died before he took his seat.

Howe, Samuel Gridley, American philanthropist: b. Boston 10 Nov. 1801; d. there 9 Jan. 1876. He was graduated from Brown University in 1821, and from the Harvard Medical School in 1824. Immediately after completing his studies he joined the Greek army at the time of the war for independence; he created an excellent surgical corps for the Greeks, and was also distinguished as a brave commander in battle; at the declaration of peace he established an industrial colony of Greeks on the Isthmus of Corinth. He returned to the United States for a short time, but becoming interested in the work for the blind, went back to Europe in order to study the schools for the blind there; while in Paris he was chairman of the committee for the relief of the Poles in the time of the Polish uprising; he went to Prussia to distribute the funds collected, and was imprisoned by the Prussian authorities. In 1832 he returned to Boston, and founded the Perkins Institution for the Blind, of which he became superintendent; in this position he did much to improve the methods in the instruction of the blind, and to found similar schools throughout the United States. His greatest success was in the training of Laura Bridgman. (See Defectives, Education of.) He also assisted in organizing the Massachusetts School for Idiots. He was active in the anti-slavery cause; was candidate of the Conscience Whig Party for Congress, but was defeated; and was editor of the anti-slavery paper, the 'Boston Commonwealth,' assisted by his wife, Julia Ward Howe (q.v.). At the close of the Civil War he joined in the work of the Freedmen's Bureau (q.v.). He was always active in many lines of philanthropic work, organized the Massachusetts State Board of Charities and went to Greece in 1867 with supplies for the Cretans. In 1870 he was one of the commission appointed by President Grant to visit Santo Domingo and report upon the advisability of its annexation. He wrote: 'Historical Sketches of the Greek Revolution' (1828); 'Reader for the Blind' (1839). Consult: The 'Life,' by Julia Ward Howe, and Sanborn, 'S. G. Howe, the Philanthropist.'

Howe, Timothy Otis, American statesman: b. Livermore, Maine, 24 Feb. 1816; d. Kenosha, Wis., 25 March 1883. He received a common school education, studied law, was admitted to the bar, and sat in the Maine legislature in 1845. He removed in that year to Wisconsin, entered politics, and in 1861 was chosen United States Senator, serving till 1879. He declined a Supreme Court judgeship on the death of Salmon Chase, but in 1881 became postmaster-general in President Arthur's cabinet.

Howe, Sir William, English general: b. 10 Aug. 1729; d. 12 July 1814. He was a brother of Admiral Richard Howe (q.v.) and was the successor of Gen. Gage in command of the British forces in America. He had previously served under Wolfe at the battle of Quebec. He commanded at the battle of Bunker Hill (1775), in which he lost one third of his men present in the action, and in August 1776, gained the battle of Long Island and took New York city. He won the battle of Brandywine in September 1777, in consequence of which Philadelphia was occupied by his army. At his own request he was recalled in 1778, and was succeeded by Sir Henry Clinton, who repulsed Washington at Germantown in the October following. He succeeded to the Irish peerage as viscount in 1799.

How'ell, Clark, American journalist and politician: b. Barnwell County, S. C., 21 Sept. 1863. He was graduated from the University of Georgia in 1883, entered journalism, became managing editor in 1889 of the Atlanta *Constitution,* and editor-in-chief 1897. He was a member of the Georgia House of Representatives 1890–1 and has been a member of the Georgia Senate from 1900.

Howell, Mich., village, county-seat of Livingston County: on the Pere M. and the Ann A. R.R.'s; about 50 miles northwest of Detroit. It is located in a rich agricultural section of the State. The chief manufactures are flour and condensed milk; and it has a large sash, door,

and blind factory, and a planing-mill. Pop. (1900) 2,518.

Howells, William Dean, American novelist, poet and critic: b. Martin's Ferry, Ohio, 1 March 1837. During his boyhood his father owned and published daily papers in Hamilton and Dayton, Ohio, successively, and he learned the printer's trade and gradually the whole business of conducting a newspaper. In 1851 he was working in Columbus as a compositor; in 1856 he became Columbus correspondent of the Cincinnati *Gazette;* and in 1859 was appointed news editor of the *Ohio State Journal.* At this time he published a small volume of poems, and also some poems in the 'Atlantic Monthly.' In 1860, when Lincoln was nominated, Howells wrote his life, and in 1861 was appointed United States consul at Venice, where he remained till 1865. The impressions of his stay there were embodied in 'Venetian Life' (1866), and 'Italian Journeys' (1867). On his return to the United States, he was for a time connected with the staff of the New York *Tribune,* the *Times,* and the 'Nation.' In 1866 he became assistant editor of the 'Atlantic Monthly,' and editor-in-chief in 1872. In 1886–92 he conducted the critical department of 'Harper's Monthly' called "The Editor's Study"; and in 1892 was editor of the 'Cosmopolitan' for a short time.

His first novel 'Their Wedding Journey,' was published in 1871; his other novels include: 'A Chance Acquaintance' (1874); 'A Foregone Conclusion' (1875); 'The Lady of the Aroostook' (1879); 'The Undiscovered Country' (1880); 'Doctor Breen's Practice' (1882); 'A Modern Instance' (1882); 'A Woman's Reason' (1883); 'The Rise of Silas Lapham' (1885); 'Indian Summer' (1886); 'The Minister's Charge' (1886); 'April Hopes' (1887); 'A Hazard of New Fortunes' (1889); 'The Shadow of a Dream' (1890); 'An Imperative Duty' (1892); 'The Quality of Mercy' (1892); 'The World of Chance' (1893); 'The Coast of Bohemia' (1893); 'A Traveller from Altruria' (1894); 'The Landlord at Lion's Head' (1897); 'An Open-Eyed Conspiracy' (1898); 'The Story of a Play' (1898); 'Ragged Lady' (1899); and 'Their Silver Wedding Journey' (1900). Howells has also written farces and comedies, including: 'The Sleeping-Car' (1883); 'The Mouse-Trap' (1897); 'The Unexpected Guests' (1898); and 'The Albany Depot' (1898); etc., and the following volumes of verse: 'Poems of Two Friends' (1860), with J. J. Piatt; 'No Love Lost, a Romance of Travel' (1868); and 'Poems' (1873). His other works include: 'Tuscan Cities' (1885); 'Modern Italian Poets'; 'Essays and Versions' (1887); 'Criticism and Fiction' (1891); and 'Impressions and Experiences' (1896); 'Literary Friends and Acquaintances' (1899); and 'Heroines of Fiction.'

In American literature, Howells is the leader of the realistic school; his novels portray the average, everyday American life; he has a true and sympathetic understanding of the "common people" of the United States, and types of the American "self-made" man appear and reappear in his stories. His latest phase, that in which he seeks to understand and set forth the American social problems, — the meaning of socialism, the relations of labor and capital, and, more broadly, the mystery of poverty and of human suffering, — is typified in a book like 'A Hazard of New Fortunes'; and 'A Traveller from Altruria,' a picture of an ideal commonwealth. The absence of idealism in Howells' writings has been cited as their gravest defect; but it is by no means true that he entirely excludes the ideal sides of life from treatment. His work is marked by carefulness and thoughtfulness in style and construction, and by fidelity to a high ideal of artistic excellence. His essays, like his novels, have always that indefinable charm which is the enduring note in good literature, and to the charm are added the broad outlook and the deep ethical interest which are typical of the man.

How'ison, George Holmes, American philosopher: b. Montgomery County, Md., 29 Nov. 1834. He was graduated from Marietta College, Ohio, in 1852, and from Lane Theological seminary, Cincinnati, in 1855, and after holding various college professorships elsewhere became Mills professor of philosophy at the University of California in 1884. He has published 'Treatise on Analytic Geometry' (1869); 'Limits of Evolution' (1901); 'The Conception of God' (1897).

Howison, Henry Lycurgus, American rear-admiral: b. Washington 10 Oct. 1837. He was graduated from the United States Naval Academy in 1858. He served in various important engagements, becoming lieutenant-commander in 1865. In 1899 he became rear-admiral and was retired 19 Oct. 1899. In 1901 he was appointed a member of the Schley court of inquiry, but on being challenged, was relieved from service.

How'itt, William and **Mary,** English authors commonly named together. William (b. Heanor, Derbyshire, 18 Dec. 1792; d. Rome, Italy, 3 March 1879), showed such a bias to literature that he published verses at 13. In 1821 he married Mary Botham (b. Uttoxeter 12 March 1799; d. Rome 30 Jan. 1888), who wrote both by herself and with her husband. Their first joint work, a volume of poems, 'The Forest Minstrel,' was published in 1823, and in 1827 appeared 'The Desolation of Eyam.' The best lines in these are by Mrs. Howitt. Howitt himself having no great poetic gift. In 1871, however, he published a volume entitled 'The Mad War Planet and Other Poems.' William and Mary Howitt settled first in Staffordshire. In 1823 they removed to Nottingham, where they resided till 1837, and in 1840 visited Germany, where they resided for three years. Results of their residence in Germany appeared in 'Student Life of Germany' (1841) and 'Rural and Domestic Life of Germany' (1842), which, being translated into German, acquired flattering popularity. While at Heidelberg Mrs. Howitt set herself to translate the tales of Frederika Bremer into English, and later the works of Hans Andersen. Their most ambitious work is 'The Literature and Romance of the North' (1852). Howitt's best works are those in which English history and life are treated of in connection with English scenery. The earliest of these was the 'Book of the Seasons' (1831), which acquired great popularity; 'Rural Life in England' (1838) was also well received. Still others are: 'Visits to Remarkable Places' (1840); 'Homes and Haunts of

the British Poets' (1847); 'The Year Book of the Country' (1850); and 'The Northern Heights of London' (1869). With his wife he published volumes on 'The Ruined Abbeys and Castles of Great Britain.' Mrs. Howitt's books for young people were long popular in the United States, and 'The Pet Lamb' and a few other unpretending verses of hers have become familiar to thousands of juvenile readers.

How'itzer. See ORDNANCE.

How'land, Alfred Cornelius, American painter: b. Walpole, N. H., 12 Feb. 1838. As an art student he began in the studios of Schultz and Eppindale at Boston, and subsequently went to Düsseldorf and Paris, in which latter place he painted under Lambinet. He excels in genre and landscape, and among his favorite works are 'Ford's Glen' (1878); 'Rendezvous of the Veterans' (1884); and 'The Coming Circus' (1886).

Howland, Gardiner Greene, American journalist: b. New York 1834; d. there 9 May 1903. He was the intimate and confidential friend of the elder James Gordon Bennett, held the same relations with the younger Bennett, was general manager of the *Herald* for more than twenty-five years, and one of the corporators named under the incorporation of the newspaper.

Howley, Michael Francis, Canadian ecclesiastic: b. 1843. In 1857 he entered Saint Bonaventure's College, and in 1863 went to Rome, entering Propaganda as an ecclesiastical student. In 1868 he was ordained a priest and went to Scotland as secretary to Most Rev. Dr. Ayre, but in 1870 returned to Rome with Dr. Ayre and was present on the occasion of the declaration of the dogma of papal infallibility by Pope Pius IX. He accompanied the Rt. Rev. Thomas J. Power to Newfoundland in 1870, and for over 30 years he has labored with great success for the spiritual and ecclesiastical advancement of Newfoundland. In 1886 he was made prefect apostolic of Saint Georges, in 1892 was consecrated bishop in Saint John's and made vicar apostolic of Saint Georges, in 1902 appointed bishop of Saint John's in succession to Rt. Rev. Dr. Power, and in 1904 he was named by the Holy See archbishop of the ecclesiastical province of Newfoundland. Archbishop Howley is not only distinguished as a theological scholar and thinker, a devoted missionary and able preacher, but also as a poet, lecturer, and antiquary. He has also contributed much to the historical study of Newfoundland (q.v.).

Howorth, how'ërth, **Henry Hoyle, SIR,** English author and politician: b. Lisbon, Portugal, 1 July 1842. He was a Conservative member of Parliament for South Salford 1886–1900. In recognition of his works on Eastern history and other subjects, he was created K. C. I. E. in 1892. Besides very many scientific memoirs, he has published: 'History of the Mongols'; 'The Mammoth and the Flood'; 'The Glacial Nightmare and the Flood'; 'Genghis Khan and his Ancestors,' etc.

Howrah, how'rā, India, an independent municipality, suburban to Calcutta (q.v.). Pop. (1901) 157,847.

Hox'ie, Vinnie Ream, American sculptor: b. Madison, Wis., 23 Sept. 1846. She was educated at Christian College, Columbia, Mo., and going to Washington, D. C., studied art, executed busts of Grant, Sherman and others, and a statue of Lincoln for the National Capitol. She then went abroad, where she designed medallions of Doré, Liszt, Buchanan, Read, and others. Among other works of hers are ideal statues of 'Sappho'; 'The Spirit of the Carnival'; and the statue of Admiral Farragut in Farragut Square, Washington. She was married to Major R. L. Hoxie of United States Engineers.

Hoyle, Edmond, English writer on games: b. 1672; d. London 29 Aug. 1769. It is said that he was educated for the law, but nothing definite is known of his career except that he was for many years in London a writer on and instructor in games. His 'Short Treatise on Whist' (1742), a compendium of the laws of the game and many rules for play, sold largely and has been the basis of all subsequent manuals of the kind. So generally has his authority been accepted in the game that "according to Hoyle" has attained a proverbial significance.

Hoyt, Charles Hale, American dramatist: b. Concord, N. H., 1860; d. 1900. He was at one time musical and dramatic critic of the *Post* of Boston. His works comprise 'A Midnight Bell' (1887), and a long series of farce-comedies, such as 'A Trip to Chinatown' (1890).

Hoyt, Henry Martyn, American lawyer and soldier: b. Kingston, Pa., 8 June 1830; d. Wilkesbarre, Pa., 1 Dec. 1892. He was graduated from Williams College in 1849, read law, was admitted to the bar in 1853, practised at Wilkesbarre, at the opening of the Civil War was appointed lieutenant-colonel of 52d Pennsylvania regiment, served during the Peninsular campaign in 1862, and was captured in a night attack on Fort Johnson during the siege of Morris Island. Mustered out with the grade of brevet brigadier-general; he practised his profession until 1867, and was then appointed additional law-judge of the Luzerne County courts. In 1879–83 he was Republican governor of Pennsylvania. His administration was particularly characterized by a wise financial policy, by means of which the State debt was reduced to $10,000,000 and refunded at three per cent. He published: 'The Controversy between Connecticut and Pennsylvania' (1879); 'Protection *v.* Free-Trade' (1885).

Hoyt, John Wesley, American educator: b. near Worthington, Ohio, 13 Oct. 1831. He was graduated at Ohio Wesleyan University in 1849, and later studied both medicine and law. He has had charge of educational exhibits in several international expositions, and was made chairman of the National Committee to Promote the Establishment of the University of the United States. He was the first president of the University of Wyoming, and was governor of Wyoming 1878–83. He has published 'Progress of University Education'; 'Studies in Civil Service'; etc.

Hoyt, Wayland, American Baptist clergyman and author: b. Cleveland, Ohio. He was educated at Brown University and studied for the Baptist ministry at the Rochester Theological Seminary. Since then he has held pas-

torates at Pittsfield, Mass., Cincinnati, Brooklyn, Minneapolis, and Philadelphia. Among his published works are 'Hints and Helps for the Christian Life' (1880); 'Gleams from Paul's Prison' (1882); 'Light on Life's Highway' (1890).

Huaina Capac, wä-ē'nä kä'päk, or **Huayna Capac,** 11th Peruvian Inca: b. Cuzco, Peru, about 1450; d. Tumibamba, Ecuador, November 1525. He began his reign in 1480, or, according to some authorities, 1491, and made many conquests, even subduing the country as far south as Chile. By his will he divided the empire between two of his sons, Huascar and Atahualpa (q.v.).

Huamanga, wä-män'gä, or **Guamanga,** gwä-män'gä, Peru, the former name of Ayacucho (q.v.).

Huanaco, hwä-nä'kō, the most numerous and widely distributed of the two species of the genus *Lama* (*L. guanaca*), of the camel family, resident in South America. It is somewhat like a large goat in form, but with a much longer neck, surmounted by a small camel-like head, and long, pointed, alert ears, but no weapons. A large male is about four feet tall at the withers, a female somewhat less. The coat is of long, woolly, reddish-gray hair, the improvement of which by selective breeding in domestication has formed the alpaca breed (see ALPACA). It roams the open plains of Argentina and Patagonia, serving as the principal game animal of that region, and furnishing the scattered natives with food, clothing and shelter. In the autumn it gathers into large herds, and behaves in general like the antelopes of the similar arid plains of other parts of the world. Consult Darwin, Hudson, Spears, and other writers on Patagonia. See LLAMA.

Huascar, wäs'kär, Peruvian Inca, son of Huaina Capac (q.v.). See ATAHUALPA.

Hub'bard, hŭb'ard, Elbert, American author: b. Bloomington, Ill., 1859. After working on a farm as a boy, he went to Chicago, where he entered a printing-office, and later was employed in a soap factory In the latter business he rose to be manager, and finally partner of the firm; selling out his interest, he devoted himself for a time to study and travel, and finally settled at East Aurora, where he established the Roycroft shop, devoted mainly to the artistic printing and binding of books. The organization of the shop is co-operative, and its ideal is for every worker to do that which best expresses his own individuality. Hubbard is editor of the 'Philistine,' a "magazine of protest," and has written 'Little Journeys' (biographical sketches); 'No Enemy but Himself'; 'Message to Garcia' (1898); and 'Time and Chance' (1901); 'The Man of Sorrows' (1904).

Hubbard, Joseph Stillman, American astronomer: b. New Haven, Conn., 7 Sept. 1823; d. there 16 Aug. 1863. He was graduated from Yale in 1843, and accompanied Frémont as observer of latitude and longitude in the latter's transcontinental journey. From 1845 until his death he was stationed at the Washington observatory as professor of mathematics in the United States navy. He made important investigations regarding comets, was at two different periods editor of the 'Astronomical Journal,' and was a member of the National Academy of Sciences.

Hubbard, Leonidas, Jr., American journalist, writer, and explorer: b. Waldron, Mich., 12 July 1872; d. Labrador 18 Oct. 1903. He was a teacher in the public school at Angola, Mich., while still in his teens, and early in life showed keen interest in writing, exploration, and athletics. Graduated from University of Michigan in 1897. He at once began reportorial work in Ann Arbor, and later on the Detroit *Evening News.* He came to New York in the summer of 1899 and attached himself to the staff of the *Daily News,* but early in 1902 became associate editor of 'Outing,' in which work he was much interested. He conceived the idea of exploring into the wilds of Labrador, and 20 June 1903, accompanied by Dillon Wallace, a New York lawyer, and George Elson, a Cree Indian guide, he left New York, going by steamer from Saint Johns, N. B., to Rigolette, a Hudson Bay trading post on the Grand River. From this point Hubbard and his friends traveled by canoe and on foot, mapping correctly for the first time Grand Lake; then penetrating the interior in a westerly and northwesterly direction, mapping the course of the Beaver River from its source to the point where it flows into the southeast bay of Lake Michikamau; and locating and mapping several large lakes in the interior. The party penetrated some 250 miles farther into new territory than any previous expedition. Notes on the geology and general observation of the topography of the country were also made. Among Mr. Hubbard's most noted writings are: 'The Moonshiner at Home' (1902); 'Barataria' (1902); 'Children of the Bush' (1903); and 'Where Romance Lingers' (1904).

Hubbard, Oliver Payson, American physician: b. Pomfret, Conn., 31 March 1809; d. New York 9 March 1900. Graduated from Yale in 1828, he was assistant to Silliman the elder in the laboratory there in 1831–6, and aided Goodyear in experiments connected with the vulcanizing of India rubber. In 1836–66 he was professor of chemistry, pharmacy, mineralogy, and geology at Dartmouth, in 1866–71 lectured on those subjects, and from 1871 until his retirement as professor emeritus in 1883 was professor of chemistry and pharmacy. He was a founder of the American Association of Geologists and Naturalists in 1841, and its secretary in 1844. He contributed to the 'American Journal of Science,' and published 'A History of Dartmouth Medical College' (1880), etc.

Hubbard, Richard William, American artist: b. Middletown, Conn., 15 Oct. 1810. He was educated at Yale, set up his studio in New York, was elected to the National Academy in 1858, and painted numerous American landscapes, such as: 'Mansfield Mountain at Sunset'; 'Showery Day, Lake George'; 'Glimpse of the Adirondacks'; and 'Lake Cazenovia.'

Hubbard, William, American colonial clergyman and historian: b. Tendring, Essex, England, 1621; d. Ipswich, Mass., 14 Sept. 1704. He was graduated at Harvard College in 1642, and was ordained about 1656 as minister at Ipswich, where he continued during the remainder of his life. He is the author of 'A Narrative of the

Troubles with the Indians from 1607 to 1677, with a Discourse' (1677), the map accompanying which is supposed to be the first executed in America. He left in manuscript a 'General History of New England,' for which the colony paid him £50, and which has been consulted with advantage by Mather, Hutchinson, Holmes, and other American historians and annalists. It was published by the Massachusetts Historical Society in 1815.

Hubbardton, hŭb'ard-tŏn, Vt., town in Rutland County; 13 miles from Castleton, its nearest railroad station. It is in an agricultural region, and has but little manufacturing; its raw products are sent direct to the markets. On 7 July 1777 a battle took place here between the Americans under Colonels Francis and Warner, and a British and Hessian force under Generals Riedesel and Fraser, in which the British were successful. The Americans, the rearguard of Gen. St. Clair's army, who were retreating from Ticonderoga, lost in killed, wounded, and prisoners 324 men; and the British loss was 183 men. A monument in memory of the American soldiers who were killed in this battle, occupies a prominent position. Pop. 500.

Huber, Johannes, German philosopher and theologian: b. Munich 18 Aug. 1830; d. there 19 March 1879. He was educated at the University of Munich, became professor of philosophy there in 1859, and was one of the leaders of the Old Catholic party and an active opponent of the Ultramontanes. He vigorously attacked the definition of the dogma of papal infallibility. Among his works were 'Studies' (1867); 'Das Papsttum und der Staat' (1870); 'Der Jesuitenarden' (1873); and 'Zur Philosophie der Astronomie' (1877).

Huber, Victor Aimé, German publicist and author: b. Stuttgart 10 March 1800; d. Wernigerode 19 July 1869. Educated at Würzburg and Göttingen, he became professor of the history of literature and of modern history at Rostock in 1833, of the languages of western Europe at Marburg in 1836, and at Berlin in 1843. He retired in 1850. Huber was one of the most profound of German scholars in the Spanish language and literature. Among his publications were: 'Die Geschichte des Cid' (1829); 'Crónica del Cid' (1844); and 'Skizzen aus Spanien' (1828–35).

Hubert de Burgh, English statesman: d. London 12 May 1243. He held office under Richard Cœur de Lion, and was made castellan of Falaise by King John, with whom he sided in the struggle with the barons, though advising the granting of Magna Charta. In the year of Runnymede (1215) he was made justiciar (chief-justice) of England. On 24 Aug. 1217 he won a distinguished victory over a French fleet bringing reinforcements to the army besieging Dover Castle; the treaty of Lambeth was concluded (11 September) and the enemy evacuated England. After 1219 he was co-regent with Langton, archbishop of Canterbury, for Henry III. He vigorously opposed the foreigners who were endeavoring to obtain control of the government, and sought to end the exactions of the clergy. In 1232 he was dismissed, owing largely to his failures in the conflict with the Welsh, and thereafter he had no part in the government.

Hubert, hū'bert (Fr. ü-bār), Saint, apostle of Ardennes, the patron of huntsmen; d. about 727. Legend says that he was a keen hunter, and that being once engaged in the chase on Good Friday, in the forest of Ardennes, a stag appeared to him having a shining crucifix between its antlers, and he heard a warning voice. He was converted, entered the church, and became bishop of Maestricht and Liège. He worked many miracles, and his body, at first deposited in the church of St. Peter at Liège, was in 817 conveyed to the Benedictine convent of Andain, in the Ardennes, which received the name St. Hubert's of Ardennes. The day of the saint is 3 November, and was formerly celebrated at many courts by a solemn chase.

Hübner, Joseph Alexander, Count, Austrian diplomat: b. Vienna 26 Nov. 1811; d. there 30 July 1892. He was educated at Vienna, and, having entered the service of the government, became in 1849 minister at Paris, and in 1865–8 was ambassador at Rome. In 1879 he became a member of the clerical-conservative wing in the upper house of the Reichsrat. Among his published works are: 'Sixte-Quint-D'après des Correspondances Diplomatiques Inédites' (1870, new ed. 1883); 'Ein Spaziergang um die Welt' (1872, 7th ed. 1891); and 'Durch das Britische Reich' (1886, 2d ed. 1891).

Hübner, Julius, German painter: b. Oels, Silesia, 27 Jan. 1806; d. Loschwitz, Saxony, 7 Nov. 1882. He studied at the Berlin Academy and was also a pupil of Schadow at Berlin and Düsseldorf. In 1841 he became professor in the Dresden Academy of Arts. He was an historical painter of the Düsseldorf School, his works including 'Disputation between Luther and Eck' and 'Charles V. at Saint Just.'

Hübnerite, a native tungstate of manganese, $MnWO_4$. It always contains some ferrous iron and as its percentage increases it graduates toward wolframite (q.v.), which it often much resembles, but from which it is distinguished by its brown color and pleochroism. It occurs in monoclinic crystals, often bladed and deeply striated. It has easy pinacoidal cleavage, is brittle, has a hardness of 5. to 5.5 and is very heavy, its specific gravity being 7.2 to 7.5. Its lustre is sub-metallic or resinous, and its streak yellowish-brown or greenish-gray. It occurs in considerable quantities near Silverton, Colo., in New Mexico, Nevada, Arizona and elsewhere.

Huck'leberry, a name of uncertain derivation applied to a variety of shrubs, especially to species of the genus *Gaylussacia*, and to those belonging to the order *Vacciniaceæ* and the genus *Vaccinium*. The principal species are found mainly in the northern hemisphere, throughout North America, Northern Britain and Europe. The fruit of *Vaccinium* is a many-sided berry with four or five cells. *V. Pennsylvanicum* is a small plant about six inches in height. Other species range widely in size, *V. corymbosum* sometimes attaining a height of nearly 10 feet. In many places in the United States huckleberries are a valuable product, the fields in which they grow are preserved, and the berries are secured either for household use or for profitable marketing.

Huckleberry Finn, The Adventures of, a story by Samuel L. Clemens ("Mark Twain"), published in 1884. It is a sequel to, and fol-

lows the fortunes of the leading characters of the same author's 'Tom Sawyer.' In this book the author not only preserves to us a valuable record of a rapidly disappearing social order, but throws light upon some questions of moment to the student of history.

Hudibras, hū'dĭ-brăs, Sir, the hero of a famous satirical poem by Samuel Butler (q.v.), published 1663–78.

Hud'son, H. Lindsay, "Harry Lindsay," English novelist; b. Belfast, Ireland, 10 April 1858. He has been a journalist and schoolmaster by turns, and among his writings published under the signature "Harry Lindsay" are 'Methodist Idylls' (1897); 'An Up-to-Date Parson' (1899); 'Judah Pyecroft: Puritan' (1902).

Hudson, Henry, English navigator. The time and place of his birth appear to be lost. We only know that he had earned, perhaps by the time he was 40, sufficient reputation as a bold and skilful navigator to be placed in command of the ship Half Moon of Amsterdam. Early in 1609 he made a contract with a party of Dutch merchants to act as captain of their private exploring expedition, and in the written agreement between them he was described as "Henry Hudson, Englishman." This settles the honor of his birth country, though nothing more. At that time the one great commercial demand was for a shorter and better, all-sea trade route to the Far East. It was known that there was land to the west of Europe and it was believed that a passage could be found through these lands directly westward to the East. It is clear that Hudson believed that the western route was the most promising and, no doubt, he suggested it to his employers, but they evidently had more faith in a sea passage north and then east, round Europe and Asia to China. Thus it happened this English sea captain sailed from the Dutch port of Amsterdam in the small ship "Half Moon bound for China by the way of the North Cape. The ship's company of Dutch and English was fortunate in having as mate one Robert Juet (perhaps also of England), and the mate could read and write. Juet kept the ship's log, and in this log book on the first page are these words: "On Saturday, the five and twentieth of March, 1609, after the old account (style), we set sayl from Amsterdam, and by the seven and twentieth day we were down at the Texel; and by twelve of the clock we were off the land, it being east of us two leages off."

Once "off the land" the ship was free to go where the captain pleased and it certainly did not please the crew to face the arctic cold of the attempted voyage round Europe. Solid pack ice and the open mutiny of the crew decided Hudson to turn back and he steered south — and west. It is evident that he felt free to carry out his own plans and reach China by another route. His owners' plans had failed and, while his plan might fail, his success would justify his action. Hudson's decision was almost as bold as that of Columbus for, while he had, no doubt, some knowledge of the lands to the west, he evidently had no conception of the shape or size of North America nor of the width of the Pacific.

The Half Moon was a slow sailer, and four months passed before she made the land along the eastern coast of what is now the United States. The log book described the land as "low white sandy ground" — exactly describing all the shore line south of Sandy Hook. The book might also have described parts of Long Island or Cape Cod and it is clear it did not describe the coast of Maine, and it is more than probable the first land mentioned in the book was south of Sandy Hook for, on reaching the land and finding no passage westward, Hudson steered "northeast by north" until, about two weeks later, he came to a great bay. The log book, which does not give the name of the month, and which must have been September, says, "And from that lake or bay the land lyeth north by east, and we had a great streame out of the bay." The Half Moon had found the "great stream" described by Verrazano, and with the flood tide sailed into New York Bay and headed for the Narrows and, as the log book says, "came to three great rivers." And it continues: "So wee stood along to the northmost, thinking to have gone into it." The Half Moon was off Manhattan. It was true Verrazano, in 1524, had entered New York Bay and left a record of a high hill and a great bay out of which flowed a large river, but Verrazano had not the courage to pass the Narrows, except in a small boat. Other explorers may have looked into the bay. The Half Moon was the first ship to pass up the "great stream" and to Hudson belonged the entire honor of discovering and exploring the river that now bears his name.

The pages of Juet's journal tell nothing of Hudson's own hopes, fears and anticipations. Yet, it is fair to think that Juet's enthusiasm over the beauty and value of the great valley was shared by his captain and that the ship's log was, in a sense, a reflex of Hudson's own views. There is no hint of Hudson's belief that he could reach China by this route, yet it is reasonable to suppose he entered New York Bay in the hope that the "great stream" would lead through the land to the Pacific. The great size of the bay and river and the fact that the tide flowed far into the land and that for the first few days' sail the water remained salt, no doubt encouraged him to keep on through this most promising opening in the land. Favored by "fairer weather" and a favorable breeze he steered northerly over the wide salt arm of the sea until the apparent strait became a river and the sea water became fresh. At the Highlands all hope of a road to China must have faded away. Still, he would sail on, push through the mountains and see what manner of country lay beyond.

The items of the log book plainly show that Hudson, after passing the Highlands, began to recognize the transcendent importance of his discovery. He had found a new land of surpassing beauty and fertility and everywhere clothed in splendid forests. Hudson clearly recognized the commercial value of his discovery, for the log book enumerates all the potential wealth of the river and valley in fish, game, lumber, fruits, vegetables, grains and peltry. It even mentions the fact that Hudson, while the ship was at anchor somewhere near the present city of Hudson, sent the ship's carpenter ashore to fashion a new forearm out of one of the primeval trees — the first bit of lumbering done by white men in the valley.

Hudson seems to have decided, after reaching the upper river and sailing to a point opposite the Catskills, that the best way to mollify his owners on his return would be to report as fully as possible the potential wealth he had discovered and he sent a boat up the river to explore the country. The boat party appears to have been absent several days, for they rowed up stream about nine leagues or perhaps beyond Albany where, as the log book says, the boat found "it bee at an end for shipping to goe in — with but seven foot water and unconstant soundings." Meanwhile Hudson evidently traded with the Indians for peltry, no doubt regarding the furs as something that would demonstrate to his merchant owners the value of his discovery.

Three weeks after the Half Moon entered "the great streame" she again passed Sandy Hook and steered away for Amsterdam. There is no record of the return voyage nor is there any record of Hudson's report to the merchants of Amsterdam, yet it is evident that his story and perhaps the exhibit of peltry created a tremendous sensation in the commercial cities of Holland. Hudson appears not to have cared much about this side of the affair. He seems to have considered his voyage a failure. He had tried to reach China and failed, and wished to sail again, but the merchants seem to have been wholly occupied in fitting out new ships under more commercial captains and would not listen to him. At last, after some delay, he did secure a second ship and set forth once more to find a sea path through America. He appears to have thought there might be a passage round by the north of America and he steered for Baffin's Bay. Once more he found a great passage leading westward into the land, once more a salt water strait seemed to promise success, but it only led to an inland sea. His miserable crew, ignorant, frightened at the arctic cold and gathering ice, rose in mutiny, and putting their great captain in an open boat, with his son, a boy of seven, and some invalid sailors, set them adrift in the vast waters of Hudson Bay and left them there to perish.

CHARLES BARNARD,
Lecturer, Board of Education, New York.

Hudson, Henry Norman, American Shakespearian scholar and Episcopal clergyman: b. Cornwall, Vt., 28 Jan. 1814; d. Cambridge, Mass., 16 Jan. 1886. He served as chaplain in the Civil War, was professor of Shakespeare at Boston University, and for a time editor of the 'Churchman.' He published 'Lectures on Shakespeare' (1848); 'Campaign with General Butler' (1865); 'Shakespeare, his Life, Art, and Characters' (4th ed. 1883); 'Essays on Education' (1883). He edited the Harvard and the University edition of Shakespeare.

Hudson, Thomson Jay, American philosophical writer: b. Windham, Ohio, 22 Feb. 1834; d. Detroit, Mich., 1903. After studying law and being admitted to the bar in Cleveland, Ohio, in 1857, he practised three years, was engaged in journalism in Michigan 1860–76, and was principal examiner in the United States Patent Office 1886–93. He has published 'The Law of Psychic Phenomena' (1893); 'A Scientific Demonstration of the Future Life' (1895); 'The Divine Pedigree of Man' (1899); 'Law of Mental Medicine' (1903).

Hudson, William Henry, American educator and critic: b. London, England, 2 May 1863. He was five years private secretary to Herbert Spencer (q.v.) and coming to America was assistant librarian of Cornell University, 1890–2. He has been an assistant professor of English literature at Leland Stanford University from 1892, and has published 'The Church and the Stage' (1886); 'An Introduction to the Philosophy of Herbert Spencer' (1893); 'Studies in Interpretation' (1896); 'Idle Hours in a Library' (1897); 'The Study of English Literature' (1898); 'The Sphinx and Other Poems' (1900); 'The Meaning and Value of Poetry' (1901); 'Life of Sir Walter Scott' (1901); 'Famous Missions of California' (1901); etc.

Hudson or Hudson's Bay, Canada, an extensive bay or inland sea extending between lat. 51° and 64° N., and lon. 77° and 95° W. Its greatest length north to south is about 800 miles, greatest breadth, 600 miles. It is connected with the Atlantic Ocean by Hudson Strait and with the Arctic Ocean by Fox and other channels. Hudson Bay is navigable in summer from the middle of June to the end of October, being obstructed by drift-ice during the rest of the year. There are many islands, reefs and sand banks. The white whale is found in its waters, and there is a considerable summer fishery. Numerous rivers flow into the bay, the chief being the Nelson and Churchill on the east. The shores on the east are high and bold; those on the west are low and level, and much of the land is favorable for stock and dairy farming, while valuable deposits of iron ore, galena, and plumbago exist. With the exception of a few fur trading stations on the west and south coast, there are, however, no settlements.

Hudson, Mass., town, Middlesex County, on the Assabet River, and on the Boston & M. and the Fitchburg R.R.'s; about 17 miles northwest of Worcester. The town is situated in an agricultural region, but it is particularly noted for its manufactures, especially of articles made from leather and rubber. The chief manufactures from rubber are gossamer clothing, webbing, goring, and boots and shoes. Some of the other manufactures are paper and wooden boxes, leather, and leather boots and shoes. The town owns and operates the electric-light plant and the waterworks. Pop. (1900) 5,454.

Hudson, N. Y., city, port of entry, county-seat of Columbia County; on the Hudson River, and on the New York Central & H. R. and the Boston & A. R.R.'s; about 30 miles south of Albany. Area of the city, one square mile. Hudson was settled in 1783 and was called Claverack Landing; but the year following the name was changed to Hudson. In 1785 it was chartered as a city, and in 1790 it was made a port of entry. From the first it was a trading station of importance and a whaling port. After the Revolution a large foreign trade was established, but the commerce of the city was injured by the destruction of its shipping in the War of 1812. The surrounding country is devoted largely to agriculture, and the city has a number of manufacturing establishments. The chief manufactures are foundry products machinery, knit goods, car-wheels, and creamery products. It has a large sash and blind factory

and several small manufacturing establishments. Some of its prominent buildings are the State Volunteer Firemen's Home, the State House of Refuge for Women, an orphanage, hospital, and the city public buildings. The city owns and operates the waterworks. The government is vested in a mayor, who holds office two years, and a city council. Pop. (1900) 9,528.

Hudson, Ohio, town in Summit County, on the Pennsylvania railroad, 20 miles south of Cleveland. This was one of the earliest settled towns on the Ohio Western Reserve, and prior to the Civil War was an abolition stronghold. The Western Reserve College, before its removal to Cleveland, was located here. Pop. (1900) 2,240.

Hudson, Wis., city, county-seat of Saint Croix County; on Lake Saint Croix, an expansion of the Saint Croix River, and on the Chicago, St. P., M. & O. railroad; about 65 miles northwest of Eau Claire and 20 miles east of St. Paul, Minn. The chief manufactures are flour, finished lumber, furniture, railroad cars, machinery, beer, and brooms. The city has a large cold-storage plant and ample facilities for shipping butter, poultry, vegetables, and fruits. It has a large sanatorium. The electric-light plant and the waterworks are owned and operated by the city. Pop. 3,259.

Hudson, the largest river in the State of New York, has its head waters in Hamilton and Essex counties, and flows southwest into Saratoga County, then nearly directly east to Sandy Hill in Washington County, and from this point south through New York Bay into the Atlantic Ocean. It is fed by several of the Adirondack lakes, a number of small streams, and by Schroon River, Batten Kill, Hoosick, Wappingers and Croton from the east, and the Sacondaga, Mohawk, Wallkill, and Esopus Creek from the west. The Mohawk (q.v.), which flows into the Hudson at Cohoes, is the largest tributary; the Rondout enters the Wallkill near the Hudson. The head waters of the Hudson and the sources of several of the streams which flow into the Saint Lawrence are very near each other in the Adirondack Mountains. At Troy, three miles below the mouth of the Mohawk, the Hudson becomes a navigable tidal stream. There is a tidal rise of about one foot at Albany. Above Troy there are a number of rapids and long falls in the river; but below, the navigation is uninterrupted. At one time there were a few obstacles, the largest of which was "Overslaugh", or Castleton Bar, at Castleton. This hindrance to navigation has been almost wholly removed by the Federal and State government. The Catskill Mountains, on the west side, begin about 25 miles below Albany. Lower down are the Highlands, averaging about 1,100 feet in height, which extend along the shore for a distance of about 20 miles. The Highlands of the Hudson are noted for their beautiful scenery. On the west bank are the famous Palisades (q.v.) about 13 miles long, their southern extremity being near Fort Lee, in New Jersey, and the northern extremity near Piermont, New York. This remarkable arrangement of rock rises from near the water's edge, almost perpendicularly, from 350 to 550 feet. Below Verplanck and Stony Point is an expansion in the river the upper part of which is called Haverstraw Bay and the lower part Tappan Sea. Many small islands in the river serve as foundations for lighthouses, or for the erection of dredging platforms. Iona, on which there is now a naval station, Constitution, and Beeren Islands have all figured in history. Below Albany the Hudson is more an estuary or fiord than a river, which accounts for the great depth of water. The area drained by the Hudson above where the Mohawk enters is about 30,000 square miles. The river is noted for its beautiful scenery from the source to the mouth. Along the lower part of its course there are many fine residences, as a large part of the country on both banks from New York to Albany is now a residential section. The Hudson is fittingly called the "Rhine of America."

Hudson River was discovered by Verrazano, an Italian navigator, in 1524; but it was explored by Henry Hudson in 1609. The Indian name for the river was Shatemuc, and the first colonists called it North River, as the Delaware was then called South River. The part of the river west of New York city is still called North River; but it was given the name Hudson in honor of its first explorer. The history of the country since its discovery by Europeans occupies an important place in the history of the United States. The almost unbroken waterway from the Atlantic Ocean through what is now the State of New York, to the Saint Lawrence River, made this an important route for missionaries, traders, and for the armies in the various wars. From the mouth of Lake Champlain to Lake George, across the portage from Lake George to the Hudson, and the Hudson to the ocean, was all disputed territory, and the scene of many a contest of the Revolutionary War. What a change in the map of America if Burgoyne had succeeded in his plan of 1777 "to cut the nation in two" by getting possession of Lake Champlain and the Hudson. See CHAMPLAIN, LAKE; CROWN POINT; HAVERSTRAW; TICONDEROGA.

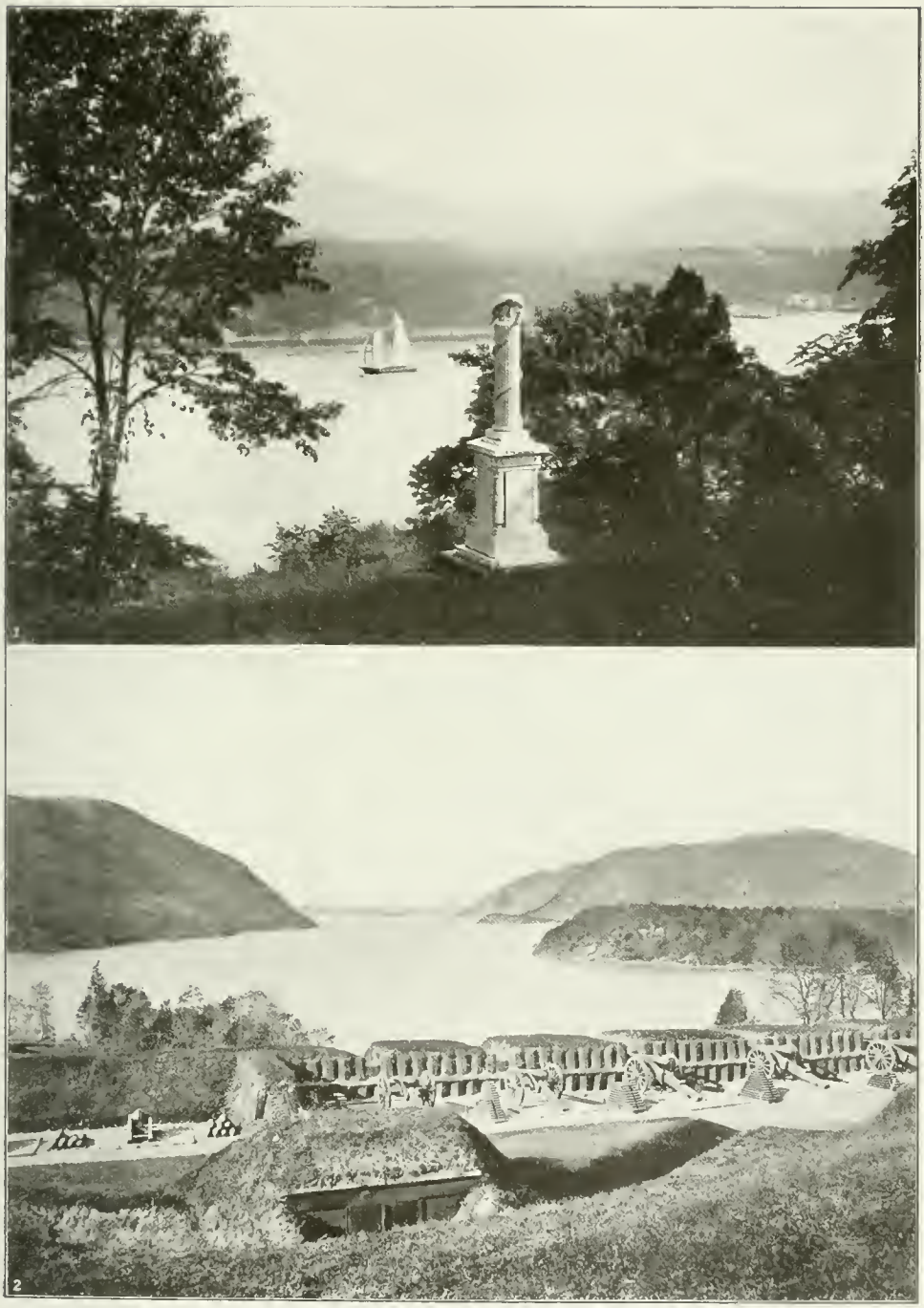
The river is navigable for ships of the first class for about 117 miles from the ocean. Its whole length is about 300 miles. Before the introduction of railroads, the navigable waters of the Hudson, connecting New York with a large section of country, gave the city great opportunities for development. A canal built along the Mohawk Valley, in 1817–25, connected the Hudson with Lake Erie, and the Champlain Canal completed the water route from the Hudson to Lake Champlain. Later the Erie and the Delaware and Hudson railroads brought the coal of Pennsylvania to the Hudson River for transportation by water to markets in the interior. The New York Central and Hudson River Railroad is on the east side of the river and the West Shore on the west side. In 1807 Robert Fulton made on this river the first successful experiment with steam navigation. The Hudson is now a thoroughfare for an immense amount of freight, and elegant passenger steamers ply daily between New York and Albany. The government has erected and maintains 21 lighthouses and lighted beacons. Navigation ceases in winter because the river is frozen nearly its whole length. The ice crop harvested each winter on that part of the river between Albany and the Highlands is shipped, when navigation opens, chiefly to New York city. Shad fishing is one of the important Hudson River industries. Many of the cities on the Hudson were at first

only trading posts or ferry towns, but nearly all have kept pace in development with the rest of the State. The principal cities and towns on the river from north to south are Glens Falls, Sandy Hill, Fort Edward, Mechanicsville, Cohoes, Troy, Albany, Hudson, Catskill, Kingston, Poughkeepsie, Newburg, West Point, Peekskill, Haverstraw, Ossining, Nyack, Tarrytown, and Yonkers. At the mouth of the river are New York and Jersey City, with the suburbs, which are important shipping ports, Hoboken and Weehawken. The only bridge crossing the river between New York and Albany is the one which extends from Poughkeepsie on the east side to Highland on the west. There are 14 public ferries. The use of the water-power of the Hudson as an aid in developing electrical power for the mechanical arts is most important. From Mechanicsville the power of the Hudson is transmitted to the general electric shops of Schenectady. At Spiers Falls, at the foot of Mount McGregor, about forty miles above Albany, there has been constructed a dam,—a stone wall over 1,800 feet long, 100 feet high, and containing 1,800,000 cubic feet of masonry. The Hudson is raised 50 feet above its former river bed, then its waters fall 80 feet, and the power developed is (1904, 30,000 horse-power), transmitted for electrical machinery, to Schenectady, Albany, Troy, Amsterdam, and other places. The electric motors at Spiers Falls get some of their power from the older plant at Mechanicsville, about 20 miles distant. At other points storage plants will be constructed, more power will be developed, the current will be sent at a high pressure to sub-stations at Saratoga, Schenectady, Ballston, Glens Falls, Fort Edward, and Watervliet. This will mean running cars, lighting streets, driving machinery by power developed hundreds of miles away. This power development of the waters of the Hudson combined with development of like power of the waters of the Saint Lawrence at Massena (q.v.), keeps the two rivers, as in early years of our country, of vast importance to the State. Many industries are affected by this great new power, not the least of which are the coal-mining of Pennsylvania and the preservation of the Adirondack forests.

The Hudson occupies an important place in the historical, commercial, and mechanical development of the nation, also in its literary and artistic progress. Washington Irving who lived at "Sunny Side" and was laid to rest in Tarrytown, introduced to the world many of the places along the Hudson. Cro' Nest is associated with Joseph Rodman Drake and his poem, 'Culprit Fay'; West Park and the country around have been practice observation ground for the naturalists John Burroughs and Ernest Ingersoll; Cornwall-on-the-Hudson was the home of N. P. Willis and E. P. Roe. Artists who have received inspiration from Hudson's scenery and history have become sufficiently numerous and their works of importance enough to be called "The Hudson School of Painters." Consult Ingersoll, 'Guide to the Hudson River'; Cooper, article in 'Magazine of American History,' Vol. IV.

Hudson's Bay Company, incorporated 1670, the great fur-trading and later landholding and administrative company of Northwest Canada. It originated in the dissatisfaction of two French Protestant employees of the French fur-trading monopoly at Quebec, Groseilliers and Radisson, with its unwillingness to extend the trade to Hudson Bay, after vainly trying to induce Boston merchants and the French court to take up their scheme for so doing. They gained the ear of a company of London merchants and Prince Rupert, cousin of Charles II., brought a load of furs from the bay, and on 2 May 1670 Rupert and 17 associates received from Charles a charter for "The Governor and Company of Merchants-Adventurers trading into Hudson's Bay." It had the monopoly of the right to trade in the bay or on its coasts, and could expel any one entering the territory without its license; could build forts, send out ships of war and privateers, and declare war and make peace with any non-Christian people. Its capital was £10,500, divided into 34 shares with an extra one for Prince Rupert, and in 1676 it imported some £19,000 worth of furs, sending in return £650 worth of goods to the Indians. The profit was high on the petty capital paid in, but the gross amount was not large for a century. In 1748 the trade was carried on with four ships, and employed about 120 men in all, including the garrisons at its forts. The furs and other imports amounted to over £30,000, the exported goods to £5,000, and the costs of business over £17,000. The average profit was 40 per cent. on capital, but the sum was trivial. Moreover, the company had great losses and tribulations from the French rivalry and assaults, especially in the national wars. The French laid claim to the territory on the strength of a mythical expedition of Jean Bourdon in 1656, and in 1682 and 1686 captured several of the company's forts, the two countries' trading posts shared in the long war ended by the Peace of Ryswick in 1697, captured each others' forts, and the peace yielded Port Nelson to the French, to the great damage of the company. The War of the Spanish succession inflicted frightful hardships on both sides: the company claimed a loss of over £100,000, hundreds of trappers and employees starved to death, and the Indians turned cannibals. The Treaty of Utrecht in 1713 finally resigned all French claim to the Hudson's Bay territory, and thence till the cession of French Canada in 1763, the monopoly gave the company an easy life and good profits, though still on a small scale. But when that cession opened up access to Hudson's Bay from both land and sea, the possibilities of trade were incalculably enlarged. Despite the clandestine rivalry of Montreal traders who intercepted their boats, the gross volume increased manifold, and it was not crippled by the ravages of France in 1782, as part of the war begun in 1778, when they captured and partly ruined the massive stone Fort Prince of Wales at the mouth of Churchill River, and altogether destroyed property valued by the company at half a million pounds. But a much worse rivalry was at hand, organized and powerful: the Northwest Company (q.v.), started on a co-operative plan in 1784 by an association of Scotch merchants in Montreal. The Declaration of Rights having guaranteed free and open trade to all British subjects, this company invaded its rival's territory, and the trade competition for many years merged into actual war. In 1821 they had done each other so much harm that they consolidated, and Parliament in view of the evils of competi-

HUDSON RIVER FROM WEST POINT.



1. Looking eastward, showing the Dade monument.
2. Looking northward from the battery.

tion empowered the crown to issue licenses for the "Indian territories," which was exercised in favor of the new company. Meantime exploration had been steadily enlarging the territory: Samuel Hearne for the old company had reached the Arctic in 1771, Alexander Mackenzie for the new one reached the Pacific in 1793. With the United States, its rivalry for the far Northwest was strenuous and persistent: it planted posts in the Oregon district, repelled settlers, and there was much danger of war till the boundary settlement of 1846 quieted the dispute. In 1849 it secured a grant of Vancouver Island. This was the time of its palmiest growth. In 1846 it had 513 employees and 35 officers, in 1856 it had over 3,000 employees and officers together, with 152 posts. Its trade monopoly expired by limitation in 1859, but there was also a great desire to settle the Northwest Territories, with which the fur-trade and administrative rights of the company were incompatible. The company, liable to be dispossessed by force if it refused to come to terms, agreed in 1869 to transfer its territorial rights to the Dominion of Canada for £300,000 and one twentieth of the lands set out for settlement by the government for the next 50 years. It retained its posts and its rights of trade. The transfer to Canada, and the survey of lands for settlement, was immediately followed by the Riel rebellion (q.v.). The company, despite its lapse of administrative powers, remains the most potent influence for law and order in the unsettled parts, through its relations with the Indians. Consult Bryce, 'History of the Hudson's Bay Company' (1900); Willson, 'The Great Company' (1900); Cawston and Keane, 'Early Chartered Companies' (1896). For the Northwest Company, see also Irving, 'Astoria.'

Hué, hoo-ā', the capital of Anam, on the river Truong, 10 miles from its mouth in the Gulf of Tonking. It is surrounded by Vaubanian fortified walls, five miles in circumference, the internal city being built on a rectangular plan with wide and straight streets. The chief building is the royal palace. Hué is the seat of a French political resident, and at Thuan-an, the port at the river mouth, there is a French garrison. Pop. estimated at 100,000, of whom less than 400 are Europeans.

Huelen, wā'lān, Chilean hero: b. about 1540; d. 1603. He attained the command of the native forces in Araucania, and was for a time successful in repelling the invading Spaniards, whose methods of warfare he copied. He defeated the enemy at Valdivia, near Concepción, and near Bio-Bio, but died at the siege of Osorno.

Hueppe, hüp'pē, **Ferdinand**, German hygienist: b. Heddesdorf, Rhine Province, 24 Aug. 1852. He studied at the Friedrich Wilhelms Institut of Berlin, and in 1890 became professor of hygiene in Prague University (German). His researches in bacteriology and disinfection have been extensive and important. He wrote 'Die Methoden der Bakterienforschung' (1885); 'Naturwissenschaftliche Einführung in die Bakteriologie' (1896); 'Handbuch der Hygiene' (1899), and other works.

Huger, ū-jē', **Benjamin**, American soldier: b. Santee, S. C., 22 Nov. 1805; d. Charleston, S. C., 7 Dec. 1877. He was graduated from West Point, served in the United States army during the Civil War and was brevetted colonel. He resigned his commission in 1861 and entering the Confederate army became a major-general.

Huger, Francis Kinloch, American soldier: b. Charleston, S. C., September 1773; d. there 14 Feb. 1855. He was a nephew of I. Huger (q.v.). His father, Major Benjamin Huger, was killed before the lines of Charleston in 1780. He joined with Dr. Eric Bollman of Philadelphia in a visit to Europe for the purpose of attempting the rescue of Lafayette from the dungeons of Olmütz, his father having been the first to receive that general on his arrival in Georgetown in 1777. The enterprise resulted in their imprisonment for eight months. Huger became a captain in the United States army in 1798, was a colonel in the war of 1812, and served in both branches of the legislature of his State.

Huger, Isaac, American general: b. Limerick Plantation, S. C., 19 March 1742; d. 17 Oct. 1797. He was one of five patriot brothers active in the revolution. Promoted to the rank of brigadier-general in 1777, he took a conspicuous part in the engagements connected with the siege of Savannah in 1778, commanded a force of cavalry at the siege of Charleston in 1780 which was surprised and dispersed by Tarleton, and commanded the Virginia brigade which formed the right wing in the battles of Guilford Court-House, and Hobkirk's Hill.

Huggins, hŭg'ĭnz, **Sir William**, English astronomer: b. London 7 Feb. 1824. In 1852 he was elected a member of the Microscopical Society, and in 1856 erected an observatory at Tulse Hill, in northeastern Surrey. When in 1859 Professor Kirchoff of the University of Heidelberg announced the true interpretation of the dark Fraunhofer lines in the solar spectrum, Huggins at once saw the possibility of using his practical knowledge of chemistry and physics in the service of astronomy. With W. A. Miller, professor of chemistry at King's College, London, he at once set about the task of constructing a star-spectroscope. The two then began the observation of stellar spectra. A full statement of their results was read before the Royal Society in 1864, the essence of the statement being, in Huggins' own words, that the chemistry of the solar system prevails, essentially at least, wherever a star twinkles. In August 1864 Huggins directed his star-spectroscope toward a planetary nebula in Draco, and found its spectrum to be a monochromatic one, thus proving that the nebula consists of a luminous gas. In 1868 he was able to announce to the Royal Society the results of his first measurements of the motion of stars in the line of sight. He began his observations of comet spectra with that of Winnecke's comet in 1868, and in 1868–9 made spectroscopic observations of the solar prominences. About 1876 he resumed his abandoned efforts to photograph stellar spectra, using the gelatine dry plate process then recently introduced, and this time he was completely successful. His photographs of the invisible ultra-violet portions of stellar spectra have proved extremely valuable, providing, for example, the only reliable data for determining the relative ages of the stars. He was elected a fellow of the Royal Society in 1865, and

awarded by that body a Royal Medal (1866), the Rumford Medal (1880), and the Copley Medal. He was president of the Royal Astronomical Society in 1876–8. With Lady Huggins he published in 1900 a valuable 'Atlas of Representative Stellar Spectra.'

Hugh Capet, king of France, founder of the Capetian dynasty. See CAPET.

Hughes, hūz, **Ball,** American sculptor: b. London 19 Jan. 1806; d. Boston, Mass., 5 March 1868. He early exhibited a decided taste for modeling, and at 12 years of age made out of wax candle ends a bas-relief copy of a picture representing the wisdom of Solomon, which was afterward cast in silver. He was then placed in the studio of Edward Hodges Bailey, where he remained seven years. At this time he successfully competed for the prize awarded by the Royal Academy, winning the large silver medal for the best copy in bas-relief of the Apollo Belvidere; also the silver medal from the Society of Arts and Sciences for a copy of the Barberini faun, the large silver medal for the best original model from life, and a gold medal for an original composition, "Pandora brought by Mercury to Epimetheus." He emigrated in 1829 to New York, where his first work of importance was a marble statue of Hamilton, for the Merchants Exchange, which was destroyed by fire in 1835. He subsequently removed to Boston, Mass. Among later works of his are the bronze statue of Bowditch at Mount Auburn Cemetery, a bust of Washington Irving, and a statuette of General Warren at Bunker Hill.

Hughes, David Edward, English-American inventor: b. London 16 May 1831; d. there 22 Jan. 1900. When very young came with his parents to the United States. He was educated at Bardstown College, Kentucky, where he was appointed professor of music (1850), and later of natural philosophy. In 1855 he patented his first important invention, that of the well-known printing telegraph which bears his name. It was at once adopted in America, and by 1876 by practically every European country. In 1878 Hughes announced to the Royal Society his invention of the microphone, an ingenious instrument which not only transmits sound, but so magnifies faint sounds as to make them distinctly audible. The microphone is now in universal use in the telephone. Another important invention, that of the induction balance, was completed by Hughes in 1879, and in 1880 he was elected a fellow of the Royal Society.

Hughes, Hugh Price, English Wesleyan clergyman: b. Caermarthen 1847; d. London 17 Nov. 1902. He was educated at University College, London, and the Wesleyan Theological College, Richmond, was appointed to Dover in 1869, and was afterward at Brighton; Stoke-Newington; Mostyn Road, London; Oxford; Brixton Hill; and the West London Mission. From 1885 he was editor of the Methodist 'Times,' and he was also at one time president of the national council of Evangelical free churches. He was prominently identified with reform work in London, and with the Anti-gambling League. Among his writings are: 'Social Christianity' (1889); 'The Atheist Shoemaker' (1889); 'The Philanthropy of God' (1890); and 'Ethical Christianity' (1892).

Hughes, John, American Roman Catholic prelate: b. Annaloghan, County Tyrone, Ireland, 24 June 1797; d. New York 3 Jan. 1864. His parents were poor but made sacrifices to give him the opportunity of acquiring an elementary education; and by his own efforts he continued his studies so that when he came with his parents to America in 1817 he was prepared for college. However, for lack of means he had to defer entering any school, and instead began work as a day laborer, in which occupation he continued for three years, but at 23 entered the Roman Catholic theological seminary, Mount Saint Mary's, Emmittsburg, Md. As a student, his remarkable power of reasoning and his ability in argument attracted attention. He was ordained priest in 1826, and for a time was stationed at Bedford, Pa., from which he was transferred to Philadelphia. Here he had charge of Saint Joseph's parish and later Saint Mary's parish. In 1838 he was consecrated titular bishop of Basileopolis and appointed coadjutor to the bishop of New York. In 1842, after the death of Bishop Du Bois, he was made bishop of New York. In 1850 the diocese of New York became an archdiocese, and on 19 July 1850 he was raised to the dignity of first archbishop of New York, which office he held until his death.

He was an active and effective worker. As a speaker or writer he was ever ready to defend the Church which he represented. When a student at Mount Saint Mary's, he wrote the pamphlet, 'An Answer to Nine Objections against the Catholic Church.' When in Philadelphia, he wrote the replies to Dr. Breckenridge, a Presbyterian clergyman. The articles on both sides are issued in book form, 'Hughes and Breckenridge.' Before asking his priests to collect money to build schools and churches, he had set the example. He collected money for the rebuilding of Mount Saint Mary's after it had been burned. He established St. John's orphan asylum in Philadelphia, and a number of charitable institutions in New York. He settled decisively the "trustee system" question which was agitating New York when he came there; and he defended the Church property against the attacks of the "Knownothing" element. The "school question" was to him all important. One of his first undertakings was to establish a theological seminary at La Fargeville in Jefferson County, N. Y.; the distance from New York caused the abandonment of this plan, and Saint John's College (q.v.) was founded at Fordham instead. In 1858 he laid the corner stone of Saint Patrick's Cathedral. In 1861, during the Civil War, he was sent by the United States government to Europe, to present the cause of the Union, and counteract any adverse sentiment which might exist against the attitude of the North. His diplomatic mission was most successful in France, Italy, and Ireland. Consult: Brann, 'John Hughes,' in the 'Makers of America Series'; Hassard, 'Life of John Hughes'; Sadlier, 'Archbishop Hughes,' in the 'Ave Maria' magazine.

Hughes, Rupert, American author: b. Lancaster, Mo., 31 Jan. 1872. He was graduated from Adelbert College of the Western Reserve University in 1892, was for a time assistant editor of the New York 'Criterion,' and in 1900 entered editorial work in London. In addition

to many contributions to periodicals, he wrote: 'The Lakerim Athletic Club' (1898); 'One Dozen from Lakerim' (1899); 'American Composers' (1900); 'Guide-Book to the World of Music' (1901); and, in verse, 'Gyges' Ring' (1901).

Hughes, Thomas, English author: b. Uffington, Berkshire, 20 Oct. 1823; d. Brighton, Sussex, 22 March 1896. He was educated at Rugby and Oxford, later studied law at Lincoln's Inn, was called to the bar of the Inner Temple in 1848, and began practice at once. In 1869 he was appointed queen's counsel, in 1882 county court judge. Throughout his long public career, as advanced Liberal in Parliament (1865–74), as founder with Canon Kingsley and Frederick Maurice of the Christian Socialists, as creator of Rugby, a socialistic community in the mountains of Tennessee (1880), he tried most earnestly to exercise a helpful influence upon English working-people. He early essayed journalism, writing many sketches for the London 'Spectator,'— chiefly accounts of traveling experiences. These sketches served as his apprenticeship in writing, and afterward were collected in book form with the title 'Vacation Rambles' (1895). But authorship was a secondary interest until 'Tom Brown's School Days,' first appearing in 1856, made him famous. This work is largely a presentation of the influence of Dr. Thomas Arnold (q.v.) in the great public school. 'The Scouring of the White Horse' (1858), a spirited account of a vacation trip, had a respectful although less cordial reception. The great success of the first story led him to continue his hero's career with 'Tom Brown at Oxford' (1861), first published serially in 'Macmillan's Magazine.' This second volume, which is much the longer, although often fine and spirited, sometimes waxes prolix, and has never been so popular as the earlier story. At the time of the American Civil War, Hughes was a decided abolitionist, and thus established a friendship with James Russell Lowell. Among other works of his are 'Alfred the Great' (1869); 'Life of Livingston'; 'Memoir of a Brother'; 'Life of Bishop Fraser' (1887).

Hughes, Thomas Patrick, American Protestant Episcopal clergyman: b. Ludlow, England, 26 March 1838. He was educated at Islington College, was ordained priest in 1864, in 1865–85 was missionary and chaplain at Peshawar, Afghanistan, in 1885–9 rector at Lebanon Springs, N. Y., and from 1889 of the Church of the Holy Sepulchre, New York. In 1875–85 he was also examiner in Oriental languages to the British government. Among his writings are: 'Notes on Mohammedanism'; 'The Poems of Abdur Rahman'; 'A Dictionary of Islam'; 'Heroic Lives in Foreign Fields.'

Hugo, hū'gō (Fr. ü'gō), **Victor Marie,** French poet and novelist: b. Besançon 26 Feb. 1802; d. Paris 22 May 1885. Major Hugo, his father, having entered the service of Joseph Bonaparte, king of Italy and afterward of Spain, Victor's earlier years were partly spent in these countries. At the age of 12 he was already writing verses, and in 1823 his first novel, 'Han d'Islande,' appeared, followed in 1825 by 'Bug Jargal.' In 1828 a complete edition of his 'Odes et Ballades' appeared. In these productions Hugo's anti-classical tendencies in style and treatment of his subject had been very visible, but the appearance of his drama, 'Cromwell' (1827), with its celebrated preface, gave the watchword to the anti-classical or romantic school. 'Cromwell' was too long for representation, and it was only in 1830 that 'Hernani,' over which the great contest between Classicists and Romanticists took place, was brought on the stage. Other dramas followed — 'Marion Delorme' (1831); 'Le Roi s'amuse' (1832); 'Lucrèce Borgia' (1833); 'Marie Tudor' (1833); 'Angelo' (1835); 'Ruy Blas' (1838); 'Les Burgraves' (1843). During those years he had also published a novel, 'Notre Dame de Paris' (1830), and several volumes of poetry, 'Les Feuilles d'Automne' (1831); 'Les Chants du Crépuscule' (1835); 'Les Voix intérieures' (1837); 'Les Rayons et les Ombres' (1840). The poetry of this period has a melody and grace superior perhaps to any that he afterward wrote, but wants that deep and original sense of life characteristic of his later poems. During the same period he also wrote critical essays on Mirabeau, Voltaire, and a number of articles for the 'Revue de Paris.' In 1841, after having been four times previously rejected, he was elected a member of the French Academy; made shortly afterward a tour in the Rhineland, of which he wrote a brilliant and interesting account in 'Le Rhin' (1842). In 1845 he was made a peer of France by Louis Philippe. The revolution of 1848 threw Hugo into the thick of the political struggle. At first his votes were decidedly Conservative, but afterward whether from suspicion of Napoleon's designs or from other reasons, he became one of the chiefs of the democratic party. After the *coup d'état,* 2 Dec. 1851, he was one of those who kept up the struggle in the streets against Napoleon to the last. He then fled to Brussels, where he published the first of his bitter satires on the founder of the Second Empire, 'Napoléon le Petit.' In August 1852 he went to live in Jersey, and finally settled in Guernsey, where he bought an estate called Hauteville House. In the following year (1853) the famous volume 'Les Châtiments,' a wonderful mixture of satirical invective, lyrical passion, and pathos, appeared. It was in the comparative solitude and quietness of the Channel Islands that he wrote most of the great works of his later years. 'Les Contemplations' (1856); 'La Légende des Siècles,' 1st series (1859); 'Chansons des Rues et des Bois' (1865), and his celebrated series of social novels, 'Les Misérables' (1862); 'Les Travailleurs de la Mer' (1866); and 'L'Homme qui Rit' (1869). In 1870, after the fall of the Empire, Victor Hugo returned to Paris, where he spent his remaining years in occasional attendances at the senate, and in adding to the already long list of his literary works. Among these latest productions may be cited, 'Quatre-Vingt-Treize' (1873); 'L'Art d'être Grand-père' (1877); 'L'Histoire d'un Crime' (1877); 'Le Pape' (1878); 'La Pitié Suprême' (1879); 'Religions et Religion' (1880); 'Les Quatre Vents de l'Esprit' (1881); 'La Légende des Siècles' (last series, 1883); 'Torquemada' (1882). If not the greatest writer that France has produced, certainly he is her greatest poet. But he had grave defects and limitations, the chief being an entire want of humor, a too frequent straining after effect through the abnormal and

bizarre, an overweening belief in his own infallibility, and an ever-present conviction that he was a sage, all of whose sayings might be regarded as priceless teachings, to be eagerly caught up by a listening world. An edition of his complete works in 40 vols. appeared at Paris in 1886. The house in which Victor Hugo lived, on the Place des Vosges, has recently been transferred to the city of Paris, and now forms a Victor Hugo Museum, full of interesting relics of the poet. Consult: Swinburne, 'Study of Victor Hugo' (1886); Barbou, 'Victor Hugo et son Temps' (1882); Mabilleau, 'Victor Hugo' (1893); Nichol, 'Victor Hugo, a Sketch of his Life and Work' (1894); Dupuy, 'Victor Hugo, l'Homme et le Poète' (1887); Bire, 'Victor Hugo après 1852' (1894).

Huguenots, hū'gē-nŏts, a term of unknown origin, believed to be derived from a personal name, applied to the Protestants of France during the religious struggles of the 16th and 17th centuries. During the early part of the 16th century the doctrines of Calvin, notwithstanding the opposition of Francis I., spread widely in France. Under his successor Henry II., 1547–59, the Protestant party grew strong, and under Francis II. became a political force headed by the Bourbon family, especially the King of Navarre and the Prince of Condé. At the head of the Catholic party stood the Guises. The contest between the two parties was as much political as religious. The result was that a Huguenot conspiracy headed by Prince Louis of Condé was formed for the purpose of compelling the king to dismiss the Guises and accept the Prince of Condé as regent of the realm. But the plot was betrayed, and many of the Huguenots were executed or imprisoned. In 1560 Francis died, and during the minority of the next king, Charles IX., it was the policy of the queen mother, Catharine de Medici, to encourage the Protestants in the free exercise of their religion in order to curb the Guises. In 1562 an accidental conflict between the followers of the Duke of Guise and some Protestants at a church meeting precipitated a series of religious wars which desolated France almost to the end of the century. Catharine, however, began to fear that Protestantism might become a permanent power in the country, and suddenly making an alliance with the Guises, with their help she projected and carried out the massacre of St. Bartholomew's (q.v.). The Protestants fled to their fortified towns and carried on a war with varying success. On the death of Charles IX., Henry III., a feeble sovereign, found himself compelled to unite with the King of Navarre, head of the house of Bourbon and heir-apparent of the French crown, against the ambitious Guises, who openly aimed at the throne, and had excited the people against him to such a degree that he was on the point of losing the crown. After the assassination of Henry III. the King of Navarre was obliged to maintain a severe struggle for the vacant throne; and not until he had, by the advice of Sully, embraced the Catholic religion (1593), did he enjoy quiet possession of the kingdom as Henry IV. Five years afterward he secured to the Huguenots their civil rights by the Edict of Nantes (q.v.) which confirmed to them the free exercise of their religion, and gave them equal claims with the Catholics to all offices and dignities. They were also left in possession of the fortresses which had been ceded to them for their security. This edict afforded them the means of forming a kind of republic within the kingdom, which Richelieu, who regarded it as a serious obstacle to the growth of the royal power, resolved to crush. The war raged from 1624 to 1629, when Rochelle, after an obstinate defense, fell before the royal troops; the Huguenots had to surrender all their strongholds, although they were still allowed freedom of conscience under the ministries of Richelieu and Mazarin. But under Louis XIV. a new persecution of the Protestants commenced. They were deprived of their civil rights, and bodies of dragoons were sent into the southern provinces to compel the Protestant inhabitants to abjure their faith. The Edict of Nantes was revoked in 1685, and by this act about 50,000 Protestant subjects were driven out of France to other countries. (See HUGUENOTS IN AMERICA.) In the reign of Louis XV. a new edict was issued repressive of Protestantism, but so many voices were raised in favor of toleration that it had to be revoked. The Code Napoléon and later enactments place Protestants in France on an equality with their Catholic compatriots.

Huguenots in America. The French Protestant settlements in the New World divide themselves into two classes: those of choice (or at least with time and opportunity to make choice) and those of necessity. The former extend from the middle of the 16th century down to the capture of New York by the English in 1664; the latter comprise all those dating from the increasing severity of repression that heralded the Dragonnades and the Revocation of the Edict of Nantes to the end. The former were deliberate organized colonizations, of the same stamp as the English and from the same motives; the latter were the desperate and generally hurried resource of crowds of ruined exiles. The former were complete failures, and were soon suppressed, absorbed, or exterminated; the latter sought only life and livelihood and welcomed absorption. The former include the abortive attempts in Brazil and Florida, the earliest settlements in Acadia and Canada, the first settlement of New York, and the settlement of some of the West Indies; the latter include the feeble attempts at settlements in New England, the flood of accessions to the French element in New York, the founding of New Rochelle, the migrations to Pennsylvania, Delaware, and Maryland, the promising but aborted attempt in Virginia and, greatest of all, the tide of immigrants that created South Carolina.

The first attempt at creating a New-World Huguenot asylum and magazine of supplies was undertaken in 1555; Nicholas Durand de Villegagnon (q.v.) pretended to undertake it for Coligny, and settled a colony in Rio Janeiro harbor. But it was half Catholics; Villegagnon was a scamp, persecuted and scattered the Protestants, and finally deserted the colony; and the Portuguese slaughtered it out in 1567. A more honest attempt was made by Jean de Ribault in 1562, at Port Royal, S. C., but failed. In 1564 René de Laudonnière founded a colony on the St. John's in Florida (q.v.), at Fort Caroline; but the next year Pedro Menendez de Avilés butchered

the entire settlement. St. Bartholomew and the religious wars intervened; and no further efforts were made till after the accession of Henry of Navarre, who had imbibed the ardor for colonization from Coligny. In 1604, under his commission, Sieur de Monts planted a settlement to be on the basis of perfect religious equality, the first in the New World — at Port Royal, N. S.; French mercantile jealousy had the commission revoked, and it perished; but two years later it was refounded by Poutrincourt, and De Monts and Champlain founded Quebec. In 1613 Sir Samuel Argall (q.v.) destroyed Port Royal, but the French stayed and bands of Protestants came to reinforce them at intervals. A small settlement was made on Newfoundland, but was broken up by the government except for a few who would turn Catholics. The founding of New Amsterdam, usually supposed to be by the Dutch, was in fact by Huguenots under Dutch auspices. The Huguenots — largely French-speaking Walloons — who had crowded into the Netherlands to escape persecutions, had tried to gain permission to found settlements in the English colonies; rebuffed in this, they engaged with the Dutch, and the first shipload of emigrants that came to the future New York were entirely Huguenot. Peter Minuit himself being a Walloon. French families had been there already for years, the first white child born on Manhattan Island being French. For three generations the French element continued to be a highly important factor in the city, and composed much of the business aristocracy; even after the English occupation, all official documents were printed in both Dutch and French as well as English. Of the first shipload of emigrants, a number went up the Hudson and founded Fort Orange (Albany). In 1660 a number of Walloon and Vaudois exiles, who had taken refuge in the Lower Palatinate, settled near Kingston, N. Y.; later, the Vaudois founded New Paltz in the Wallkill Valley. In 1677 a French town was founded at Hackensack, but the fast-breeding Dutch soon swamped it. Small French groups settled in various parts of New Jersey.

Of the second class, the refugee emigration, too scattered and hurried in general to found separate French settlements, the first beginning from the north was at Boston. From 1660 on, small numbers had come from the Channel Islands and Rochelle, but after the Dragonnades 200 or 300 families came over, including some of the most notable names in Boston history. A settlement at Oxford, Mass., was made in 1687, primarily to convert the Nipmuck Indians, but that tribe joined hands with the Canadian tribes in league with the French, and inflicted such horrors on them — one whole summer besieging them in their blockhouse — that the settlement broke up in despair, many of them taking refuge in Milford, Conn. Many small groups settled in Rhode Island; the largest had a miserable history, being defrauded by a New England company organized expressly to sell to innocent foreigners a tract of land to which it had no title. In Connecticut Hartford and Milford received the greatest number. In New York the arrivals strengthened the French element, but soon melted into the general mass. In Pennsylvania, Delaware, and Maryland, many hundreds settled, but as scattered members of the population, and left no outward trace. In Virginia, whose southern climate was congenial to them, the Huguenots had settled in considerable numbers for many years, but in 1690 William III. sent over some 300 Huguenots who had followed him from Holland, and they made a settlement named Monacantown, from an extinct Indian tribe. In 1700, after long negotiations, four shiploads more came over under Marquis de La Muce; about half of them settled at Jamestown, Va., and in South and North Carolina, the rest at Monacantown. Several hundred more came over at different times, and the settlement seemed to have struck enduring roots; but furious religious dissensions broke it in two, and the pastor led part of them to the Trent in North Carolina, whence in fear of Indian massacre they finally went to South Carolina, the Canaan of the Huguenots, settling at Jamestown there. This South Carolina French immigration, due to the latitude and soil fitting their habits, began in 1670 in small numbers. In 1680 the city of Charleston was founded, largely under French auspices; the same year Charles II. sent over about 90 Huguenots to raise wine, oil, and silk. After the Revocation the great tide began to flow in; in 1687 there were four wholly or largely French settlements — Jamestown on the Santee, the "Orange Quarter" on the Cooper, St. John's Berkeley, and Charleston. In 1732 a band of 360 French-Swiss Protestants settled Purysburg on the Savannah; and in 1764 the last French colony was founded — New Bordeaux in Abbeville County. In the intervals there was a steady stream, very large for many years after 1685. Some of the greatest names in Southern history are French, and the entire character and action of the State have been deeply molded by this fiery, impulsive, gallant strain. It is pitiful to record that after all the sacrifice and courage of these exiles, religious persecution forced them to close their churches. All but members of the Church of England were disfranchised in 1706, and the Huguenots were bribed into submission by government support of the churches and having the liturgy translated into French.

The Huguenot settlements in the West Indies — St. Christopher, Martinique, Guadeloupe, and some smaller ones — belong in origin to the former group, that of voluntary colonization; their later history and the flight from them belongs to the latter. They were colonized by a trading company under Richelieu's patronage from 1626 on; there was nominal prohibition of public worship, but actually the law was a dead letter, as there would have been no trade but for the Huguenots; the Walloon Synod of Holland supplied ministers, and the life was one of prosperity and content. Then as the Revocation approached, atrocious penal laws were passed, but still not enforced. But the Revocation changed everything into a scene of misery. The first result was the using of the islands as a penal settlement for the Huguenots of France; the latter were sold into service, sometimes of the worst character, and the horrors of the passage rivaled the worst of the slave-trade. Then the governor-general was ordered to extirpate heresy at all hazard, and threatened a dragonnade if the inhabitants did not recant.

The effect was a general flight; next a stern order from the governor-general to stop or he would carry out the government orders in all their severity, which produced a still greater stampede, assisted by the Catholics themselves. In a few months the islands were half depopulated and their trade nearly ruined. The king then modified his orders; the flight ceased and a few returned; but most of the refugees remained in the English colonies or Bermuda. Several score at least removed to New York, and some of them founded New Rochelle; a few to New England, and the Southern colonies naturally received the largest quota. This immigration had an important effect on the United States trade with the West Indies, as the Huguenot merchants, from their familiarity with the region and their family ties, took the lead in and greatly developed it.

The "dead-line" of the French churches in America, the test of that element's separate existence, is about the middle of the 18th century; beyond that, according to Baird, few existed and fewer kept their language. French instinct was to blend, and of course it was much the best that it should do so. The element was absorbed soon and utterly, but its blood and its ideas have been very valuable to the United States. Consult Baird, 'History of the Huguenot Emigration to America' (1885).

Huichol (wē'chōl) **Indians.** See INDIANS, AMERICAN.

Hull, Edward, Irish geologist: b. Antrim 21 May 1829. As a member of the Geological Survey of Great Britain for 20 years, he geologically mapped a large portion of the central counties of England. In 1869 he became professor of geology at the Royal College of Science, Dublin; and in 1883 commanded an expedition under the auspices of the Palestine Exploration Society to Arabia Petræa and Palestine. Among his important works are: 'The Coal-Fields of Great Britain' (1865); 'Building and Ornamental Stones' (1872); 'A Text-Book of Physiography' (1888); 'Mount Seir, Sinai, and Southern Palestine' (1885); 'Volcanoes, Past and Present' (1892); 'Our Coal Resources at the Close of the 19th Century' (1897).

Hull, Isaac, American commodore: b. Derby, Conn., 9 March 1775; d. Philadelphia 13 Feb. 1843. He commenced his career in the merchant service, and was commissioned as lieutenant in the navy at the commencement of hostilities with France in 1798. In 1800 when first lieutenant of the Constitution, he cut out a French privateer from under a strong battery in the harbor of Port Platte, San Domingo. During the war with Tripoli (1802–5) Hull served with distinction in the squadrons of Commodores Preble and Barron, in command of the schooner Nautilus and brig Argus, participating in the several attacks on the city of Tripoli in July, August, and September 1804, and subsequently co-operating with Gen. Eaton in the capture of the city of Derne. In May 1804, he was promoted to the rank of master commandant, and in April 1806, to that of captain. At the opening of the War of 1812 between the United States and Great Britain he was in command of the frigate Constitution, and in July of that year, while cruising off New York, fell in with a British squadron, which chased the Constitution closely for nearly three days and nights. The wind was light and baffling, but Hull handled his vessel with superior seamanship, and finally escaped without injury; at one time he resorted to a novel and successful expedient; the boats were lowered, and all the spare rope on board was bent to a kedge anchor which was carried out nearly a mile ahead and let go. The ship was warped up to this kedge, which was weighed while another was carried out. In this way she left her pursuers before they discovered the manner in which it was done. After this remarkable escape, Hull went into Boston for a few days, whence he sailed 3 August, and 19 August met the English frigate Guerrière, which after a short conflict he reduced to a complete wreck, and forced the English to surrender. (See CONSTITUTION, THE.) As this was the first naval action of the war, it was regarded as a very important one; Capt. Hull was enthusiastically received, and Congress at its next session presented him with a gold medal. After the war his principal services were in command of the navy yards at Boston and Washington, of the squadrons in the Pacific and Mediterranean, and as a member of the board of navy commissioners.

Hull, William, American soldier: b. Derby, Conn., 24 June 1753; d. Newton, Mass., 29 Nov. 1825. He was graduated at Yale College in 1772, studied law at Litchfield, Conn., and was admitted to the bar in 1775. He entered the army of the Revolution at Cambridge in 1775 as captain of a Connecticut company of volunteers; was promoted to the rank of major in the 8th Massachusetts regiment in 1777, and to that of lieutenant-colonel in 1779. He was in the battles at White Plains, Trenton, Princeton, Stillwater, Saratoga, Monmouth, and Stony Point. His services throughout the war received the approbation of his superior officers, and neither his courage nor patriotism was ever doubted. He was governor of Michigan Territory from 1805 till 1812, when he was appointed as brigadier-general to the command of the northwestern army. He marched his troops to Detroit, heard of the declaration of war, and of the fall of Michilimackinac, which let loose the Indians of the Northwest upon him, crossed into Canada, but found his communications cut off, recrossed, and on the arrival of Gen. Brock surrendered to that officer the post of Detroit and the territory. For this he was tried two years after by a court-martial, and sentenced to be shot. The execution of the sentence was remitted by the President in consideration of his age and Revolutionary services. Historians are now agreed that the difficulties which surrounded Gen. Hull were so great that we need not ascribe his surrender either to treason or to cowardice. In 1824 he published a series of letters in defense of his conduct in this campaign which had a wide circulation. Consult 'Life,' by his daughter, Maria Campbell, and his grandson, James Freeman Clarke (1848).

Hull, Canada, town and county-seat of Ottawa County, Quebec, on the Ottawa River, at the junction of the Gatineau River, opposite the city of Ottawa, and on the Canadian Pacific railway. It is connected with its important neighbor by a fine suspension bridge spanning the Chaudière Falls. Iron mining is carried on

in the neighborhood, and the Falls afford immense water-power. Lumbering is the chief industry of the district; and Hull has vast lumber yards, saw- and planing-mills, and manufactories of pulp, paper, matches, pails, woodenware, woolens, axes, etc. It has 5 churches, a college, a convent, many fine residences, and French and English newspapers. The population is chiefly French Canadian. The town has been rebuilt since its almost total destruction by fire, 26 April 1900. Pop. (1901) 13,993.

Hull, Kingston-upon-, England, a large river port, municipal and parliamentary borough, city and county of itself, situated in the East Riding of York, on the north shore of the estuary of the Humber, where it is joined by the Hull, 34 miles east-southeast of York. Its buildings of note are the town-hall, the exchange, the corn exchange, market-hall, post-office, the custom-house, Trinity House, dock offices, public rooms, royal institution (containing the rooms of the Philosophical Society, etc.), art gallery, technical schools, central library, Hymers College, grammar-school, the jail, royal infirmary, borough asylum, hospitals, crematorium, and dispensary. The town possesses three well-laid-out public parks. The industries are varied. There are several ship-building yards, iron-foundries, machine-shops, and steam flour-mills; the other principal branches of industry comprehend seed-crushing, color-making, paper-making, canvas, rope, and cable making, tobacco manufacturing, and oil boiling. Hull ranks as the third port in the kingdom, and has extensive ship accommodation, docks, quays, etc. The principal exports are machinery, coal, metal goods, and woolen and cotton goods, the total value in 1900 being £16,933,078 (besides £5,516,723 of foreign and colonial produce); imports — timber, corn, iron, wool, flax, hemp, tallow, hides, pitch, tar, rosin, bones, etc.; in 1900 £31,168,579. The name of Kingston-upon-Hull was given by Edward I., who erected a fortress, and constituted it a chartered town and port. When Edward III. invaded France in 1359 Hull contributed 16 ships and 470 mariners. During the civil war Hull was besieged unsuccessfully by the Royalists twice. Pop. (1901) 240,618.

Hul'lah, John Pyke, English musical composer: b. Worcester 27 June 1812; d. London 21 Feb. 1884. In 1833 he entered the Royal Academy of Music. His first important composition, an opera entitled 'The Village Coquettes,' of which the words were by Charles Dickens, was successfully produced at St. James' Theatre in 1836. Early in 1841 he opened classes in Exeter Hall for the instruction in vocal music of schoolmasters and the general public, and from 1849 to 1860 continued them in St. Martin's Hall, built for him by his friends and supporters. His classes were remarkably successful despite much adverse criticism of his method of teaching. In 1858 he succeeded Horsley as organist at the Charterhouse, and in 1872 received the appointment of musical inspector of training schools for the United Kingdom. He conducted the Philharmonic concerts at Edinburgh 1866–7, and those of the Royal Academy of Music 1870–3. He also held professorships in King's College, Queen's College, and Bedford College. Hullah's best-known compositions are songs, of which several, such as 'The Sands of Dee,' 'Three Fishers,' 'The Storm,' and 'O that We Two Were Maying,' have become very popular. He issued many excellent collections of songs and other musical pieces, among which are: 'Part Music,' in three series (1842–5); 'Vocal Scores' (1846 onward); 'School Songs' (1851); 'Sea Songs'; 'Singer's Library of Concerted Music' (1859); and 'Song Book' (1866). Dr. Hullah was the author of the following among other works on the history and theory of music: 'Grammar of Vocal Music' (1843); 'On Vocal Music' (1849); 'Grammar of Musical Harmony' (1852); 'The History of Modern Music' (1862); 'Grammar of Counterpoint' (1864); 'Music in the House' (1877). See the 'Life' by his wife (1886).

Hulme, Frederick Edward, English botanist: b. Hanley, Staffordshire, 1841. He has long been prominent as a writer upon natural history, art, heraldry, etc., and among his numerous works are: 'Plant Form' (1868); 'Familiar Wild Flowers' (7 vols. 1878–1902); 'Art Instruction in England' (1882); 'History, Principles and Practice of Symbolism in Art' (1891); 'History, Principles and Practice of Heraldry' (1892); 'Cryptography' (1898); 'History of the Flags of the World' (1897).

Humaita, oo-mä-ē'tä, Paraguay, town and fort; on the Paraguay River, near the mouth of the Paraná River; in the southwestern part of the republic. Its situation made its possession of importance during the war of the "Triple Alliance." It withstood a siege for a whole year, the attacking forces being Argentine and Brazil soldiers, but finally, in 1868, surrendered. At the close of the war, in 1870, the fortifications were destroyed. It is surrounded by a fertile agricultural country. There is but little local manufacturing, but there is an extensive trade in coffee, sugar, cotton, tobacco, hides, and live stock. Pop. 4,000.

Humane Association, American, a consolidation of various societies, formed at Cleveland, Ohio, in 1877, becoming a national organization for the prevention of cruelty to animals and children. The initial work of the society was to regulate the abuses in cattle-transportation by the railroads, and to secure the passage of State laws looking to this end. It offered a prize of $5,000 for the best model of a cattle car that would make possible the feeding, watering and resting of cattle in transit, and many improved cattle cars were brought into use. See ANIMALS, CRUELTY TO; CHILDREN, SOCIETY FOR THE PREVENTION OF CRUELTY TO.

Humane Society, Royal, formed in London, in 1774, for the purpose of resuscitating those who had been immersed in water and were apparently drowned. At the present time it distributes rewards, consisting of medals, clasps, testimonials, and sums of money to those who save or attempt to save life from drowning. Also "all cases of exceptional bravery in rescuing or attempting to rescue persons from asphyxia in mines, wells, blast-furnaces, or in sewers where foul gas may endanger life, are recognizable by the society." It likewise gives prizes for swimming to the pupils of public schools and of training-ships.

Hu'manists, the name assumed at the revival of learning by those who looked upon

the cultivation of classical literature as the most valuable instrument of education, in opposition to those who clung to the ancient methods of the Scholastics. In their modes of thought also the tendency of the humanists was to exalt paganism at the expense of Christianity. In the 18th century the name became a word of reproach for those who showed a blind zeal for the classics as the sole educational subject, opposing the Philanthropists, who asserted the value of mathematics, science, modern languages, and history.

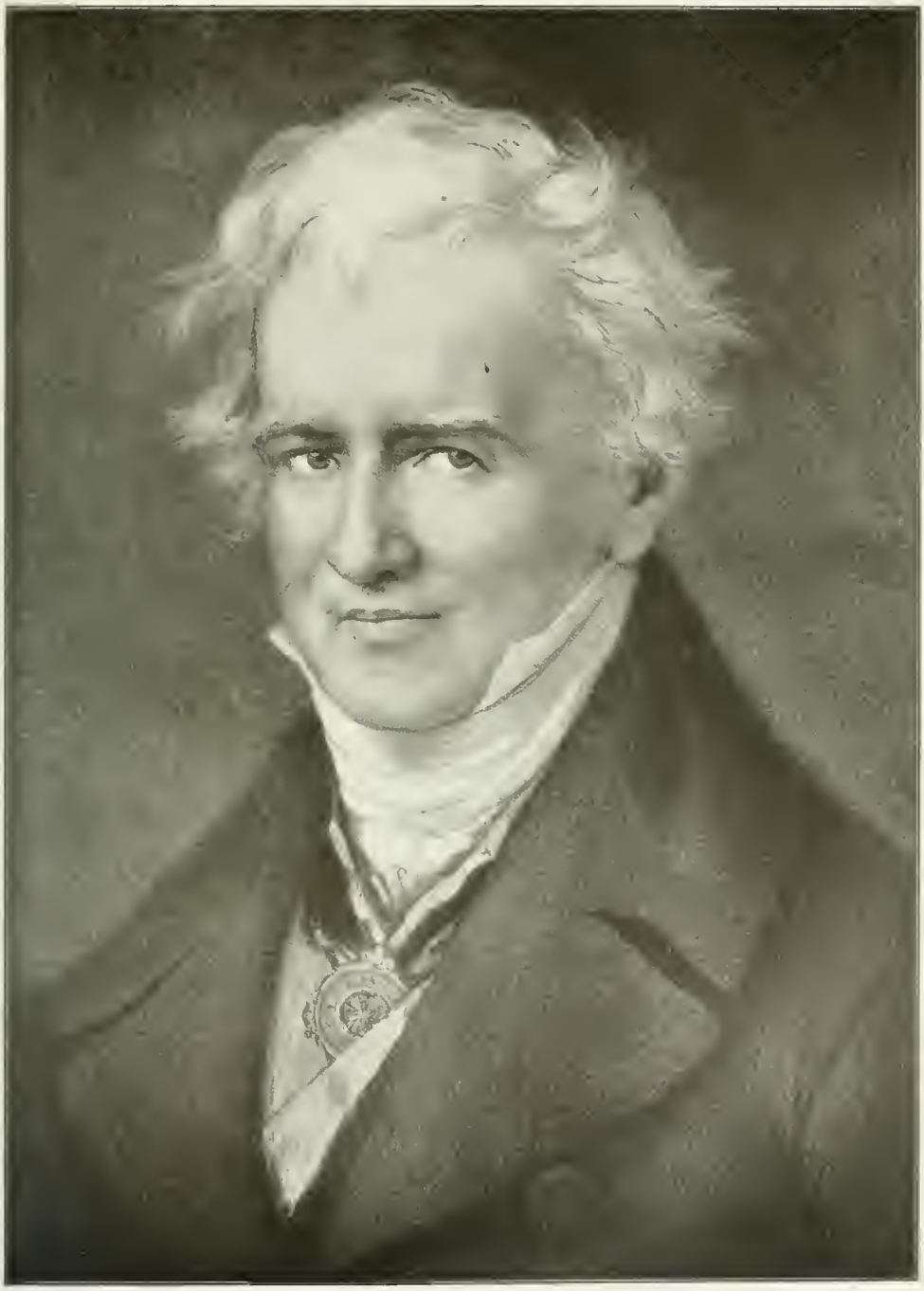
Humanita'rians, a term applied to the various classes of anti-Trinitarians, who regard Christ as a mere man. The earliest known author of the purely humanitarian theory is Theodotus of Byzantium, who lived in the second century. A contemporary of his, Artemon, taught the same doctrine, and asserted that such had been the universal belief of Christians up till the beginning of the 3d century. See UNITARIANISM.

Hum'bert I., RANIERI CARLO EMANUELE GIOVANNI MARIA FERDINANDO EUGENIO, king of Italy: b. Turin 14 March 1844; d. Monza, near Milan, 29 July 1900. He was eldest son of Victor Emmanuel II. and Queen Marie Adelaide, daughter of the Archduke Regnier of Austria. He took part as a youth in the war of independence, and in 1866 was in command of a division at Custozza. On 22 April 1868 he married his cousin, Princess Margherita of Savoy, daughter of the Duke of Genoa. On the death of his father he succeeded to the throne of Italy 9 Jan. 1878 as Humbert I. During his reign he carefully regarded constitutional limitations, and directing his choice of prime-ministers according to parliamentary conditions, selected but one, Rudini, from the Conservatives. In foreign policy he was evidently desirous of an active part in European affairs. In 1891 was concluded the "Triple Alliance" with Germany and Austria, a compact which necessitated the maintenance of a large army and navy, and the oppressive taxation of an already burdened country. Humbert also believed in colonial expansion, which he inaugurated by the occupying of Massowah, on the Red Sea. The Italian troops suffered reverses in 1887 and 1888, when they were defeated by the Mahdi, and 1 March 1896 when they lost the battle of Adowa to the Abyssinians. Humbert's attitude toward the Vatican was one of firmness, respecting all guarantees to the Pope, but insisting on the permanence of the Italian possession of Rome. His private munificence — it is said that he expended not less than $500,000 yearly in benefactions — and his personal interest and courage in the rescue work after the earthquake at Ischia (28 July 1883), and in visits to Busca and Naples during the cholera epidemic (1884), made him greatly respected by the Italians, to whom he was known as "Humbert the Good." He was thoroughly a soldier and eager in the interests of the army. Two unsuccessful attempts were made upon his life, one at Naples 17 Nov. 1878 by Passanante, a fanatic, and another near Rome 22 April 1897 by Acciarito, an anarchist. On 29 July 1900 he was shot and killed at Monza, near Milan, by the anarchist Bresci. See ITALY, *History.*

Humbert Swindle, The, one of the most daring and extensive frauds on record, perpetrated by a Mme. Humbert of Paris with the aid of various accomplices. It was alleged by Mme. Humbert that a certain Robert Henry Crawford, American millionaire, had left to her his fortune of $20,000,000. A subsequent will divided the estate between her younger sister, Marie Daurignac, and Henry and Robert Crawford, nephews of the testator, while a third document bound the heirs to the preservation of the title-deeds and securities, and placed these in the keeping of M. and Mme. Humbert until Marie should attain her majority. Without examination the alleged title-deeds and securities were deposited and sealed in a safe by the authorities. On this wholly fictitious basis Mme. Humbert obtained extensive loans. She is thought to have netted $10,000,000, while the amount of notes in the form of original loans and renewals equaled $140,000,000. The fraud was at last discovered, and Mme. Humbert and other parties to it were tried and condemned.

Humble-bee. See BUMBLEBEE.

Humboldt, hŭm'bōlt (Ger. hoom'bōlt), **Friedrich Heinrich Alexander,** BARON VON, German traveler and naturalist: b. Berlin 14 Sept. 1769; d. there 6 May 1859. His father was chamberlain to the king of Prussia. He studied at the universities of Frankfort-on-the-Oder, Berlin, and Göttingen, and in 1790 traveled along the Rhine to Holland, France, and England. This journey gave rise to his 'Observations on the Basalt on the Rhine,' published in 1793. In 1791 he studied mining and botany at the mining school in Freiberg, where his acquirements, his attractive and instructive conversation, his wit, and goodness of heart gained him universal esteem and affection. In 1792 he was appointed assessor in the mining and smelting department, and soon afterward removed to Baireuth, as overseer of the mines in Franconia. Here he introduced many improvements, among which was the establishment of the mining school at Steben; he likewise made valuable galvanic experiments, the results of which were published in 1796, in two volumes. But in 1797 he gave up this office from a desire to travel. Owing to the disturbed state of the Continent, however, it was not easy for him to carry out his project. For some time he resided in various parts of Germany, particularly at Jena, where he became intimately acquainted with Goethe and Schiller. In 1797 he went, in company with his brother, Karl Wilhelm, a Prussian minister of state, to Paris, where he became acquainted with Aimé Bonpland, a pupil of the medical school and botanic garden in Paris. He then went to Madrid, and having obtained permission from the crown to travel through the Spanish colonies in America, immediately sent for his friend Bonpland, and sailed with him from Corunna. They landed at Teneriffe, where they ascended to the crater in Pico, in order to analyze the atmospheric air, and to make geological observations. In July they arrived at Cumana in South America. For five years they were occupied incessantly in traveling through tracts of the earth rich in all that could interest the scientific observer, and till then never scientifically described. They explored the regions of South America watered by the Orinoco and the upper part of the Rio Negro, fully tracing the connection between the Orinoco and the Amazon; then returned to the coast and sailed



FRIEDRICH HEINRICH ALEXANDER VON HUMBOLDT.

for Cuba, where they remained some months. Leaving Cuba in 1801, they returned to the South American continent, sailed up the Magdalena as far as they could, pursued their route by land to Popayan and Quito, and thence as far south as Lima, crossing the Andes no fewer than five times in the course of their journey, and, besides other mountain ascents, climbing Chimborazo (23 June 1802) to an elevation of 19,300 feet, being the highest point of the Andes then reached by man; from Lima they sailed to Guayaquil, and thence to Acapulco, Mexico (January 1803). Some months were spent in examining the city of Mexico and the surrounding country, and in a visit to the United States; and in January 1804, they set sail for Europe, taking Cuba again on their way. On 3 Aug. 1804, they arrived at Bordeaux, bringing with them, as the result of their labors, an immense mass of fresh knowledge in geography, geology, climatology, meteorology, botany, zoology, and every branch of natural science, as well as in ethnology and political statistics. Humboldt selected Paris as his residence, no other city offering so many aids to scientific study, or having so many distinguished savants, and remained there till March 1805, arranging his collections and manuscripts, and experimenting with Gay-Lussac, in the laboratory of the polytechnic school, on the chemical elements of the atmosphere. He was accompanied by Gay-Lussac, who exerted a lasting influence on his chemical studies, in a visit to Rome and Naples, and also by Von Buch on his return through Switzerland to Berlin, where, after an absence of nine years, he arrived in November 1805. As the condition of Germany made it impracticable to publish there his large scientific works, he was permitted by King Frederick William III., as one of the eight foreign members of the French Academy of Sciences, to remain in Paris, which was his residence, excepting brief periods of absence, from 1808 to 1827. There appeared his 'Voyage aux Régions équinoxiales du Nouveau Continent' (with Atlas, 1809–25; German edition, Stuttgart 1825–32; new edition, edited by Hanff, four vols., 1859–60). When in 1810 his elder brother resigned the direction of educational affairs in Prussia to become ambassador at Vienna, the former post was urged upon Humboldt by Hardenberg; but he declined it, preferring his independence. He had also already decided upon a second scientific expedition, through Upper India, the region of the Himalaya, and Tibet, in preparation for which he was diligently learning the Persian language. The political events between the Peace of Paris and the Congress of Aix-la-Chapelle gave him occasion for several excursions. He went to England in the suite of the King of Prussia in 1814; again in company with Arago, when his brother was appointed ambassador to London; and again in 1818 with Valenciennes from Paris to London, and from London to Aix-la-Chapelle, where the king and Hardenberg wished to have him near them during the congress. He also accompanied the king to the Congress of Verona, and thence to Rome and Naples; and in 1827, at the solicitation of the monarch, gave up his residence in Paris, and returned by way of London and Hamburg to Berlin, where in the following winter he delivered a series of public lectures on the cosmos. Under the patronage of the Czar Nicholas he undertook in 1829 an expedition to northern Asia, to explore the Ural and Altai Mountains, the Chinese Dsoungaria, and the Caspian Sea. In this expedition he was accompanied by Ehrenberg and Gustav Rose. Their course lay through Moscow, Kazan, and the ruins of Old Bulghari to Ekaterinburg, the gold mines of the Ural, the platinum mines of Nijni Taghilsk, Bogoslovsk, Verhoturye, and Tobolsk, to Barnaul, Schlangenberg, and Ustkamengorsk, in the Altai region, and thence to the Chinese frontier. From the snow-covered Altai Mountains the travelers turned toward the southern part of the Ural range, and traversed the great steppe of Ischim, passed through Petropavlovsk, Omsk, Miask, the salt lake of Ilmen, Zlatousk, Taganay, Orenburg, Uralsk (the principal seat of the Uralian Cossacks), Saratov Dubovka, Tzaritzin, and the Moravian settlement of Sarepta, to Astrakhan and the Caspian Sea. They visited the Kalmuck chief Sered Jaab, and returned by Voronesh, Tula, and Moscow. The entire journey of over 10,000 miles was made in nine months; its results are given in Rose's 'Mineralogischgeognostische Reise nach dem Ural, Altai und dem Kaspischen Meere' (1837–42); and Humboldt's 'Asie Centrale, Recherches sur les Chaines de Montagnes et la Climatologie comparée.' It extended the knowledge of telluric magnetism, since in consequence of it the Russian Imperial Academy established a series of magnetic and meteorological stations from St. Petersburg to Peking, which was followed, on Humboldt's application to the Duke of Sussex, by the establishment of similar stations in the southern hemisphere by the British government. The convulsions of 1830 gave a more political direction to Humboldt's activity for several years. On the news of the French revolution, and the accession of Louis Philippe, he was selected to convey to Paris the Prussian recognition of the new monarch, and to send political advices to Berlin. The latter office fell to him again in 1834–5, and he was called upon to fulfil it five times in the 12 following years, residing four or five months in Paris on each mission. To this period belongs the publication of his 'Examen critique de la Géographie du Nouveau Continent' (1835–8). He accompanied the king of Prussia in visits to Denmark, England, etc. (1841–5), and resided for several months in Paris in 1847–8, from which time he lived in Prussia, usually in Berlin, occupying a high position at the court until his death. His last great work, 'Cosmos' (1845–58), has been unanimously recognized as one of the most valuable contributions to science ever published. It explains the physical universe according to its dependencies and relations, grasps nature as a whole, moved and animated by internal forces, and by a comprehensive description shows the unity which prevails amid its variety. It has been translated into all languages in which a book of science is required, and has been without an equal in giving an impulse to natural studies. See Bruhns, 'Alexander von Humboldt, eine Wissenschaftliche Biographie' (Eng. trans., 1873); Klenke, 'Alexander von Humboldt, ein biographisches Denkmal' (1859).

Humboldt, Karl Wilhelm, Baron von, German statesman and philologist, brother of

the preceding: b. Potsdam 22 June 1767; d. Tegel near Spandau, 8 April 1835. He studied law at Berlin, at Frankfort-on-the-Oder, and at Göttingen, and at the same time devoted equal attention to antiquities, æsthetics, and the philosophy of Kant. In 1789–90 he lived in Erfurt and Weimar, where a friendship commenced with Schiller, continued without interruption till the poet's death. A valuable memorial of his friendship with Schiller is the correspondence between them (Briefwechsel zwischen Schiller und Wilhelm von Humboldt, 1830). In 1801, at the request of the Prussian government, he accepted the situation of ministerial resident at Rome. From 1806–8 he was here minister plenipotentiary, but, having been called from Rome to fill the office of minister of the interior in connection with ecclestiastical and educational matters, had a most important share in the educational progress which Prussia has since made; more especially is the erection of the Berlin University to be ascribed to him. He exchanged this situation in 1810 for that of extraordinary ambassador and minister plenipotentiary to Vienna. He took an active part during the armistice of 1813 in the peace congress at Prague; in 1814 at the Congress of Chatillon, and the conclusion of the first Paris peace; in 1815 at the Congress of Vienna; and in 1816 at Frankfort-on-the-Main, in all matters connected with the German diet. He was afterward appointed ambassador to London, and in 1818 attended the Congress of Aix-la-Chapelle. In 1819 he was an active member of the Prussian ministry, but sent in his resignation the same year, in favor of a freer and more constitutional system. His collected works (1841–52), include poems, essays on subjects of taste, and in particular numerous valuable disquisitions in regard to the origin and progress of language.

Humboldt, a river which has its rise in the northeastern part of the State of Nevada, flows west and southwest, a distance of about 350 miles into Humboldt Lake, in the eastern part of the State. The stream is narrow, the waters saline, and the whole course is through a barren region, destitute of large trees and but few shrubs, except a few clusters of willows. The fields are covered with sage brush. The only east and west pass through the mountains of Nevada is the valley of the Humboldt. The Central Pacific railroad, in its course through the State, follows this river. Humboldt Lake has no outlet; but the waters evaporate so rapidly that sometimes its bed is dry, but when the water is high it overflows the banks. A dam built a few years ago prevents the overflow from falling in Carson Sink.

Hume, David, Scottish historian and metaphysician: b. Edinburgh 27 April 1711; d. there 25 Aug. 1776. He appears to have entered the University of Edinburgh at 12, and to have left at 14 or 15 without taking a degree. He began the study of law, but abandoned it in order to devote himself to the "pursuits of philosophy and learning." His first work, the 'Treatise of Human Nature,' was published partly in 1739 and partly in 1740; the books entitled 'Of the Understanding' and 'Of the Passions' appearing in the former, and that entitled 'Of Morals' in the latter year.

The 'Treatise of Human Nature' is the final and most complete exposition of the fundamental principles of the old school of empirical philosophy,—the school to which belonged Bacon, Locke, and Berkeley. According to Hume, the contents of the mind are embraced in the term "perceptions." Perceptions consist of sensuous impressions and ideas. Ideas are merely images of sensuous impressions. Knowledge is the cognition of the relation between two perceptions. There is no necessary connection between cause and effect. The idea of cause depends on the habit of the mind which expects the event that usually follows another. Mind is but a series or succession of isolated impressions and ideas. As knowledge is dependent on experience derived through the senses, and as the senses frequently deceive, one can have no absolute knowledge of things, but only of one's impression of them. Hence, to give the conclusion later arrived at in the famous 'Essay on Miracles,' a miracle even if genuine is incapable of proof.

The 'Treatise of Human Nature' is clear, forcible, and untechnical. Its most striking characteristics are its spontaneity and individuality. Hume owed little to academic training, and wrote his earlier works at a distance from centres of learning, without access to large libraries. The literary beauties of the 'Treatise,' however, are marred by its structural defects. It is a series of brilliant fragments rather than a well-rounded whole, and is concerned more with criticism of metaphysical opinions from the point of view of Hume's theory of knowledge than with the construction of a complete system of philosophy.

In 1741 appeared the first volume of the 'Essays, Moral and Political,' the second volume coming out in the following year. These, with some additions and omissions, were republished in 1748 under the expanded title, 'Essays, Moral, Political, and Literary,' which has been retained in the many subsequent editions. Hume's essays are models of their kind, full of sparkle, interest, and animation. Hume accompanied General Sinclair in 1746 and 1747 in his expedition against France and in a military embassy to Vienna and Turin. He now published a recasting of his 'Treatise upon Human Nature,' under the title 'An Inquiry Concerning the Human Understanding' (1747). In 1752 he published his 'Political Discourses,' which were well received, and his 'Inquiry Concerning the Principles of Morals.' The same year he obtained the appointment of librarian of the Advocates' Library at Edinburgh, and began to write his 'History of England,' of which the first volume appeared in 1754. It was, like most of the succeeding volumes, severely attacked both for its religious and political tendencies; but, in spite of adverse criticism, after its completion in 1761, was recognized as a standard work. Its merits are chiefly clearness and force of narrative and philosophical breadth of view in the judgment of men and events. In 1763 he accepted an invitation from the Earl of Hertford, then proceeding as ambassador to Paris, to accompany him, and was enthusiastically received by Parisian circles in his character of philosopher and historian. After the departure of Lord Hertford in 1756, he remained as *chargé d'affaires,* and returned to England in 1766, bringing with him Rousseau, for whom he pro-

cured a pension and a retreat in Derbyshire. But the morbid sensitivity of Rousseau brought about a disagreement which put an end to the friendship. In 1767 Hume was appointed under-secretary of state, a post which he held till 1769. As a philosopher, in which quality his reputation is perhaps greatest, Hume's acute skeptical intellect did great service by directing research to the precise character of the fundamental conceptions on which our knowledge and our beliefs are based. His acute negative criticism of these conceptions (for example, his reduction of the ideas of personal identity, conscience, causality, to mere effects of association) compelled philosophy either to come to a dead halt or to find, as Kant did, a new and profounder view of the nature of human reason. See Burton, 'Life and Correspondence of David Hume' (1840); Jodl, 'David Humes Lehre von der Erkenntnis' (1871); Gizyck, 'Die Ethik David Humes' (1878); Huxley, 'Hume' (1879); Knight (1886), and Hume, 'My Own Life.'

Hume, Fergus, English novelist: b. 24 July 1862. He was educated at the University of Otago, New Zealand, became a barrister, and in 1888 removed to London. His first long work, 'The Mystery of a Hansom Cab,' published in Melbourne (1887), and later in London, achieved a phenomenal circulation. Later publications are: 'The Piccadilly Puzzle' (1889); 'Miss Mephistopheles' (1890); 'A Creature of Night' (1891); 'An Island of Fantasy' (1894); 'The Bishop's Secret' (1900); 'The Turnpike House' (1902); 'The Mandarin's Fan' (1904).

Hume, Martin Andrew Sharp, English historian: b. London 8 Dec. 1847. He was educated in Madrid and was attached to the Turkish army 1878–9. He is editor of Spanish State Papers in the Public Record Office and examiner of Spanish in the University of London, and has published: 'Chronicle of Henry VIII.' (1889); 'Courtships of Queen Elizabeth' (1896); 'The Year after the Armada' (1896); 'Sir Walter Raleigh' (1897); 'Philip II. of Spain' (1897); 'The Great Lord Burghley' (1898); 'Spain: Its Greatness and Decay' (1898); 'Modern Spain' (1899); 'History of the Spanish People' (1901); 'Treason and Plot' (1901); 'The Love Affairs of Mary, Queen of Scots' (1903).

Humidity. See RAINFALL.

Hum'mel, Abraham H., American lawyer: b. Boston, Mass., 27 July 1849. He went to New York city in his youth, was educated in the public schools there and entered the law office of William F. Howe as an office boy. He early showed an unusual aptitude for the law, was admitted to the bar of New York in 1870, and subsequently was admitted to practice in the United States courts. In 1870 he founded the law firm of Howe & Hummel, of which he has been ever since a member, and has attained distinction as a divorce lawyer, in theatrical litigation, and important will contests. He represents nearly every important theatre in the United States, many prominent theatrical managers, and leading American and European actors. He is counsel in the United States for the Société des Auteurs Français — organized at Paris, France, for the purpose of protecting all foreign plays produced in the United States and elsewhere.

Hummel, hoom'mĕl, **Karl,** German landscape painter: b. Weimar 31 Aug. 1821. In 1841 he studied painting with Preller. His more idealistic pictures belong to the earlier part of his career, and his later work consists largely of German landscapes. Among his most noted works are: 'The Gardens of Armida' (1888); 'Keller Lake in Holstein' (1884); 'Wooded Landscape near Michaelstein' (1888).

Humming-birds, a family of small birds, the *Trochilidæ*, closely allied to the swifts, peculiar to America and almost exclusively tropical. They are distinguished by small size, iridescent plumage, long slender bill and the peculiar form of the tongue, which consists of a double tube tapering and separating at the tip into two externally lacerated sheaths, which contain the extensile portion. "The horns of the hyoid apparatus are greatly elongated, and pass round and over the back of the head, meeting near the top, and thence stretching in an ample groove to terminate in front of the eyes. This arrangement, analogous to that found in woodpeckers, allows the tongue to be suddenly protruded to a considerable distance, and withdrawn again in an instant." This is a modification of parts adapted to food-getting habits, and is accompanied by others equally characteristic. Humming-birds feed almost entirely upon minute living insects, especially those which gather about flowers and loiter in the corollas, feeding upon the nectar; or dwell on the leaves and bark of plants and trees. Such honey as may be taken with them seems to be gratefully accepted, but the birds do not seek for, nor "suck" the nectar from flowers, as has been popularly supposed. They will dart from a perch and capture an insect like a flycatcher, but ordinarily they obtain them by poising upon their wings about leaves and in front of tree-trunks, picking up morsels, not with the mandibles, but with the tongue; and still more frequently by searching flowers. As it is in the deep, tubular, sweet corollas of trumpet-creepers, orchids, and similar great blossoms of tropical shrubs and vines that insects most abound so there does the humming-bird find its richest hunting-ground; and the long curved beaks of most species have been developed in the constant effort to penetrate to the nectarous depths of these deep blossoms; in truth, the head and half the tiny body may often be pushed into the flower, and in so doing gather and dispense pollen from flower to flower, so that humming-birds are important if not exclusive agents in the cross-fertilization of certain large-flowered plants. This method of obtaining food requires the power of sustaining themselves in the air in a fixed position while they explore leaves or blossoms, since no perch is available for their feet, which are small and weak at best. Hence humming-birds have developed lightness of body coupled with extraordinary muscularity and extent of wings, which in most species reach far beyond the root of the tail. These long narrow wings are operated by pectoral muscles which proportionately exceed in size those of any other bird,— even those of the chimney-swifts; and these huge muscles actuate remarkable short wing-bones, so that extreme rapidity of movement is possible, but it is accompanied by a loss of that power secured by the relatively

longer alar bones of other birds. By this apparatus the humming-birds are able to beat the air with a rapidity which enables them to stand still, or to dart and dodge in pursuit of some agile insect, or in escaping danger, with a speed which defies human sight to trace; the moving wings at such times, indeed, appear only as a misty halo about the body of the bird, and make a loud humming noise. Most species have very long bills — frequently exceeding, and sometimes twice as long as the head; but some have short, owl-like beaks, with which they pierce the base of such flowers as are too deep for them.

A characteristic of humming-birds is that flashing beauty of plumage which long ago led to calling them the gems of the air, and is due mainly to the quality of the feathers, upon the surface of which are small scales that reflect the light in prismatic hues, giving an iridescent or metallic sheen to certain parts, especially the throat (gorget), comparable only to the shards of some beetles. Such brilliance, however, belongs only to the males, the females being uniformly more plainly dressed, though still highly colored. In many species, also, the males are further adorned with fanciful crests, mustaches, tufts, pendants of the chin and throat, "puffs" upon the legs, and especially with ornamental developments of the tail-feathers; and these they seem to take great delight in displaying for the admiration of the female, and the exasperation of rivals. They are extremely pugnacious, especially in the nuptial season, when constant and bitter fighting occurs, and their courage is so great that neither sex has any hesitation in attacking any bird which offends them or comes too near the nest,— even hawks and crows often flee ignominiously before the impetuous onslaughts of these little furies. On the other hand no bird is more fearless of man and easily tamed.

The nests of humming-birds are small cups of downy materials, sometimes resting upon the limb of a tree (as is the method with the common ruby-throat of the eastern United States; sometimes fastened in a crotch of a bush or of large leaves; or fastened to the tip of a pendant leaf, or in a bunch of hanging moss or foliage. The materials are adapted to the place in color and appearance, and further concealment is gained by coating the structure with lichens, or bits of bark, or with cone-scales, as is the habit of the familiar Calliope hummer of California, which nests in pine trees. The eggs of all species are only two in number, and purely white.

The family is exclusively American, and is represented from Labrador and southern Alaska to Patagonia; but the more vagrant species are few, and withdraw in winter toward the equator. About 125 genera with some 500 species, are recognized by ornithologists. Nine tenths of them belong to the Amazon and Orinoco valleys, or to the lowlands of Central America; yet some species habitually spend the summer on high mountains. The variety decreases northward, but nearly 20 species reach the boundary of the United States, and several are regularly present in summer west of the great plains, as far north as southern Alaska. One species wanders over the whole country, and is abundant in the Eastern States. This is the ruby-throat (*Trochilus colubris*). It is about 3½ inches long. The whole upper part, sides under the wings, tail coverts, and two middle feathers of the tail, are rich golden green; the tail is forked, and, as well as the wings, of a deep brownish purple; the bill and eyes black; but what constitutes their chief ornament is the splendor of the feathers on the throat of the male, which are ruby-red, and gleam like a great jewel. The females and immature young lack this gorget.

Consult: Jardine, 'Naturalists' Library,' Vols. I and II (Edinburgh 1833); Lesson, 'Histoire Naturelle des Colubris' (1830); Gould, 'Monograph of the Trochilidæ' (5 vols. 1850–9); Mulsant and Verreaux, 'Histoire Naturelle des Oiseaux-Mouches ou Colubris' (4 vols. 1876); Ridgway, 'The Humming-birds' (Am. Rept. U. S. National Museum for 1890 (Washington 1892).

ERNEST INGERSOLL,

Hu'mor, a fluid of the living body, of which Hippocrates enumerated four, namely, blood, phlegm, yellow bile, and black bile. These were considered to be the principal seats of disease in man. In modern medicine humor is a term generally applied to the thinner fluids, whether natural or morbid, limpid, serous or sanious, such as the humors of the eye or the watery matter in a blister of the skin caused by heat, etc.

Hump'back Salmon, Whitefish, etc., several kinds of fishes are said to be "humpbacked" because of an unusually raised dorsal outline. The humpback salmon of the Pacific coast is a commonly known, but little valued species (*Oncorhynchus gorbuscha*), whose flesh is styled in market "pink" salmon. (See SALMON.) The common whitefish (q.v.) is known locally as humpback or bowback; and the curious razor-backed sucker (*Xyrauchen cypho*), is locally called the humpback.

Humpback Whale, one of the baleen whales or rorquals (q.v.) of the genus *Megaptera,* characterized by a low hump in place of the inconspicuous dorsal fin and a tuberculous head. The genus is world-wide, and an undetermined number of species exist, of which the best known is the northern *M. longimanus,* the specific name referring to the elongated pectoral fin, with which the animal beats the water, itself and often its playmates. These whales reach 50 or 60 feet in length, and go about in small schools. See WHALE.

Humped Cattle. See INDIAN HUMPED CATTLE.

Humperdinck, Engelbert, ĕng'ĕl bĕrt hoom'pĕr-dĭnk, German composer: b. Siegburg, near Bonn, 1 Sept. 1854; after studying music at Cologne and elsewhere he taught in the conservatoriums of Barcelona and Cologne, and was musical adviser to a publishing firm in Mainz. Wagner asked him to assist in the production of the latter's only symphony; and he prepared and coached the first cast of 'Parsifal' at Baireuth (1882). He subsequently became famous as the author of the phenomenally successful children's musical fairy play, 'Hänsel und Gretel' (1894); followed by 'Schneewittchen' (The Snow Maiden) and 'The Royal Children.'

1. Double-crested (T. cornutus). 2. Ruby-throat (Trochilus colubris). 3. White-collared (T. melivorus). 4. Tufted-neck T. ornatus). 5. Delande's (T. delandii). 6. Cora's (T. cora). 7. Golden-green (T. prasina). 8. Vieillot's (T. chalybeus). 9. Evening (T. vesper). 10. Avocet-billed (T. avocetta). 11. Curve-bill (T. curvirostris). 12. Harlequin (T. multicolor). 13. Natterer's (T. scutatus).

Humphrey, hŭm'frĭ, **Charles Frederick,** American soldier: b. New York. He served in the 5th artillery in the Civil War, became 1st lieutenant of the 4th artillery in 1868, was transferred to the quartermaster's department in 1879 as assistant-quartermaster with captain's rank, and in 1897 attained the post of deputy quartermaster-general with grade of lieutenant-colonel. In 1898 he entered the volunteer service, participated in the Cuban expedition, and was promoted brigadier-general of volunteers. In 1899–1900 he was chief-quartermaster of the division of Cuba, in 1900 of the United States China relief expedition. In 1903 he was appointed quartermaster-general, United States army, with rank of brigadier-general.

Humphrey, Heman, American Congregational clergyman and college president: b. West Simsbury, Conn., 26 March 1779; d. Pittsfield, Mass., 3 April 1861. He was graduated from Yale in 1805, was pastor of the Congregational church at Fairfield, Conn., 1807–17, and of that at Pittsfield, Mass., 1817–23 while from 1823 to 1845 he was president of Amherst College. He published several works, including a popular 'Tour in France, Great Britain, and Belgium,' but is best known by a famous pamphlet called 'Parallel Between Intemperance and the Slave Trade.' See Tyler, 'History of Amherst College.'

Humphreys, hŭm'frĭz, **Alexander Combie,** American engineer: b. Edinburgh, Scotland, 1851. He entered business in New York in 1866; in 1877–81 studied at Stevens Institute of Technology (Hoboken, N. J.). He then held various posts first in a lighting, and then in a gas improvement, company, in 1892 became connected with a gas company of London, and in 1894 established a branch business in New York. During this time he did much to improve the manufacture of commercial water-gas. In 1902 he was elected president of Stevens Institute.

Humphreys, Andrew Atkinson, American soldier: b. Philadelphia, Pa., 2 Nov. 1810; d. Washington, D. C., 27 Dec. 1883. He was graduated at West Point 1831, receiving a commission in the artillery. Resigning in 1836 he was associated with Major Hartman Bache as a civil engineer in government work. He re-entered the army in 1838, and was engaged in several government surveys. In the Civil War he was topographical engineer to the Army of the Potomac. In 1862 he was made brigadier-general and commanded the Fifth corps of the Army of the Potomac at the battles of Fredericksburg and Chancellorsville. He commanded a division in the battle of Gettysburg and earned promotion to a major-generalship in the volunteer forces. He commanded the Second corps of the Army of the Potomac in the campaign which closed with Lee's surrender. After his services at Sailor's Creek, he was brevetted major-general in the regular army and was subsequently placed in command of the engineer corps with the regular rank of brigadier-general. He has written: 'The Virginia Campaigns of 1864 and 1865' (1882); 'From Gettysbury to the Rapidan' (1882).

Humphreys, David, American poet: b. Derby, Conn., 1753; d. New Haven 21 Feb. 1818. He was educated at Yale, entered the army at the beginning of the Revolutionary War, and in 1780 became a colonel and aide-de-camp to Gen. Washington. In 1784 he accompanied Jefferson to Europe as secretary of legation, in 1786 was elected to the legislature of Connecticut, and was soon associated with the "Hartford Wits," Hopkins, Trumbull, and Barlow, in the composition of the 'Anarchiad,' being thus one of "the four bards with Scripture names" satirized in London. He was minister to Lisbon 1791–7, minister plenipotentiary to Spain in 1797–1802, and on his return imported from Spain 100 merino sheep, the first introduced into the United States, and engaged in the manufacture of woolens. He held command of the Connecticut militia in the War of 1812. His principal poems are: an 'Address to the Armies of the United States' (1772); 'On the Happiness of America'; a tragedy, entitled the 'Widow of Malabar,' translated from the French of Le Mierre; and 'On Agriculture.' His 'Miscellaneous Works' (1790 and 1804) contain beside his poems 'An Essay upon the Life of Gen. Israel Putnam,' and several orations and other prose compositions.

Humphreys, Frank Landon, American Protestant Episcopal clergyman: b. Auburn, N. Y., 16 June 1868. He was educated at Columbia and Oxford universities. He was precentor and minister in charge of the Cathedral of the Incarnation, Garden City, L. I., 1885–90, and is now canon in the Cathedral of St. John the Divine, New York. Among his writings are: 'The Evolution of Church Music' (1896); 'The Mystery of the Passion' (1898); 'Men of Understanding' (1897); 'Christmas Carols and Caroling' (1900); and 'Clerical Education' (1896).

Humphreys, Joshua, American shipbuilder: b. 1751; d. 1838. He was the first builder of war vessels for the American colonists, and is therefore often called the "father of the American navy." Among the ships constructed by him were the Chesapeake, Congress, United States, Constellation, and the famous Constitution.

Hundred Years' War, the name given to the prolonged struggle between France and England which began in 1337 and ended in 1453. Among the chief of the immediate causes of the war was Edward III.'s claim to the French throne, but the keen rivalry of the two nations rendered conflict inevitable. It lasted during the reigns of five English kings, from Edward III. to Henry VI., and of five French kings, from Philip VI. to Charles VII., ending in the expulsion of the English from France.

Hu'neker, James Gibbons, American musical and dramatic critic: b. Philadelphia 31 Jan. 1859. In Paris he was a pupil of Barili, Ritter, and Dontreleau, and subsequently became an instructor in piano at the National Conservatory of New York. He was musical and dramatic critic of the New York *Recorder* in 1891–5, and of the *Morning Advertiser* in 1895–7. Subsequently he was musical editor, and from 1902 dramatic editor of the New York *Sun*. Among his writings are 'Mezzotints in Modern Music,' essays (1899); 'Chopin, as Man and Musician' (1900), an interesting study; and 'Melomaniacs' (1902), clever but often extravagant stories satirizing the musical profession.

Hungarian Language and Literature. See HUNGARY.

Hungary (Hungarian, Magyar-Ország, "Land of the Magyars"), a kingdom in the southeast of Europe, forming with Austria (q.v.), the Austro-Hungarian monarchy. It includes, in its widest acceptation, Hungary proper, Transylvania on the east, Slavonia and Austrian Croatia on the southwest, extending in this direction so far as to comprise a strip of coast on the Adriatic Sea, together with the former military frontiers, a long strip of territory on the southern borders. Total area, 125,039 square miles, with a population (1900) of 19,254,599. The capital is Budapest. In a more restricted sense Hungary proper is limited to the territory encircled from the east round the north to the northwest by the Carpathian Mountains; bounded west by the river March and some offsets of the Noric Alps; southwest by the Drave; south and southeast by the Danube and the Transylvanian Alps (a continuation of the Carpathian range); with an area of 109,007 square miles, and a population (1900) of 16,721,574. Hungary proper may be considered as a large basin surrounded by mountains on every side except the south; but even there the natural boundaries of this geographical basin are completed at no great distance from the frontier by the highlands of Croatia, Bosnia, and Servia, that meet those of Wallachia and Transylvania at the "Iron Gate", a pass formed by the abrupt divisions of the mountains on either side of the Danube, which there forms a celebrated rapid. From that point the Carpathians proceed by various ranges at first east, but afterward successively northwest and southwest. Several of their summits rise to between 8,000 and 9,000 feet above the sea. The Carpathians are richly wooded in many parts, and their branches are interspersed with numerous romantic and fertile valleys. On the west the Leitha Mountains, a spur of the Alps separating Hungary from Styria and Austria, progressively decline toward the Danube. The Bakonywald (Bakony Forest), another Alpine spur, upward of 2,000 feet in height, and clothed with dense forests of oak, beech, and other trees, intersects the southwest region of Hungary in a northeast direction to near Waitzen, where the Danube bends south, and with the Matra Mountains, beyond that river, divides Central Hungary into a greater and a smaller plain, respectively about 21,000 and 4,000 square miles in extent. The Danube and Theiss rivers traverse the south half of the country in parallel streams about 60 miles apart, the former previously flowing from the west, and the latter from the east or northeast to near the latitude of the capital. Near Eszek, in Slavonia, the Danube, met by the Drave, turns suddenly again to the east, and forms all the rest of the south frontier of Hungary, receiving in this part of its course the Theiss and several minor affluents. The March, Waag, Neutra, Gran, and Ipoli, in Upper Hungary, flow to the Danube from the north; the Bodrog, Schajo, Hernad, and Zagyva, flowing from the same direction, unite with the Thesis; and the Szamos, Körös, Maros, etc., join that river from the east. The Poprad, in the north, flows into Galicia, and is tributary to the Vistula, it being the only Hungarian river not belonging to the basin of the Danube. The Drave forms the southwest frontier on the side of Croatia and Slavonia, and is joined in Hungary by the Mur from Styria. Excepting these two, the Raab, which joins the Danube near the town of its name, is the only river of much magnitude in the southwest quarter of the country; but in that division of Hungary are its two principal lakes, on either side of the Bakonywald—Balaton, in the great plain, and the Neusiedler-See (Hungarian, *Fertö Tava*), close to the border of Austria. In the Carpathians are several smaller lakes, between 4,000 and 5,000 feet above the sea. In the lower courses of the Danube and Theiss are extensive marshes and swamps, especially along the Theiss. The total area of the morasses in Hungary has been estimated at 1,500,000 acres, or upward of 2,300 square miles; within the 19th century enough marsh-land was drained to furnish subsistence for 500,000 inhabitants. Mineral springs are numerous; the most celebrated are those which form the baths of Mahadia in the Banat. Among the minerals are gold, silver, copper, iron, lead, zinc, cobalt, antimony, sulphur, arsenic, salt, soda, saltpeter, alum, vitriol, marble, coals, peat; among the precious stones the opal and chalcedony are remarkably beautiful.

Hungary, including Transylvania, used to yield nearly a half of all the gold annually obtained in Europe. Its principal localities are Kremnitz, Chemnitz, and other places in the north, and Nagy Banya on the Transylvanian frontiers. Silver is found in independent localities, though more frequently in connection with the gold. They are sometimes found pure, but generally in combination with copper. Mining is not yet carried on to a great extent; but the production of coal and iron is rapidly increasing. Hungary is one of the healthiest countries in Europe. Owing to the variety of its surface it possesses a great diversity of climate, which, combined with the fertility of the soil, abundantly supplies her with natural productions.

The Hungarian has a natural inclination to agriculture and the breeding of cattle. Both are however, still in a backward state, though making rapid advances. But the inexhaustible fertility of nature supplies every deficiency of industry and skill, and Hungary is now one of the chief corn-growing countries of Europe, much wheat and flour being exported. Hungarian wheat is well known for its excellent quality. All kinds of grain, a species of maize, rice, kitchen vegetables, and garden plants of every description, melons (which are cultivated in open fields), Turkish pepper, fruits (particularly plums, for the sake of the brandy prepared from them, called *Slivovitza*), wines of different kinds, wood, gall-nuts, potash, tobacco, hemp, flax, hops, saffron, woad, madder, sumach, cotton, and rhubarb are among the products of Hungary.

Many improvements are made by individual proprietors, and Hungary has a large number of technical institutes in which students are thoroughly trained in agriculture. Next to France, Hungary is the chief wine-producing country of Europe, both as regards the quantity and the variety of the product. The annual produce of Hungary and the connected territories is estimated at between 26,000,000 and 27,000,000 eimers, of about 15 gallons each. The finest variety is the Tokay, which is produced in the Hegyallya, in the county of Zemplin.

DRESDEN
CHEMNITZ
Görlitz
BRESLAU
Weimar
Rudolstadt
Fulda
Meiningen
Coburg
Bamberg
Bayreuth
NURNBERG
Hellbronn
Stuttgart
Ulm
Augsburg
MUNICH
Ravensburg
Kempten
Regensburg
Passau
Schwandorf
Danube
B O H E M I A
PRAGUE
Karlsbad
Pilsen
Budweis
Iglau
M O R A V I A
Brünn
Olmutz
Kremsier
Austerlitz
Linz
UPPER AUSTRIA
VIENNA
LOWER AUSTRIA
Baden
SALZBURG
STYRIA
Graz
Innsbruck
TYROL
Brenner Pass
Bozen
Meran
Trient
CARINTHIA
Klagenfurt
Villach
Marburg
CARNIOLA
Laibach
Trieste
Görz
Fiume
Capo d'Istria
Pirano
Parenzo
Rovigno
Pola
ISTRIA
Venice
Chioggia
Padua
Udine
Brescia
Verona
Mantua
Modena
Bologna
Ravenna
GULF OF VENICE
A D R I A T I C S E A
Tauern Chain
Dolomites
Carnic Alps
Dinaric Alps
CROATIA AND SLAVONIA
Agram
Karlstadt
Zengg
Gospich
Zara
Sebenico
Spalato
DALMATIA
Lesina
Brazza
Curzola
Lissa
Lagosta
Meleda
Pelagosa
Kujola
Pianosa
Tremiti I.
Unie I.
Sansego I.
Premuda I.
Melada I.
Lunga or Grossa I.
Incoronata I.
Zuri I.
Pta. della Blanca
Zirona I.
Solta I.
Pomo I.
S. Clemente I.
S. Andrea I.
Busi I.
Cazza I.
Brioni Is.
Pta. di Promontore
B O S N I A
HERZEGOVINA
Balaton L.
Pressburg
Neusiedler See
Schweidnitz
Weisses
Semmering Pass
Hallstatt
Lake of Constance
Vorarlberg
Chur
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Breitensee
Baumgarten
Penzing
Hietzing
Meidling
Lainz
Speising
Favoriten
Simmering
Schwechat
Kaiser Ebersdorf
Grinzing
Nussdorf
Salzmannsdorf
Sievering
Neustift a. Walde
Pötzleinsdorf
Dornbach
Gersthof
Weinhaus
Döbling
SCALE OF MILES


AUSTRIA-HUNGARY
SCALE OF MILES
0 25 50 75 100
Population of places is indicated by different lettering, thus;
200,000 and over ... BUDA-PEST
100,000 to 200,000 ... Szegedin
50,000 to 100,000 ... Linz
10,000 to 50,000 ... Hof
Smaller towns ... Cermo
Railroads
Canals
GALICIA
BUKOWINA
TRANSYLVANIA
HUNGARY
SERVIA
ROUMANIA
BULGARIA
TURKEY
RUSSIA
BUDA-PEST
Lemberg
Czernowitz
Cracow
Belgrade
BUKHAREST
Szegedin
Grosswardein
Klausenburg
Temesvar
Rustchuk
Vratza
Baken
Rodnan
Bolgrad
Tarnopol
Carpathian Mts.
Transylvanian Alps
Danube
Bormay & Co., N. Y.

Horses, cattle, sheep, hogs, game (in the north bears), poultry, fish (among which the sturgeon and salmon, *Salmo dantex*, are the principal), bees, and silkworms are among the productions of the animal kingdom.

The principal artisans are tanners, furriers, manufacturers of *tschism* (cordovan boots), lace-makers, harness-makers, makers of wooden wares, of straw-plait work, etc. There are few extensive manufactures in Hungary. There are numerous iron and steel works, some iron-foundries, tin-plate and wire works; also potteries, glass manufactories, sugar-refineries and beet-root sugar works, soap-works, tallow, stearine, and wax-candle works; soda, saltpeter, and potash works, and brandy distilleries. Trade is almost exclusively in the hands of the Germans, Greeks and Jews. Internal commerce is promoted by the railways and rivers, the Temes and Francis canals (the former 75, the latter 60½ miles long), the fairs (which amount to 2,000), and the complete absence of tolls. The railways in 1901 had a total length of 10,794 miles, 4,876 miles being state lines; 3,439 worked by the state, and the rest private commercial lines. The total length of navigable rivers and canals in the monarchy is over 3,000 miles. The Danube is the most important highway of traffic, but the foreign trade by it is comparatively small. Inland navigation and roads are given careful attention.

The great number of distinct races with entirely different habits which is found in Hungary is remarkable. According to the census of 1900 on the basis of language, the races inhabiting Hungary including Croatia and Slavonia were divided as follows:

Magyars	8,679,014
Rumanians	2,785,265
Germans	2,114,423
Slovaks	2,008,744
Croatians	1,667,377
Servians	1,045,550
Ruthenians	427,825
Various	526,401
	19,254,599

The Magyars, who are the dominant race, are located for the most part in the centre of the kingdom. They are high-spirited, brave, warlike and generous, and, according to travelers, more sincere than their Servian and Wallachian neighbors; impatience of control, pride, indolence, and ignorance are their besetting faults. Their general deportment is serious; and in many respects they resemble the Turks, who followed them out of Asia, and belong to the same great family of mankind. The Magyar costume is remarkable for its picturesque elegance. Most of the Hungarian nobles are Magyars; and it is by this section of the population that the constitutional form of government and municipal institutions have been mainly, if not wholly, upheld. The Slovaks are among the people apparently the earliest settled in Hungary; they inhabit the northwest, and are similar in race, customs, and language to the adjacent Moravians, to whose extensive empire they belonged before the Magyar conquest. The Ruthenians or Rusniaks dwell beneath the north and northeastern Carpathians. The Rumanians (Wallachians) occupy a tolerably wide tract of country on both sides of the west and north boundaries of Transylvania. They are far behind the Slovaks, and, indeed, nearly all the other nations of Hungary, in education and civilization. They appear to be the descendants of Italian colonists, placed in Dacia during the Roman dominion there, and have been accordingly called Daco-Romans — an epithet to which their classic features, easy manners, language, and antique costume seem to give them a claim. They call themselves *Romouni;* and speak a dialect of Latin, but they write it with the Cyrillian or Russian character. In this last particular they unite with their Servian neighbors inhabiting the Banat on their southwest. The Croats people nearly all Slavonia and Croatia, and stretch into seven of the counties of Hungary proper as far as the county of Pesth. The Wends (Vandals) inhabit two counties of Hungary proper as far as the county Theresianopel, and a few other parts of the Banat; the Montenegrins a part of the county Temes; and the Armenians portions of three of the eastern counties. The Germans appear, in the first instance, to have emigrated into the country during or before the 7th century, subsequently to which many successive immigrations took place, especially under Geysa, king of Hungary, who ascended the throne 1141 A.D. and who established large numbers of German colonists from Franconia, Thuringia, and Alsace in several of the northern counties, and in Transylvania. They speedily became dispersed in detached settlements over all Hungary; and early in the 13th century Pesth was described as a "large and rich German town." In the 18th century other Teutonic immigrants, with some French refugees, settled in the kingdom. The Germans are marked by their industry and thrifty condition, but also, it is said, by their litigious and avaricious propensities. They people the greater part of the western frontier, from Presburg and around the shores of Lake Neusiedler south nearly to the limit of Croatia; elsewhere they are most numerous in the county of Zips, the mining districts, the Banat, and especially in the towns, where they compose the bulk of the trading population.

With regard to popular education, attendance in elementary schools is compulsory from the completion of the sixth year (in Croatia and Slavonia the seventh) till the completion of the twelfth, and also in continuation-schools up to the age of 15. Every parish or commune is also bound to maintain an infant school. The great bulk of the schools are supported by the denominations. Besides gymnasiums and real-schools there are numerous technical schools for arts and industries of all kinds. There are universities at Budapest, Klausenburg, and Agram, attended by over 6,000 students. Over two thirds of the periodicals issued are in the Magyar language. The various religious bodies have long enjoyed equal rights in Hungary and Transylvania.

The civil population according to religion, on the basis of the census of 1900, comprised Roman Catholics 9,846,533, over 51 per cent; Greek Catholics 1,843,634; Greek Oriental 2,799,846; Evangelical Augsburg, 1,280,070; Evangelical Helvetian 2,423,818; Unitarians 68,005; Jews, 846,254; others 14,180.

The Roman Catholic clergy are powerful by reason of their large landed property, and the influence they possess over the appointments to many offices. There are three Roman Catholic

archbishops and 17 suffragan bishops, with a Greek (United) Catholic archbishop and five suffragan bishops. Among the Protestants, laymen and clergymen united manage the affairs of the different congregations under the direction of superintendents. Lutherans and Calvinists have each four superintendents in Hungary and one in Transylvania.

A sketch of the Hungarian constitution has already been given in the article AUSTRIA. Hungary is divided into counties and districts, according to a very old division of the country. These have the right to administer their own internal affairs. At the head of each is an *Obergespann* (or lord-lieutenant) and two *Vice gespanne*. There are three county courts in civil cases, according to the importance of the subject in question, consisting either of a judge with a jury, or of the vice-officer of the county with a judge and jury, or of the supreme tribunal of the county (*Sedes Judicaria, Sedria*), which also revises the decisions of the two other courts and of the seignorial courts. The courts of appellate jurisdiction are the Royal Table (which, however, in several cases has original jurisdiction) and the Table of the Seven. The former sits in Budapest and the latter in Agram. They are both comprised under the name of *Curia Regia*, the sentences of which have the force of law in case there is no positive law.

History.— The nations which occupied parts of Hungary before its conquest by the Magyars were the Dacians, Bastarnæ, Illyrians, Pannonians, Sarmatians, Vandals, Bulgarians, Jazyges, Alans, Huns, Marcomanni, Longobards, etc. The Romans held the southwest part of the country under the name of Pannonia, while the southeast belonged to their province of Dacia. Various Slavic tribes, together with Wallachians, Bulgarians, and Germans, were the chief occupants at the time of the Magyar invasion. The Magyars, a warlike people of Turanian race, had made various migrations, and long dwelt in the vicinity of the Caucasian Mountains, and afterward in the region between the Don and the Dniester, before they approached and crossed the Carpathians (about 887) under the lead of Almos, one of their seven chiefs (*vezér*), and elected head (*fejedelem*) or duke. Arpád, the son of Almos, conquered the whole of Hungary and Transylvania, organized the government, and also made various expeditions beyond the limits of these countries. These incursions were extended under his son Zoltán (907–46) and grandson Taksony (946–72), as far as the German Ocean, the south of France and Italy, and the Black Sea. These formidable enemies were first defeated by Henry I., the German emperor, at Merseburg in 933; they then invaded Franconia in 937, and Saxony in 938, were defeated at Stederburg, and also on the river Ohre. Their last incursion into Bavaria (954 and 955) terminated with their complete overthrow on the Lech, where Otho I., king of the Germans, conquered them. They gradually learned from the Slavonians and Germans whom they conquered, and from the prisoners whom they had taken in their incursions, the arts of peace, agriculture, and manufactures. The hospitality of Geysa (972–97), and the religious zeal of Sarolta his wife, did much to attract strangers from different countries and of all classes into Hungary. The Hungarians violently opposed the introduction of Christianity, and Geysa was obliged to leave the extension of it to his son Stephen (997–1038), who finally prevailed by the assistance of Latin monks and German knights. King Stephen granted a constitution, the principal features of which were never lost, but the unsettled state of the succession to the crown, and the consequent interference of neighboring princes and of the Roman court in the domestic concerns of Hungary, long retarded the prosperity of the country. The religious zeal and bravery of St. Ladislaus (1077–95),) and the energy and prudence of Coloman (1095–1114), shine amid the darkness of this period.

The introduction of German colonists from Flanders and Alsace into Zips and Transylvania by Geysa II. (1141–61) had an important influence on those districts. In 1186 Hungary became connected with France by the second marriage of Béla with Margaret, sister to Henry, king of France, and widow of Henry, king of England, who introduced French elegance at the Hungarian court. The reforms of Béla IV. (1235–70) were interrupted by the invasions of the Mongols (1241), and the kingdom was in a most deplorable condition. With Andrew III. (1290–1301) the male line of the Arpád dynasty became extinct, and the royal dignity became purely elective. Charles Robert of Anjou, by his mother a descendant of the extinct dynasty, was the first elected (1309). The reign of his descendant Sigismund (1387–1437) is interesting from the invasion by the Turks (1391) and the war with the Hussites. From their first appearance the Turks constantly disturbed the tranquillity of Hungary, which served as a bulwark to the rest of Europe. The death of Ladislaus I., in the unfortunate battle of Varna (1444) is to be regretted, as the plan of the hero John Huniades, for driving the Turks from Europe, failed through the coldness of the Christian courts and the intrigues of his enemies.

Matthias Corvinus (1458–90), son of Huniades, held the reins of government with a firm hand, and gained the love and confidence of the nation, notwithstanding the severe measures which he was often compelled to adopt.

During the reigns of Ladislaus II. (1490–1516) and Louis II. (1516–26) the ambition and rapacity of the optimates, headed by Stephen Zapolya, and afterward by his son John, excited domestic troubles and caused an insurrection of the peasants, which was only suppressed by the severest measures (1514), while they destroyed the foreign influence of the kingdom. The battle of Mohács (1526), in which Louis II. lost his life, and which for 160 years made a great part of Hungary a Turkish province, was the natural consequence of this state of things. The rest of the country was in dispute between the rivals Ferdinand of Austria and John Zapolya. The contest was decided by the Protestants, who, fearing the persecution of Zapolya, declared for Ferdinand. Their adherence gave him the superiority, and Zapolya was compelled to rest satisfied with the possession of Transylvania and some counties of Upper Hungary; but this division of the kingdom caused continual disputes with the descendants of Zapolya, instigated by the Turks and the French, gave rise to civil commotions, which were quicted by the treaties

of Vienna with Stephen Botskay (1606), of Nikelsburg with Gabriel Bethlen (1622), and of Lintz with George Rakoczy (1645). These circumstances delayed the expulsion of the Turks, in which Leopold I. finally succeeded so far that he took Buda (1686), and by the Peace of Carlowitz (1699) recovered the rest of Hungary (except the Banat) and Transylvania.

The Congress of Passarowitz (1718) restored the Banat to Hungary, and the Peace of Belgrade (1739) terminated hostilities with the Porte for a long time. Charles VI. (1711–40) by the pragmatic sanction secured the inheritance of the Hungarian crown to the female descendants of the house of Hapsburg, and improved the administration of the kingdom by giving the royal chancery and the vice-regal office an organization better suited to the age. He also formed a standing army for Hungary, and established the military contribution for its support. Joseph II. (1780–90), one of the greatest sovereigns of his age, was influenced by the best intentions in the changes which he undertook in the Hungarian constitution; but his zeal made him forget the necessity of proceeding gradually in such reforms, and the nation, far from entering into his views, opposed them.

The subsequent history of Hungary — the adoption of the Magyar language in its diet; the resistance against the encroachments of Austria; the heroic struggles for independence, and the noble work of Batthyani, Deak, Kossuth, and Klauzal, along these lines; the disastrous war of 1848 and the reduction of Hungary to the position of an Austrian crown-land; its rehabilitation to independence in 1867 and the constitution of the dual Austro-Hungarian Empire, are described under Austria. See paragraphs *Austria under the House of Hapsburg-Lorraine*, and *Recent Politics*.

Hungarian Language.— The language of the Magyars, as spoken and written at present in Hungary, is a phenomenon in philology, disclosing rich stores for the philosophical historian and philologist. It is classed in the Ugric branch of the northern division of the Turanian family of languages, and as such is most closely allied to the Ostiak, Vogulic, and Mordvinic, though it is also nearly akin to the Finnish and the Turkish. Differing from all the cultivated languages of Europe in internal structure and external form, the Hungarian nevertheless was obliged to express with the Roman alphabet, adopted with Christianity, all the Asiatic shades of sounds. The alphabet contains the following 26 simple and 6 compound sounds, pronounced as in Italian, except where otherwise marked:— 8 vowels: *a* (like *a* in what, swallow), *e* (=*é* French), *i* and *y*, *o*, *u*, *ö* (= French *eu* or German *ö*), *ü* (French *u*); 18 consonants: *b*, *d*, *f*, *g*, hard *h* (German), *j* (German), *k*, *l*, *m*, *n*, *p*, *r*, *s* (English *sh*), *t*, *v* (also *w*), *z* (French), *sz* (English *s*), *zs* (or *ś*, French *j*); 4 compounds with *y*: *gy* (pronounced *dy*, *gyar*, factory, pronounced *dyar*, in one syllable), *ly* (French liquid sound as in *fille*), *ny* (French and Italian *gn*), *ty*; and two compound sibilants: *cs* (written also *ch* and *ts* = English *tch*), and *cz* (English *ts*). If we add the long vowels, marked with the acute accent, *á*, *í*, *ó*, *ő* (long *ö*), *ű*, *ü* (long *ü*), we have 38 sounds in all, besides *x*, which is used in foreign names. The Hungarian has adopted a good many Slavic, Latin, German, Greek, and other foreign words; but it still retains the essential characteristics of its grammar and phonology. As in the other Turanian languages the root is never obscured in words, whatever changes they undergo. Determining or modifying syllables are placed at the end, and have a double form, always taking a different vowel when attached to a sharp-vowel root from what they have when attached to a flat-vowel root. This is a general characteristic of the Turanian languages. These suffixes represent the case-endings of nouns and the conjugations of verbs in other languages, and are very numerous. Hungarian is destitute of diphthongs. At the beginning of a syllable the Hungarian never allows more than one consonant; in foreign words which begin with two consonants, the consonants are made to go with different syllables by putting a vowel before them (for example, of *schola* they make *iskola*), or a vowel is put between (as from *král* they make *király*). In common with the other languages allied to it, it has no distinction of sex whatever. Family names are considered as adjectives, from which they mostly originated, and hence are put before the baptismal name; for instance, Bátori Gábor (Gabriel Bátori), as if it were the Batorish Gabor, the Gabor of the Batori family. The beautiful proportion between vowels and consonants, the accurate shadowing and full articulation which every syllable requires (the Hungarian suffers no mute vowels), and the fixed succession of vowels, give to the Hungarian language a character of masculine harmony, in which it will bear a comparison with any other. The richness and expressiveness of its various forms give it great energy; the regularity of its inflections and compositions, in which it is to be compared with the Sanskrit, makes it clear and distinct, and its infinite power of composition gives it the means of increasing its stores beyond almost any western language.

Hungarian Literature.— The preference given to Latin over the national language, not only in the church, but in judicial proceedings, legal documents, and forms prevailed until past the middle of the 19th century. The use of a dead language in common life, as well as on all scientific subjects, could neither be advantageous to the language itself, to the general improvement of the people, nor to the national literature. Despite these disadvantages, some buds of literature from time to time unfolded themselves, and native genius, notwithstanding its chains, would sometimes attain distinction. Though with the introduction of Christianity into Hungary the Latin language acquired the ascendency in the church, in schools, and public affairs; yet Hungarian was used in commerce, in the camp, and even the resolutions of the diet were first drawn up in Hungarian. When the missionaries addressed the people in Latin an interpreter was usually present; and there are several relics of poetry, sacred eloquence, and state papers extant in Hungarian. A new impulse was given to this language on the accession of the house of Anjou to the throne of Hungary. The Latin was indeed still the language of church and state; but the Hungarian became the language of the court. Documents were drawn up in Hungarian, and the Hungarian oath, in the Corpus Juris Hungariæ, dates from this time. The Holy Scriptures were translated into Hungarian; in the imperial

library, Vienna, there is a manuscript translation of 1832; and several other translations were published. In 1465 Janus Pannonius wrote a Hungarian grammar, which is lost. The 16th century was favorable to Hungarian literature, through the religious disputes in the country, the sacred, martial, and popular songs, as well as by the histories written and published for the people, and the multiplied translations of the Bible. It then reached a degree of perfection which it retained until the latter part of the 18th century. Among writers of ballads or metrical tales belonging to the 16th century may be mentioned Tinódi, Kákonyi, Tsanádi, Valkai, Tserényi, Szegedi, Illésfalvi, Fazékas, Balassa, etc. A higher aim was manifested by the epic poems of Count Niklas Zrinyi (1652), Ladislaus Lissthi (1653), Christopher Paskó (1663), Count Stephen Koháry (1699), and in particular the numerous and excellent productions of Stephen von Gyöngyösi (1664–1734), as well as the lyric poems of Rimai, Balassa, Benitzky, etc. In 1653 an encyclopædia of all the sciences, and in 1656 a work on logic, were drawn up in the Hungarian language by John Tsere (Apátzai). A large number of grammars and dictionaries were printed from the 16th century to the 18th. But the hopes of the further development of Hungarian literature were not realized; a Latin period again succeeded, from 1700 to 1780, during which time numerous and finished works were composed in Latin by Hungarian writers. In 1721 a Latin newspaper was established, and the state calendar, which commenced in 1726, was regularly published in Latin. In 1781 the first Hungarian newspaper was printed in Presburg.

After Joseph II. died (1790) many violent yet bloodless changes were made in the Hungarian constitution, and several laws were passed in favor of the Hungarian language. It was required to be used in all public proceedings. Courses of lectures were delivered in Hungarian in some of the schools, and it was taught in all of them. Several periodicals were established, Hungarian theatres erected in Buda and Pesth, many works were written both in poetry and prose. The modern period of Hungarian literature may be said to date from the time of Joseph II. The epic poem of Arpád was written by Andrew Horváth, and published at Pesth in 1830. The brothers Alexander and Charles Kisfaludy acquired a great and deserved reputation as poets and dramatists, and did much toward developing the national language and literature. The latter (who died in 1830) may be looked upon as the founder of the modern drama in Hungary. The most celebrated works of the former are his lyrical masterpiece, 'Himfy Szerelmei' (Himfy's Love, 1807), his 'Regék a Magyar elöidöböl' (Tales of the Early Hungarian Times), and his historical tragedies, which were partly modeled on those of Schiller. The development of the Hungarian literature owes much to the influence of the periodical press, which spread abroad a taste for literature at the same time as it intensified the sentiment of nationality among the people. In this department the name of Kossuth deserves honorable mention. Previous to the troubles of 1848–9, which checked for a time the natural growth of the literature, almost every species of composition was successfully practised. Works on politics and narratives of travel were written by Eötvös, Szechényi, Szalay, Szemere, etc.; on history by Stephen and Michael Horváth, Szalay and Jaszay; on philology by Fogarassy and Bloch; works on the exact sciences, however, were confined to translations from the German, French, and English. Novels and romances were written by Baron Jósika, Eötvös, Kemény, Kuthy, Nagy, Pálffy, etc., which, though of no great originality, showed considerable artistic skill, and helped to diffuse a more correct style. The dramatic pieces of Eötvös, Obernyik, Vörösmarty, and the prolific Szigligeti — who for a long time had almost the exclusive possession of the national stage — have greater value and originality. It is in poetry, strictly so called, however, that modern Hungarian literature shines. Many of the poems (songs, ballads, etc.) of Czuczor, Vörösmarty, Bajza, Garay, Bachot, Szász, Erdélyi, Kerény, and others, are among the finest things that modern literature has produced. In this field the palm must be awarded to Alexander Petöfi, who completely freed Hungarian poetry from its dependence on foreign models and subjects, and inspired it with a life drawn fresh from nature and national feeling; and who, in artistic skill and masterly handling of his mother tongue, ranks as a model. Tompa, Hiador, Lisznyai, and others, have copied him with more or less success. The collection of ancient Hungarian national poetry, compiled and edited by John Erdélyi, at the instance of the Kisfaludy Society (three vols., Pesth, 1845–7), contributed greatly toward bringing back the modern poetry to nature and originality, and to impress upon it the stamp of nationality. The ill success of the revolutionary struggle seemed for a time to have dealt a heavy blow to the progress of Hungarian literature, the most gifted writers having either fallen in battle (as Petöfi), or been imprisoned or banished. Time, however, opened the prisons and brought back the exiles; to the writers already mentioned others were added, and an active literary life again began. The greatest recent Hungarian poet is John Arany, who surpasses even Petöfi in artistic feeling, and whose national epic, 'Toldi,' is looked upon as a masterpiece. Baron Jósika holds the first place among the novelists; Jokai, Kuthy, Bérczy, Pálffy, Miksrath, and Dobzsa are also favorite fiction writers. Narratives of travel have been written by Count Andrassy, Ladislaus Magyar, Vámbéry, etc.; on politics by Esengery, Szalay, Pákh, and Eötvös. National history has attracted much attention; and besides the works of Szalay and Horváth, we should mention Teleki's 'Age of Hunyad,' Jászay's 'Hungary after the Battle of Mohács,' Salomon's 'The Rule of the Turks in Hungary,' etc. Many excellent translations of modern foreign works have been made, some of which, such as Esengery's translation of Macaulay's 'History of England,' and Somssich's translation of Guizot's 'Histoire de la Révolution d'Angleterre,' rival the originals in style. The best works on Hungarian literature are those of Toldy, some of which have been translated into German.

Hunger. See APPETITE; DIGESTION; FASTING; FOOD.

Hungerford, hŭng'gėr-fōrd, **Margaret Hamilton Wolfe Argles** ("The Duchess"), Irish novelist: b. Ross, Ireland; d. Bandon, County Cork, 24 Jan. 1897. She was the daughter of a vicar choral of Cork Cathedral and the death of her first husband, Edward Argles, left her with a young family to support, whereupon she took to writing novels, using the pseudonym "The Duchess." Later she was married to T. H. Hungerford. Her more than 30 novels were widely popular both in America and England and without possessing a large amount of literary value are cleverly written, entertaining fictions. Among them may be cited: 'Phyllis' (1877); 'Molly Bawn' (1878); 'Airy Fairy Lillian' (1879); 'Beauty's Daughters' (1880); 'Mrs. Geoffrey' (1881); 'Portia' (1882); 'O Tender Dolores' (1885); 'Green Pastures and Gray Grief' (1886); 'A Modern Circe' (1887); 'The Duchess' (1887); 'Undercurrents' (1888); 'Hon. Mrs. Vereker' (1888).

Hunk'ers (supposably from Dutch *honk*, "post" or "station;" "stick-in-the-muds"), in American politics, at present a contemptuous nickname, like "moss-backs," for the unprogressive elements of a party, which detest change. Originally, a name given about 1844 to the section of the New York State Democrats which opposed new issues: the points for which it then stood, however, had become party tenets from about 1835. Thence till 1840 the Hunker faction was in opposition to the Locofoco wing (q.v.) which opposed bank charters; but was obliged to yield in 1838. From 1840 to 1846 they oposed the Radicals, who wished a revised State constitution, elective judges, and cessation of State canal building. Thence till 1852 they opposed the Barnburners (q.v.), who, at first separately and then in alliance with the Free-Soil Party (q.v.), fought the national Democratic Party for recognition of its State power. After the election of Pierce in 1852, it divided into "hards" and "softs"; the first under Daniel S. Dickinson opposed the administration, the second under William L. Marcy supported it. The former made up the bulk of the "War Democrats" after 1861. Besides those named, Horatio Seymour is the best remembered Hunker leader; while the opposition has the familiar names of Martin Van Buren, Silas Wright, and John A. Dix, besides others remembered by the older generation.

Hunneus, ŭn-nā'ŭs, **George,** Chilean statesman: b. Santiago, Chile, 1831. He was graduated at the university of his native town in 1857, and became professor of political economy and jurisprudence at the same institution the following year. Montt, president of Chile, drove him out of the country on account of his liberal opinions, which he found carried into actuality in the government of the United States, where he spent his time of banishment. He was recalled to his native land in 1861, was elected to the House of Representatives and became its speaker. He was also appointed secretary of public instruction and is now rector of Santiago University, while holding from time to time high positions in the Chilean administration.

Hun'newell, James Frothingham, American bibliographer, and historical writer: b. Charlestown, Mass., 3 July 1832. He has written: 'Historical Monuments of France' (1884); 'The Imperial Island: England's Chronicle in Stone' (1886); 'A Century of Town Life' (1886); 'The Lands of Scott' (1871).

Huns, a people who make their appearance in authentic history about 375 A.D. Ethnologists identify them with a Mongolian people of Northern Asia, who invaded the Chinese Empire about 200 B.C., and after various migrations entered Europe. They appear afterward to have sided with the Goths of Mœsia against the Romans, and sometimes in alliance with the emperors, who purchased their services, and sometimes in hostility with them, they continued to extend their dominion along the Danube until the time of Attila (434), their greatest leader, whose reign constitutes the best-known period of their history. See Attila.

Hunt, Helen. See Jackson, Helen Fiske Hunt.

Hunt, Henry Jackson, American soldier: b. Detroit, Mich., 14 Sept. 1819; d. Washington, D. C., 11 Feb. 1899. He was graduated from West Point in 1839, receiving a commission in the artillery. He saw service in the Canadian rebellion 1837–8; afterward in the Mexican War. In General Scott's advance on the city of Mexico he distinguished himself as officer of the artillery at Contreras (18 Aug. 1847) and Churubusco (20 Aug. 1847) and subsequently received the brevet rank of major for his gallantry. In 1856 he was placed on the board engaged in revising the system of light artillery tactics. At the outbreak of the Civil War he was stationed at Fort Pickens, Fla., 1861, and the same year commanded the artillery at the battle of Bull Run, and in the defense of Washington during the summer of the same year. The September following he served on General McClellan's staff with the rank of colonel. He subsequently organized and commanded the reserve artillery of the Army of the Potomac. As commander of artillery he was present at the battle of Malvern Hill (1 July 1862) where his disposition of the artillery was especially commended, and he also took part in the battle of South Mountain, after which he maintained his position as commander of artillery in the Army of the Potomac until the end of the war. He was brevetted brigadier-general of volunteers in 1862, and was present at the battles of Antietam, Fredericksburg, Chancellorsville, and Gettysburg, where the fire of his artillery rendered futile the stubborn valor of the Confederate troops, and turned to flight the brilliant charge of Pickett. He served with distinction in the Wilderness campaign and at the end of the war retired from his position with the rank of brigadier-general in the United States army. In 1866 he received the commission of colonel in the reorganized army, and in 1883 became governor of the National Soldiers' Home at Washington. Among his writings are: 'Instruction for Field Artillery' (1860); 'Battles and Leaders of the Civil War'; 'The Battle of Gettysburg.'

Hunt, James Henry Leigh, English poet and essayist: b. Southgate, Middlesex, 19 Oct. 1784; d. Putney, Surrey, 28 Aug. 1859. He was educated at Christ Church Hospital, entered the office of his brother, an attorney, and afterward obtained a situation in the war office. In 1808,

with his brother John, he started the 'Examiner' newspaper, which soon became prominent for the fearlessness with which public matters were discussed. Ere long official resentment took shape in two prosecutions of the brothers, the second of which, occasioned by an article in the paper of 22 March 1812, reflecting on the character of the prince regent, resulted in the brothers being sentenced to pay a fine of £500 each, and to suffer two years' imprisonment. During this time Hunt wrote several works, among which are the 'Feast of the Poets'; the 'Descent of Liberty'; and the 'Story of Rimini.' In 1818 appeared 'Foliage,' a collection of original poems and translations from Homer, Theocritus, Bion, etc.; and in 1819 the 'Indicator' was started, a weekly journal on the model of the 'Spectator,' which contained some of Hunt's best essays. In 1822 he proceeded to Italy, having received an invitation thither from Byron and Shelley, and, with the former, carried on a newspaper called the 'Liberal,' but it proved unsuccessful. On his return to England Hunt published 'Recollections of Lord Byron and some of his Contemporaries' (1828). Among his subsequent works may be mentioned, 'A Legend of Florence,' a play presented with some success at Covent Garden in 1840; 'Stories from the Italian Poets' (1846); 'Men, Women, and Books' (1847); 'A Jar of Honey from Mount Hybla' (1847); 'The Town, its Memorable Characters and Events' (1848); 'Autobiography' (1850); 'Table Talk' (1850). In 1847 a government pension of £200 a year was bestowed on him.

Hunt, Leigh. See HUNT, JAMES HENRY LEIGH.

Hunt, Richard Morris, American architect: b. Brattleboro, Vt., 31 Oct. 1828; d. Newport, R. I., 31 July 1895. He began the study of architecture in Europe at an early age, attended the Ecole des Beaux-Arts in Paris, traveled in Germany, Italy, Asia, and Egypt, and under his former teacher, Lefuel, was clerk of the works on the buildings that were erected to connect the Tuileries with the Louvre. In 1855 he returned to the United States and immediately proceeded to signalize himself by a remarkable series of noble architectural creations, such as the Capitol extension at Washington, the Lenox Library, New York, the Yorktown Monument, Va., etc. He also designed the pedestal for Bartholdi's colossal statute of 'Liberty Enlightening the World' on Bedloe's Island, New York harbor. Some of the finest private houses in the country were built by him on a truly palatial scale of magnificence, such as that of W. K. Vanderbilt's in New York; the country house of George Vanderbilt, at Biltmore, N. C.; the so-called 'Marble House' and the 'Breakers' at Newport. He was one of the founders and served as president of the Institute of Architects, and through his artistic and structural faculty exercised a profound influence over American architecture, which is still felt in the traditions he has bequeathed to many distinguished pupils.

Hunt, Theodore Whitefield, American Presbyterian clergyman and educator: b. Metuchen, N. J., 19 Feb. 1844. He was graduated from Princeton 1865 and from Princeton Theological Seminary 1869, was instructor in English at Princeton 1868–71 and has been professor of English there from 1873. He has published 'The Principles of Written Discourse' (1884); 'English Prose and Prose Writers' (1887); 'Studies in Literature and Style' (1890) 'Ethical Teachings in Old English Authors' (1892); etc.

Hunt, Thomas Sterry, American chemist and geologist: b. Norwich, Conn., 5 Sept. 1826; d. New York 12 Feb. 1892. In 1845 he became an assistant to the elder Silliman at Yale College; was chemist and mineralogist to the Canadian Geological Survey 1847–52, professor of chemistry at Laval University 1856–62, and at McGill University 1862–68, and professor of geology in the Massachusetts Institute of Technology 1872–8. In organic chemistry his name is identified with a system his own to all intents, and his researches into the structure of rocks were of the greatest value. In 1859 he invented the green ink with which greenbacks (q.v.) are printed. He was made an officer of the Legion of Honor in 1867, Fellow of the Royal Society in 1859, and was president of the Royal Society of Canada in 1884. Among his published books are 'Chemical and Geological Essays'; 'New Basis for Chemistry'; etc.

Hunt, William Henry, American lawyer: b. New Orleans, La., 5 Nov. 1857. He was educated at Yale, became attorney-general of Montana in 1884; and held various public offices there after Montana became a State. He was for a time United States agent before the Chilean Claims Commission, but resigned that post in 1900 to become secretary of Porto Rico, and in July 1901 succeeded Charles H. Allen as governor of that island. On 1 July 1904 he was succeeded by Gov. Winthrop.

Hunt, William Holman, English Pre-Raphaelite painter: b. London 2 April 1827. He entered the schools of the Royal Academy in 1845, and next year he exhibited his first picture, 'Hark!' representing a child holding a watch to her ear. About 1848 Hunt, D. G. Rossetti, and J. E. Millais formed the Pre-Raphaelite Brotherhood, afterward enlarged by the admission of other painters and writers, and which attained a position of great influence through the eloquent support of Ruskin. Each of the three founders exhibited in 1849 a picture painted in strict accordance with the principles of the Brotherhood. Hunt's picture represented 'Rienzi Vowing to obtain Justice for the Death of his Younger Brother Slain in a Skirmish between the Colonna and Orsini Factions,' and was exhibited at the Royal Academy. The exhibition of 1854 included two of his greatest pictures, one of them the well-known 'Light of the World.' Both it and 'The Awakening Conscience' are characterized by the careful draughtsmanship and attention to detail which form notable features of the best Pre-Raphaelite work, but their full meaning is far from clear to the average spectator. In 1854 Mr. Hunt went to Palestine in order to obtain a living acquaintance with the scenes of the Biblical stories, and the first fruits of his study of Eastern life was 'The Scapegoat' (1856), one of his most original and most poetical works; but much finer is his 'Finding of the Saviour in the Temple,' exhibited in 1860. Among subsequent works of Hunt's are: 'A Street Scene in Cairo — the

Lantern-Maker's Courtship' (1861); 'Portrait of D. G. Rossetti' (1850); 'Fairlight Downs' (1858); 'The After-Glow in Egypt' (1865), "that modern masterpiece of technical art"; 'Isabella, or the Pot of Basil' (1868), based on the well-known story from Boccaccio utilized by Keats, and in respect of coloring, the finest of the artist's works; 'The Shadow of Death' (1873), showing a prevision of the Crucifixion in the carpenter shop where Jesus is working beside his mother; 'The Triumph of the Innocents' (1885), one of his masterpieces; 'Christ among the Doctors' (1860). See biography by Farrar and Meynell (1893); Williamson, 'Life of Holman Hunt.'

Hunt'er, David, American soldier: b. Washington, D. C., 21 July 1802; d. there 2 Feb. 1886. He was graduated at West Point in 1822, became captain in 1833, and resigning from the army in 1836 settled in Chicago. He, however, re-entered the army in 1842 as paymaster with the rank of major, and in May 1861 was appointed brigadier-general of volunteers, and a few months later major-general. He recruited and organized in South Carolina the first negro regiment in the Union army. He defeated the Confederates at Piedmont, 5 June 1864, and was chairman of the military commission which tried the conspirators engaged in the assassination of President Lincoln. He was brevetted major-general United States army, 13 March 1865, and retired on account of age in 1886.

Hunter, John, British surgeon and physiologist: b. Long Calderwood, Lanarkshire, 13 Feb. 1728; d. London 16 Oct. 1793. He was a younger brother of William Hunter (q.v.) In 1749 and 1750 he studied surgical pathology at Chelsea Hospital, London, and already began to make original observations, which his subsequent experience confirmed. In 1751 he attended St. Bartholomew's Hospital and in 1754 entered as a surgeon pupil at St. George's Hospital. In 1754 or 1755 he was admitted to a partnership in his brother's school of anatomy, and continued to lecture there till 1759. He served as staff-surgeon in France and Portugal 1760–3, and then returned to London and commenced practice as a surgeon. In 1767 he received an unexpected proof of the high estimation in which he was held by men of science in being elected a member of the Royal Society, and in 1768 he was appointed surgeon to St. George's Hospital. His investigations at this time extended over every branch of natural history, particularly pathology, comparative anatomy, and physiology, to which he devoted his entire leisure time. In 1790 he was appointed inspector-general of hospitals and surgeon-general to the army. Hunter left at his death a museum which he had built for himself, and filled with upward of 10,000 preparations illustrative of the departments of science to which his attention had been devoted. It was afterward purchased by government, and presented to the Royal College of Surgeons. In addition to papers contributed to the 'Transactions' of learned societies, his leading works are the 'Natural History of the Human Teeth' (1771); 'Treatise on the Venereal Disease' (1786); 'Observations on Certain Parts of the Animal Economy' (1786); 'Treatise on the Blood, Inflammation, and Gun-shot Wounds' (1794).

Hunter, Robert Mercer Taliaferro, American statesman: b. Essex County, Va., 21 April 1809; d. 18 July 1887. He was graduated at the University of Virginia, and, choosing the law for his profession, commenced practice in 1830. He soon began to take an active part in politics and at 24 was elected to the house of delegates, where he remained until 1837, when he was elected to Congress. In the discussions growing out of the commercial convulsion of that year, he at once took his stand on the side of the administration in favor of the independent treasury bill, and in his first speech developed those principles of free trade to which he consistently adhered throughout his public career. In the succeeding Congress he was elected to the speakership; and at the close of his term of service, the usual vote of thanks was passed without a dissenting voice, in a House of Representatives strongly marked by partisan bitterness. At the election in the spring of 1843 for members of the 28th Congress, Hunter was defeated by a small majority, mainly on account of his adherence to that clause of the independent treasury scheme requiring all dues to the government to be paid in specie. At the next congressional election in 1845, he was successful. In 1846 Hunter, in common with other southern representatives, resisted the application of the Wilmot Proviso. He voted for all the measures necessary to prosecute the war to a just and honorable conclusion, but altogether opposed the project, favored by some, of incorporating the whole of the Mexican states into our political system. During the winter of 1846–7 he was chosen by the legislature of Virginia to the United States Senate, and took his seat in December 1847, remaining there until 1861. He was active in framing the tariff act of 1857 and after leaving the Senate became the Confederate secretary of state. At a later period he was a Confederate senator and in 1865 commissioner of peace. He became treasurer of Virginia in 1877 and retired from public life in 1880.

Hunter, William, British anatomist: b. Long Calderwood 23 May 1718; d. London 30 March 1783. After studying at Glasgow University 1732–7, and subsequently medicine at Edinburgh, he went to London in 1741, and in 1746 received the appointment of lecturer on anatomy to a society of naval surgeons. In 1747 he became a member of the College of Surgeons, and practised surgery and midwifery, but at length confined himself entirely to that branch, and was appointed accoucheur to the British Lying-in Hospital. In the first volume of 'Observations and Inquiries,' published by the Medical Society in 1757, appeared Hunter's 'History of an Aneurism of the Aorta.' In 1762 he published 'Medical Commentaries,' and in 1764 was appointed physician-extraordinary to the queen. Hunter was elected a fellow of the Royal Society in 1767; and in 1768, on the establishment of the Royal Academy of Arts, he was appointed professor of anatomy. He was made a foreign associate of the Royal Medical Society at Paris in 1780, and of the Royal Academy of Sciences in 1782. The most elaborate of his publications, the 'Anatomy of the Human Gravid Uterus,' appeared in 1774. In 1770 he purchased and completed a house and theatre, in which he constituted a splendid museum. At

first he only contemplated a collection of preparations in human and comparative anatomy, but added a collection of shells, corals, and other objects of natural history, paintings and ancient coins and medals. He bequeathed the whole of his splendid museum, valued at £150,000, to the University of Glasgow, with the sum of £8,000 in cash to be expended in an appropriate building for its reception, and a further sum of £500 per annum to bear the charges of its preservation.

Hunter, Sir **William Wilson,** English statistician and author: b. Glasgow 15 July 1840. He was educated at the University of Glasgow and foreign universities, and appointed to the Bengal Civil Service in 1862. As director-general of statistics he made a statistical survey of India, the results of which are embodied in the well-known 'Imperial Gazetteer of India' (1881; 1885–7). He is also the author of 'Annals of Rural Bengal' (1868; 5th ed. 1872), continued in 'Orissa' (1872); 'The Life of the Marquess of Dalhousie'; 'A Dictionary of the Non-Aryan Languages of India and High Asia'; 'Brief History of the Indian Peoples,' which has been translated into five languages, and is the editor of the series of biographies known as 'The Rulers of India.' He was knighted in 1887.

Hunting, the sport or recreation of pursuing game, is a very ancient amusement. Alexander the Great is said to have paid a large sum of money for a treatise on hunting by Aristotle. The true sportsman rarely kills game for any other purpose than eating. The hunting of large game, as bear, deer, tigers, lions, leopards, etc., will be found treated under the titles by which they are described. In Europe the various methods of shooting game are known as open shooting, covert shooting, river and pond shooting, and salt-water wild fowl shooting. Deer-stalking (q.v.) and wild-boar hunting are favorite amusements of royalty in Europe; in India boar-hunting is commonly known as "pig-sticking." See Fox Hunting; Game Laws; Game Preserves, etc. Consult Dodge, 'Hunting Grounds of the Great West' (1877); Gasper, 'The Complete Sportsman' (1893); Mills, 'The Sportsman's Library'; Long, 'American Wild-Fowl Shooting' (1874); Murphy, 'American Game Bird Shooting' (1892); Pringle, 'Twenty Years' Snipe Shooting' (1899); Ramsford, 'Hunting' (1896); Roosevelt, 'Big Game Hunting' (1899); Ward, 'Records of Big Game' (1896).

Hunting-dog. See Hyena-dog.

Hunting Leopard. See Cheeta.

Hun'tingdon, Selina Shirley, Countess of, English religious leader: b. 24 Aug. 1707; d. 17 June 1791. She was married in 1728, to the Earl of Huntingdon and on his death in 1746 became very devout, appointing the famous George Whitefield (q.v.) her private chaplain. Adopting the principles of the Methodists, she was long considered, owing to her rank and fortune, as the head of the Calvinistic Methodists, her followers being known as the "Countess of Huntingdon's Connection." She founded a College at Trevecca in Wales, for the education of ministers, built some 64 chapels, and contributed liberally to the support of the clergy.

Huntingdon, Pa., borough, county-seat of Huntingdon County; on the Juniata River, and on the Pennsylvania railroad; about 200 miles west of Philadelphia. Where Huntingdon is located was once a famous council ground for the Indians of the central part of Pennsylvania. It was first settled by white people in 1760, and was chartered in 1796. The country around is a fertile agricultural region, with valuable mineral deposits and quite extensive forests. The chief manufactures are boilers, machinery, radiators, sewer-pipe, flour, furniture, stationery, knit goods, and stoves. The trade is in the manufactures, and grain and fruits. Huntingdon is the seat of the State Industrial School, and of Juniata College, an institution opened in 1876 under the auspices of the German Baptist Brethren. The original charter is still in force and provides for a chief burgess, who holds office three years, and a council. Pop. (1900) 6,053.

Huntingdon's Disease, hereditary chorea. Chorea, or St. Vitus' dance, sometimes attacks adults, most frequently pregnant women. In such cases it is hard to distinguish from locomotor ataxia. The offspring of adults thus affected are likely to have congenital or hereditary chorea.

Hun'tington, Collis Potter, American capitalist: b. Harwinton, Conn., 22 Oct. 1821; d. Pine Knot Camp, near Lake Raquette, N. Y., 13 Aug. 1900. He worked on his father's farm, until his 14th year. In his 16th year he procured credit in New York for $3,000 worth of clocks, and peddled them through the South and West. He shipped goods to California in 1848; followed them in person in 1849 and began to make his fortune in the hardware business. In 1860 he matured a plan for a transcontinental railroad in conjunction with Leland Stanford, Charles Crocker, and Mark Hopkins. The Central Pacific was finished in 1869. This was the crowning achievement of his life, and at his death the railroad system known as the Southern Pacific, of whose managing board he was president, comprised 26 corporations, with more than 9,000 miles of tracks and 5,000 miles of steamship line. He was one of the largest landholders in the country and his fortune was estimated at $35,000,000. He built a granite church, to the memory of his mother, in his native town; gave C. W. Peale's portrait of Washington to the New York Metropolitan Museum; a library and reading-room to Westchester, N. Y., materially aided in building and equipping Hampton (Va.) Normal Agricultural Institute; and gave $50,000 for the endowment of Tuskegee (Ala.) Normal and Industrial Institute.

Huntington, Daniel, American painter: b. New York 14 Oct. 1816; d. there 18 April 1906. He was educated at Hamilton College, where he made the acquaintance of Charles L. Elliott, from whom he received a decided bias for his art. In 1835 he entered the studio of Professor Morse, president of the National Academy of Design, and soon after produced the 'Bar-room Politician'; 'A Toper Asleep,' besides some landscapes and portraits. In 1839 he went to Europe and in Florence painted the 'Sibyl' and the 'Florentine Girl.' Removing to Rome soon after, he painted the 'Shepherd Boy of the Campagna,' and 'Early Christian Prisoners,' both of which were

purchased by New York collectors. He became a member of the National Academy in 1840 and was its president in 1862 and 1869, and continuously from 1877 to 1899. He devoted himself mainly to portraits and among portraits by him of well known people are those of Presidents Lincoln and Van Buren, and of Sir Charles Eastlake. His noted 'Mercy's Dream' is now in the Corcoran Gallery at Washington.

Huntington, Frederic Dan, American Protestant Episcopal bishop: b. Hadley, Mass., 28 May 1819; d. Hadley, Mass., 11 July 1904. He was graduated at Amherst in 1839, and studied three years in the divinity school of Cambridge. In 1842 he was ordained pastor of the South Congregational (Unitarian) church in Boston, which he left in 1855 to become Plummer professor of Christian morals at Harvard. In 1860 he resigned and took orders in the Episcopal Church, founding Emmanuel Church, Boston, and serving as its rector 1861–9. In April 1869 he was consecrated bishop of Central New York. He has published: 'Sermons for the People' (1856); 'Christ in the Christian Year'; 'Helps to a Holy Lent' (1872); 'The Gospel and the People'; etc.

Huntington, Jedidiah Vincent, American author, brother of Daniel Huntington (q.v.): b. New York 20 Jan. 1815; d. Pau, France, 10 March 1862. He was educated as a physician, but in 1839 entered the Episcopal ministry, officiating for a short time as rector of an Episcopal church in Middlebury, Vt. In 1849 he became a Roman Catholic. His published works are: 'Poems' (1843); 'Lady Alice, or the New Una,' a novel (1849), which is the most popular of his works; 'Alban' (1850); 'The Forest,' a sequel to 'Alban' (1852); etc.

Huntington, Samuel, American jurist: one of the signers of the Declaration of Independence: b. Windham, Conn., 3 July 1732; d. Norwich, Conn., 5 Jan. 1796. He was educated to the law, and previous to 1775 held the offices of king's attorney and associate justice of the superior court of Connecticut. In January 1776 he entered the Continental Congress as a delegate from his native State. In September 1779 he succeeded John Jay as president of Congress, and discharged the functions of that office until July 1780, when he resumed his seat on the Connecticut bench. He served again in Congress from May to June, 1783, and in the succeeding year was appointed chief justice of the superior court of Connecticut. In 1785 he was elected lieutenant-governor of Connecticut, and in 1786 he succeeded Roger Griswold as governor, to which office he was annually re-elected until his death.

Huntington, William Reed, American Episcopal clergyman: b. Lowell, Mass., 20 Sept. 1838. After graduation from Harvard in 1859 he took orders in the Episcopal Church, was assistant at Emmanuel Church, Boston, 1861–2, rector of All Saints, Worcester, Mass., 1862–3, and since 1883 has been rector of Grace Church, New York. He has long been prominent in the councils of the Episcopal Church and is an acknowledged leader of the Low Broad Church school of thought.

Huntington, Ind., city, county-seat of Huntington County; on the Little River, and on the Chicago & E. and the Wabash R.R.'s; about 20 miles southwest of Fort Wayne and 70 miles southeast of South Bend. It was settled in 1834, incorporated as a town in 1834, and received its charter in 1873. The city has excellent water power. Its chief manufactures are bicycles, boots and shoes, pianos, plows, barrels, lime, and cement. It has railroad shops, and wood-working factories. The trade, in addition to the manufactures, is in coal and lime from the coal fields and lime-kilns nearby, and agricultural products. It is the seat of the United Brethren College. The public library has about 12,000 volumes. The city owns and operates the electric-light plant and the waterworks. Pop. (1900) 9,491.

Huntington, N. Y., town in Suffolk County on Long Island. It is on Long Island Sound and on the Long Island Railroad. Huntington originally included the village of Babylon and other adjoining places. As first laid out, the area was 150 square miles. The first settlement was made in 1653, and the first deed of land given to actual settlers was made on 2 April 1653, on behalf of the Matinecock tribe of Indians, and conveying to the whites six square miles between Cold Spring and Northport. The consideration paid was six coats, six kettles, six hatchets, six "howes," six shirts, 10 knives, six fathoms of wampum, 30 "muxes," and 30 needles. Additional lands were purchased in 1656–8. The early settlers were nearly all Puritans from England. The inhabitants of Huntington were among the first of the colonists to protest against "taxation without representation." From the first agriculture was the chief occupation; but trade with the West Indies began at an early date. In 1675 Thomas Fleet was listed as owning 40 vessels. Whales were often caught along the south coast. Nathan Hale (q.v.) was captured in Huntington. The place of capture is marked by a boulder, a shaft, and a drinking fountain. The town celebrated its 250th anniversary on 4 July 1903. The chief manufactures are pottery, brick, and dairy products. Large market gardens are in parts of the town, but much of it is a favorite residential suburb of New York. Pop. (1900) 9,483.

Huntington, W. Va., city, the capital of Cabell County, on the Ohio River, just below the confluence of the Guyandotte River, 18 miles above Ironton, 52 miles west of Charleston and on the Chesapeake & O., the Guyandotte Valley, and the Ohio River R.R.'s. The city, named after the late Collis P. Huntington, was founded and incorporated in 1871. It is an important commercial and industrial centre, has steamship communication with all the important river ports, and among its industrial establishments are the car manufacturing shops of the Chesapeake & Ohio railroad, foundry and machine shops, lumber and planing mills, manufactures of woodwork, paints, glass, stoves, bricks, and ice, bottling and meat-packing establishments, etc. The city is regularly laid out, has electric lights and street railways, two national banks, and is noted for its educational establishments which include Marshall College (the State Normal School), the Douglas High School for col-

ored students, and a Carnegie library. The West Virginia Asylum for Incurables is situated here. Pop. (1890) 10,108; (1900) 11,923.

Huntsville, Ala., city and county-seat of Madison County, on the Nashville, C. & St. L. and the Southern R.R.'s; 96 miles due north of Birmingham; 97 miles due west of Chattanooga; 125 miles south of Nashville, and 210 miles east of Memphis. The city is located in the heart of the famous Tennessee Valley, and is surrounded by a large and fertile agricultural, cotton, fruit, and stock-raising country, making it the most important commercial centre of this entire valley territory. In manufacturing it is fast reaching a position among the most important in the south. As a cotton manufacturing point it is to-day without a rival in all this section, and in spindles leads the South, and is second only to Lowell, Mass. Its nine cotton mills have 203,000 spindles, with 4,374 looms, the annual product of which amounts to $4,775,000. Besides these, Huntsville has machine and foundry shops, cottonseed-oil mills, hoop and heading factory, fibre factory, spoke and handle factories, saw and planing mills, brick plants, gas and electric plants, electric car lines, paid fire department, waterworks owned and operated by the city and supplied from a magnificent spring of purest water with a daily capacity of 2,400,000 gallons. The first settler here was John Hunt, a Virginian, and a soldier of the Revolution, who came to the "Big Spring" in 1805, built his cabin, the first, near by, and in 1806 went back to Tennessee and brought his family, having lived in that State before coming to Alabama. In 1811 the town was incorporated by the Territorial Legislature as "Huntsville." The first State constitutional convention sat here and framed the first constitution of the State, the convention convening 5 July 1819. The first legislature sat here and assembled on the first Monday in August 1820, and this was the first capital of Alabama. The city is well supplied with a number of private schools, and an excellent public city school with a new modern building erected at a cost of $25,000. Four miles north of the city is located the "Alabama Agricultural and Mechanical College for Negroes." The government of the city, under a new charter of 1897, is composed of a mayor and board of aldermen of eight, and it controls all of the city's affairs, including the waterworks. Pop. 16,000.

BENJAMIN POWEL HUNT.

Hunts'ville, Mo., city, county-seat of Randolph County; on the Wabash railroad; 130 miles northwest of Saint Louis and 145 miles northeast of Kansas City. It is situated in an agricultural and coal-mining region. Its principal industrial establishments are flour mills, machinery shops, rake and stacker factory. Its trade is chiefly in agricultural and mining implements, live stock, and farm products. Pop. (1900) 1,805.

Huntsville, Texas, city, county-seat of Walker County; on the International & G. N. railroad; about 200 miles southeast of Austin and 68 miles north of Houston. The first settlement was made about 1835. It is in a fertile agricultural region in which cotton is one of the large crops. The chief manufactures are cotton goods, cottonseed oil, cigars, steam-engines, foundry-products, agricultural implements, furniture, ice, corn-meal, and wagons. Here are the home and grave of Sam Houston, which are of historic interest; the main State Penitentiary, and the Sam Houston State Normal School are located in this city. Huntsville has an extensive trade in cotton. Pop. (1890) 1,509; (1900) 2,484.

Hurlbut, hėrl'bŭt, **Stephen Augustus,** American soldier and politician: b. Charleston, S. C., 29 Nov. 1815; d. Lima, Peru, 27 March 1882. He was admitted to the bar in 1837 and removing to Illinois became prominent in State politics, being a member of the Illinois Legislature 1859, 1861, and 1868. At the opening of the Civil War he became a brigadier-general of volunteers, and he commanded a corps in the expedition to Meridian in 1864. He was United States minister to the United States of Colombia, 1869–73; Republican member of Congress from Illinois, 1873–7; and United States minister to Peru.

Hur'ley, Wis., town, capital of Iron County, on the Montreal River, at the State boundary, opposite Ironwood, Mich. It is 49 miles by rail east by south of Ashland, on the Chicago & N. W., the Milwaukee, L. S. & W., and the Wisconsin C. R.R.'s. It is in a rich iron mining district and has saw-mills and considerable lumbering interests. Pop. (1900) 1,823.

Huron, hū'rŏn, an Indian tribe. See WYANDOT; INDIANS, AMERICAN.

Huron, S. Dak., city, county-seat of Beadle County; on the Chicago & N. W. and the Great N. R.R.'s; about 115 miles northwest of Yankton. It is situated in an agricultural and stock-raising region, where there is a large acreage of wheat and from which many cattle are shipped annually to market. Its manufactures are flour, bricks, dairy products, carriages, and wagons; and it has the Chicago & Northwestern railroad repair-shops, and grain elevators. Pop. (1900) 2,793.

Huron, Lake, one of the Great Lakes on the boundary between the United States and Canada. Canada is on the north and east, Canada and Michigan on the south, and Michigan on the west. It receives the waters of Lake Superior through the Saint Mary's River, and the waters of Lake Michigan through Straits of Mackinac, and discharges its waters through Saint Clair River into Lake Saint Clair (q.v.). Its general direction is northwest and southeast. Its length is about 250 miles, its average width about 155 miles, and its area, 22,322 square miles. This area includes Georgian Bay and North Channel. It is 581 feet above the sea, the same as Lake Michigan, 21 feet below the level of Lake Superior. The depth of the waters beyond the land shelf is from 200 to 750 feet; and along the coast, from 20 to 60 feet. The waters of the whole lake are remarkably clear, and in the northern part cold. In summer the temperature of the surface varies from 52° to 58° and of the bottom from 42° to 52°.

The chief arm of the Lake on the east coast is Georgian Bay, which indents Ontario; and on the west, Saginaw Bay, in Michigan. Other indentations on the west coast are Thunder,

Presque Isle, and Hammond bays. A number of short streams flow into the lake from Michigan, the largest of which are Thunder Bay, Au Sable, and Black rivers. The Lake receives from Canada a large amount of water from lakes Nipissing, Simcoe, Muskoka, and several other small bodies which discharge their waters through short rivers into Georgian Bay.

There are no large islands in the main body of the Lake, but on the north and northeast shores are a number of small islands, composed chiefly of glacial deposits and limestone. Grand Manitoulin and Cockburn islands, together with several small islands, belong to Canada. Drummond, Mackinac, and Bois Blanc islands belong to the United States. The long group of islands in the northeast are separated from the mainland of Ontario by North Channel. The greater part of the shore line is low and at one time the country on the west was well-wooded. Regular terraces showing different water levels, deposits of fine sand and clay containing freshwater shells, extend inland fully 20 miles and at heights above the Lake to 100 and 200 feet. These wide beaches show that at one time this Lake, as the other Lakes, must have been much larger than at present. The area of the whole basin of the Lake, including the surface of the water, is about 74,000 square miles. Some picturesque cliffs along the southeastern coast rise to a height from 80 to 150 feet. The harbors are nearly all protected by breakwaters. The chief ports on the west coast are Cheboygan, Alpena, Tawas City, Bay City (at the head of Saginaw Bay), and Sandbeach. Mackinaw and Saint Ignace, at the entrance to the Straits of Mackinac, are important ports. A railroad line from Detroit to Mackinaw is almost parallel with the west coast. There is an abundance of fish in this Lake, one kind, the whitefish, is most important.

Violent storms, to which the Lake is subject, make navigation dangerous. During the summer months, from the first of May to December, there are but few storms. Lake Huron as a factor in commercial enterprises is most important; it is one of the great waterways of the world, and the shipping on its waters is growing in amount and importance. The great bulk of the iron ore from the Lake Superior district is now brought to the Cleveland and Pittsburg districts; the wheat and flour from the Northwest comes east, and nearly all are carried over Lake Huron; and a large proportion of the products of the east which are sent to the Northwest pass over this same Lake. The Saint Mary's Falls Canal or "The Sault Canal," has been the means of greatly increasing the travel and traffic on Lake Huron.

As early as the 17th century this Lake was crossed by the French missionary, Père Marquette, who, in 1668, established a mission at Sault Sainte Marie, Saint Mary's Falls. In 1673 he was in charge of the mission at Mackinaw, from which place, on 17 May 1673, he departed with Joliet and others in search of the "Big River." For amount of tonnage see GREAT LAKES.

Huronian Series, the name (now largely abandoned) first given by Sir William Logan to a series of strata lying in the vicinity of Lake Huron. They are about 18,000 feet thick, and consist chiefly of quartzite with great masses of greenish chloritic schist, sometimes containing pebbles derived from the Laurentian rocks. No organic remains have yet been found in them, and limestones are rare. They are believed to be of Lower Cambrian age, and lie unconformably on the Laurentians. They occupy the same relative position as the upper parts of the Archæan rocks of Great Britain.

Hurricane. See CYCLONE; STORMS; TORNADO; TYPHOONS.

Hurst, hêrst, **Hal,** English artist: b. London 25 Aug. 1865. He started on his artistic career by drawing eviction scenes in Ireland. He emigrated to the United States, and joined the staff of the Philadelphia *Press;* afterward at New York, Paris, and London he contributed to various journals and periodicals. He became a painter, studying at the Art League in New York and under Julian at Paris. Among his paintings are 'The Siren' (1896); 'The Capture' (1898); and 'The First Court of Henry VII.'

Hurst, John Fletcher, American Methodist bishop: b. near Salem, Md., 17 Aug. 1834; d. Washington, D. C., 4 May 1903. He was graduated from Dickinson College, Carlisle, Pa., in 1854, studied theology in Halle and Heidelberg, Germany, and after holding pastorates in New Jersey and Staten Island became bishop in 1880, and chancellor of the American University in 1891. He was one of the leading men in his denomination and of much prominence as a writer. Among his many works may be cited: 'Literature of Theology'; 'History of Rationalism' (1865); 'Martyr to the Tract Cause' (1873); 'Life and Literature in the Fatherland' (1874); 'Outline of Church History' (1875); 'Our Theological Century' (1876); 'Bibliotheca Theologica' (1883); 'Short Histories of the Church' (1888–90); 'Short History of the Christian Church'; 'Indika: the Country and People of India and Ceylon' (1891); 'History of the Christian Church' (1897); translations of theological works and histories; etc.

Husband and Wife. See LAW OF HUSBAND AND WIFE.

Husbandry, Patrons of. See GRANGERS.

Huskisson, hŭs'kĭ-sŏn, **William,** English statesman and financier: b. Birch-Moreton, Worcestershire, 11 March 1770; d. 15 Sept. 1830. He was sent to Paris in 1783 to study medicine. In 1789 he became an enthusiastic sympathizer with the French Revolution, was present at the taking of the Bastille, and joined the Club of 1789, instituted the following year. He made a speech at the club against the proposed creation of paper money, and withdrew from it when the assembly decreed the issue of assignats. His views of the Revolution afterward underwent a change. In 1790 he was appointed secretary to the British ambassador; and when the ambassador was recalled in 1792 he returned to England, and in 1795 he became under-secretary for war and the colonies. In 1796 he was elected member of Parliament for Morpeth. He resigned in 1801, and returned in 1804. In Pitt's administration formed in this year he became secretary of the treasury, and during the Whig ministry that succeeded Pitt's death was an active member of the opposition. In 1807 he re-

sumed his post as secretary of the treasury, which he resigned in 1809. In 1823 he was elected M.P. for Liverpool, and appointed president of the board of trade, and treasurer of the navy. In 1827 he became secretary of state for the colonies. He was killed at the opening of the Liverpool and Manchester railway 15 Sept. 1830. He seldom spoke in Parliament except on commercial or financial subjects, on which he was an authority. He also anticipated Peel in his advocacy of a free-trade policy. A collective edition of his speeches appeared in 1831.

Huss, Henry Holden, American composer: b. Newark, N. J., 21 June 1861. In 1882 he entered the Munich Conservatory, Germany, and studied music, in theory and practice, under Rheinberger, Giehrl, and Abel. In 1885 he settled in New York, where he has had a successful career as composer, performer, and teacher. He has composed 'Cleopatra's Death,' a scene for soprano and orchestra, as well as songs, anthems, and charming chamber music.

Huss, or Hus, John, Bohemian religious heresiarch: b. Husinec, Southern Bohemia, about 1369; d. Constance, Switzerland, 6 July 1415. He studied at the University of Prague and in 1398 began to lecture on theology and philosophy. In 1401 he was made dean of the faculty of philosophy, and was made rector of the university (1400). Since 391 he had been acquainted with the writings of Wickliffe, and his denunciations of the indulgences, of masses for the dead, of auricular confession, etc., alarmed Archbishop Stynko of Prague, who had 200 volumes of Wickliffe's writings burned (1410) in the archiepiscopal palace, and the preaching of his doctrines in Bohemia prohibited. Huss appealed to the Pope John XXIII., who summoned him to appear at Bologna. Huss refused to appear and was in consequence excommunicated, and Prague threatened with an interdict as long as Huss should remain in it. Wenceslaus, the king, alarmed by this menace, thought to bring about peace; and at his demand, Huss made an orthodox profession of faith in 1411. But the quarrel broke out again when Huss and his friend Jerome publicly condemned the papal indulgences granted for the crusade against Ladislaus of Naples. Huss was again excommunicated and Prague interdicted. He now retired to Husinec to the protection of his feudal lord and here he wrote his books 'On the Six Errors' and 'On the Church,' in which he attacks transubstantiation, the belief in the papal primacy and the saints, the efficacy of the absolution of a vicious priest, unconditional obedience to earthly rulers, and makes the Scriptures the only rule of matters of religion. In the meantime the Council of Constance had convened in 1413. Huss was summoned to this council to render an account of his doctrines. The emperor Sigismund granted him a safe conduct to the council. After several examinations of his doctrines, and his persistent refusal to retract the points which were regarded as heretical, he was sentenced to death and burned 6 July 1415.

Husted, James William, American politician: b. 1833; d. Peekskill, N. Y., 25 Sept. 1892. He was graduated at Yale in 1854, studied law, and in 1869 was elected to the New York Assembly. He was re-elected 15 times, and was chosen speaker in 1874, 1876, 1878, 1886, and 1887. He also served in such varied capacities as superintendent of public schools, deputy superintendent of insurance, harbor master, deputy captain of the port of New York, judge-advocate of the Seventh brigade, and major-general of the Fifth Division, National Guard.

Hutcheson, hŭch'ĕ-sŏn, Francis, Irish philosopher: b. Drumalig, Ireland, 8 Aug. 1694; d. Dublin 8 Aug. 1746. He was educated at the University of Glasgow, taught in Dublin 1717–29, and in 1729 became professor of philosophy at Glasgow. In 1725 the first edition of his celebrated 'Inquiry into the Ideas of Beauty and Virtue' appeared without his name. In 1728 he published his 'Treatise on the Passions,' often reprinted, and admired even by those who dispute the soundness of its philosophy. In 1775 was published from his MSS. a 'System of Moral Philosophy.' The philosophy of Hutcheson is based primarily on that of Locke. His particular theory of conscience as a distinct sense was attacked by Richard Price in a celebrated work, 'Principal Questions and Difficulties in Morals.' The views of Hutcheson and Price are reviewed in Jouffroy's 'Cours de Droit Naturel.' Hutcheson was a writer of considerable originality, and justly regarded as the precursor of Reid, and the founder of the Scottish school in philosophy. An admirable résumé of his works is contained in Cousin's 'Philosophie Ecossaise.'

Hutch'ins, Thomas, American geographer: b. Monmouth, N. J., 1730; d. Pittsburg, Pa., 28 April 1789. In early life he enlisted in the English army, and saw active service in the French and Indian war. He was in England in 1779, and was arrested in London, and thrown into prison as an advocate of American independence. He escaped to France, from which country he sailed to America, and joined the Continental army and was appointed geographer-general by Gen. Greene. Among his published works are: 'Topographical Description of Virginia, Pennsylvania, Maryland, and North Carolina' (1778); 'History, Narrative and Topographical Description of Louisiana and Western Florida' (1784).

Hutch'inson, Anne, American religious leader, the founder of the Antinomian party in the New England colonies: b. Lincolnshire, England, about 1590; d. Westchester County, N. Y., August 1643. She was the daughter of a Lincolnshire clergyman. In England she was interested in the preaching of John Cotton and her brother-in-law John Wheelwright, and it was her desire to enjoy the ministry of the former which induced her to follow him to New England. She arrived in Boston with her husband, 18 Sept. 1634, was admitted a member of the Boston church 2 November, and rapidly acquired esteem and influence. She instituted meetings of the women of the church to discuss sermons and doctrines, in which, with a ready wit, bold spirit, and imposing familiarity with the Scripture, she gave prominence to peculiar speculations which even on her voyage had attracted the attention and caused the displeasure of her fellow passengers. Such were the tenets that the person of the Holy Spirit dwells in every believer, and that the inward revelations of the Spirit, the conscious judgments of the

mind, are of paramount authority. She had been two years in the country before the strife between her supporters and her opponents broke out into public action. Among her partisans were the young governor Vane, Cotton, Wheelwright, and the whole Boston church with the exception of five members, one of whom was the associate pastor, Wilson, while the country clergy and churches were generally united against her. "The dispute," says Bancroft, "infused its spirit into everything; it interfered with the levy of troops for the Pequot war; it influenced the respect shown to the magistrates, the distribution of town lots, the assessment of rates; and at last the continued existence of the two opposing parties was considered inconsistent with the public peace." The peculiar tenets of Mrs. Hutchinson were among the 82 opinions condemned as erroneous by the ecclesiastical synod at Newtown 30 Aug. 1637; and in November she was summoned before the general court, and after a trial of two days sentenced, with some of her associates, to banishment from the territory of Massachusetts, but was allowed to remain during the winter at a private house in Roxbury. She joined the larger number of her friends, who, led by John Clarke and William Coddington, had been welcomed by Roger Williams to his vicinity, and had obtained through his influence from the chief of the Narragansetts the island of Aquidneck, subsequently called Rhode Island. There a body politic was formed on democratic principles, in which no one was to be "accounted a delinquent for doctrine." The church in Boston, from which she had been excommunicated, vainly sent a deputation of "four men of a lovely and winning spirit" to the island with the hope of reclaiming her. After the death of her husband in 1642 she removed with her surviving family into the territory of the Dutch, probably from apprehensions that Rhode Island might not be a safe place of refuge from the encroachments of Massachusetts. The precise locality where she settled has been a matter of dispute, but according to the latest authorities it was near Hell Gate, Westchester County, N. Y. The Indians and the Dutch were then at war, and in an invasion of the settlement by the former her house was attacked and set on fire, and herself and all her family, excepting one child who was carried captive, perished either by the flames or by the weapons of the savages.

Hutchinson, Horatio Gordon, English golfer: b. 16 May 1869. He was educated at Charterhouse School, London, and graduated with classical honors in the University of Oxford. He was golf champion in England 1886–7. He has published 'Hints on Golf'; 'Golf' (in Badminton Library); 'Creatures of Circumstance'; 'Peter Steele the Cricketer'; 'My Wife's Politics'; 'Cricketing Laws and Stories'; 'The Book of Golf and Golfers' (1899); 'Little Lady Mary' (1900); 'Dreams and Their Meanings'; 'A Friend of Nelson' (1902).

Hutchinson, John, Puritan English soldier: b. Nottinghamshire 1617; d. Sandown castle, Kent, 11 Sept. 1664. Being of a religious turn of mind, he devoted much time to the study of divinity, from which his attention was soon diverted by the serious political questions which agitated the kingdom. A careful investigation of the matters at issue between the king and the parliament satisfied him of the justice of the latter's cause, and after the commencement of the civil war he declared for the parliament and was appointed governor of Nottingham castle, which he held until the close of the war. He afterward represented Nottingham in parliament, and, as a member of the high court of judiciary appointed for the trial of the king concurred in the sentence pronounced on him. The subsequent course of Cromwell, however, met with the disapproval of Hutchinson. At the restoration he was comprehended in the general act of amnesty, but was subsequently arrested on a suspicion of treasonable conspiracy, and after a detention of ten months in the Tower was removed to Sandown castle, where he died of fever.

Hutchinson, John, English philosopher; founder of a mystical school of philosophy and theology: b. Spennithorne, Yorkshire, 1674; d. 28 Aug. 1737. In 1724 appeared the first part of his 'Moses' Principia,' in which he disputed the Newtonian theory of gravitation. In the second part (1727) he continued his criticisms of Newton, and maintained on Biblical authority the doctrine of a *plenum* in opposition to that of a *vacuum*. From this time one or more of his uncouthly written volumes, containing a sort of cabalistic interpretation of the Hebrew Scriptures, appeared annually. His leading idea is that the Scriptures contain the elements of all rational philosophy as well as of general religion. The Hebrew language has not only its literal but its typical sense, every root of it being significant of hidden meanings. With this elastic principle of exegesis he deduces a system from which the occult powers of attraction, gravitation, magnetism, and electricity are excluded, but according to which the whole mechanism of the heavens is the result of the agency of fire, light, and spirit, the three material elements which were set to work in the beginning, and which typify the three persons of the Trinity.

Hutchinson, Thomas, American colonial governor: b. Boston 9 Sept. 1711; d. Brompton, near London, 3 June 1780. He was the son of a merchant of Boston who was long a member of the council, and graduated at Harvard College in 1727. He represented Boston for 10 years in the general court, of which he was for three years speaker; became judge of probate in 1752, was a councillor from 1749 to 1766, lieutenant-governor from 1758 to 1771, and appointed chief justice in 1760, thus holding four high offices at one time. In the disputes which led to the Revolution he sided with the British government. His brother-in-law, Andrew Oliver, was appointed distributor of stamps under the law which was to go into effect 1 Nov. 1765, but was compelled by mobs to resign the office before that time. The mansion of Hutchinson was also twice attacked in consequence of a report that he had written letters in favor of the act, and on the second occasion (Aug. 26), when the rioters were maddened by liquor, his house was sacked, the furniture burned in bonfires in the street, and many manuscripts relating to the history of the province, which he had been 30 years in collecting and which could not be replaced, were lost. The inhabitants of the town on the following day in public meeting voted their abhorrence of the proceedings; but though many of the actors were well-known, no one

was punished. He, however, received compensation for his losses. When in 1769 Gov. Bernard was transferred to Virginia, the government of Massachusetts fell to Hutchinson. The popular excitement had already been increased by the arrival of the British troops, and after the so-called Boston massacre a committee of citizens, headed by Samuel Adams, obliged him to consent to the removal of the regiments. The popular indignation against Hutchinson became so great that he at last obtained leave of absence and sailed for England 1 June 1773. The privy council investigated his official acts, and decided in favor of "his honor, integrity, and conduct," which decision was approved by the king. He was rewarded with a pension. He published 'History of the Colony of Massachusetts Bay, from the First Settlement Thereof, in 1628, until the Year 1750' (2 vols., 1760–7, vol. 3, 1828); 'Brief State of the Claim of the Colonies' (1764); 'Collection of Original Papers Relative to the History of the Colony of Massachusetts Bay' (1869). His diary and letters appeared (1804–6). The sober judgment of later times has reversed the prejudiced accusations of his American contemporaries and he is now seen to have been a conscientious man, zealous in the performance of duty but sorely perplexed between the claims of loyalty to the king and his natural inclinations in favor of the colony. See Hosmer, 'Life of Thomas Hutchinson' (1896); Fiske, 'Historical Essays, Vol. I.' (1902).

Hutchinson, Kan., city and county-seat of Reno County; on the Arkansas river, and on the Atchison, T. & S. F., the Chicago, R. I. & P., the Hutchinson & S. and the Missouri P. R.Rs.; 40 miles west of Wichita. The city has one of the largest salt interests in the world, producing about 6,000 barrels per day. It is also an important meat packing and shipping centre; and has manufactures of lumber, machinery, boilers, etc., and the railroad shops of the Hutchinson & Southern railroad. It has a public library, high school, state reformatory, electric lights, a national bank, and an assessed property valuation of $1,500,000. Pop. (1900) 9,376.

Hutch'ison, John, English sculptor: b. Edinburgh, Scotland, 1832. He served his apprenticeship in his native town at the trade of wood carving. Meanwhile he attended an art school, visited Rome and chose as his profession that of a sculptor. He exhibited in the London Royal Academy for the first time in 1862. He is best known for his statues of Robert Bruce and John Knox, and his busts of Norman McLeod, Queen Victoria, and the Prince Consort, as well as for the four figures he contributed to Scott's monument at Edinburgh (Baron Bradwardine, Hal-o'-the-Wynd, the Glee Maiden, Flora MacIver. Among his imaginative works are 'Greek Torch Racer'; 'Roman Dancing Girl.'

Hut'son, Charles Woodward, American educator: b. McPhersonville, S. C., 23 Sept. 1840. He was graduated from South Carolina College in 1860; served in the Confederate army, 1861–5; was professor of Greek in Louisiana State University, 1869–81; of modern languages in the University of Mississippi, 1881–9, and of English and history in the Texas Agricultural and Mechanical College from 1893. He has published 'Out of a Besieged City' (1887); 'The Beginning of Civilization' (1888); 'French Literature' (1889); 'The Story of Language' (1897).

Hutten, hoot'tĕn, **Philip von,** German adventurer; cousin of Ulrich von Hutten (q.v.): b. Birkenfeld about 1490; d. Venezuela 1546. In 1528 the Emperor Charles V. made a grant of the province of Venezuela to the Welsers, a firm of Augsburg merchants; and Hutten sailed with one of the companies sent out by them. He accompanied the viceroy, Georg Hohemut, in a journey (1536–8), in which they reached the headwaters of the Rio Japura, near the equator. In 1541 he set out in search of the Golden City. After several years of wandering, harassed by the natives and weakened by hunger and fever, he and his followers came on a large city, the capital of the Omaguas, in the country north of the Amazons; where they were routed by the Indians, and Hutten himself severely wounded. He led those of his followers who survived back to Coro in 1546, where Juan de Caravajal had in the meantime usurped the office of viceroy; and by him Hutten and his lieutenant, Bartel Welser, were seized and beheaded. Eight years later the Welsers' grant was taken from them, and the German rule in Venezuela was concluded. Hutten left an account of his journeyings which was published under the title 'Zeitung aus Indien' (1765). See Von Langegg, 'El Dorado' (1888).

Hutten, Ulrich von, ool'rĭH fŏn, German knight, distinguished for his poems and satires, and for the influence which his writings exercised upon the Reformation: b. Steckelberg on the Main 21 April 1488; d. Ufnau, an island in the Lake of Zürich, 23 Aug. 1523. His father placed him at Fulda, in order to educate him for a monk. The monastic school there was one of the most famous in all Germany, and he received an excellent education. Here he lost his faith and the declared enemy of Christianity fled to Erfurt in 1504, where he became intimately acquainted with several scholars and poets. In 1511 he went to Wittenberg, where he published a work on versification. Ulrich, duke of Würtemberg, having murdered a cousin of Hutten, Hutten gave free course to his indignation in poems, letters, and addresses, which made him known throughout Germany. He distinguished himself no less in the Reuchlinian controversy with the Dominican Hogstraaten in Cologne.

Hutten severely criticized the monastic life, and was so much the enemy of the clergy, that by his edition of Laurentius Valla, 'De falso credita et ementita Donatione Constantini,' he declared war upon the Church and prepared the way for Luther. In 1518 he entered the service of Albert, archbishop of Mayence, and made several official journeys to Paris. He also accompanied the archbishop to the diet at Augsburg, where Luther held his well-known discussion with Cajetan, and Hutten, in a Demosthenic oration, urged the German princes to a war against the Turks. He took the field with the Swabian League in 1519, against his hereditary enemy, Ulrich of Würtemberg, and then retired to the solitude of his paternal castle of Steckelberg, to engage anew in the controversy with the monks. Here he published work after work, violently assailing the Church,

the clergy and the state. Leaving Steckelberg in 1822 he went first to Basel and thence to Zürich, where he died. He was a savage and violent controversialist during his life and was unsparing in the vehemence of his invective.

Hutton, hŭt'n, **Charles,** English mathematician: b. Newcastle-upon-Tyne 14 Aug. 1737; d. 27 Jan. 1823. The destruction of the old bridge at Newcastle having attracted his attention to the subject of the construction and properties of arches, he was led to the production of a small work on the 'Principles of Bridges' (1772), which laid the foundation of his future fame. He was in 1773 appointed professor of mathematics at Woolwich Academy, elected a fellow of the Royal Society in 1774, and in 1785 published his 'Mathematical Tables,' preceded by an introduction, tracing the progress and improvement of logarithms from the date of their discovery. Later works were: 'Tracts, Mathematical and Philosophical' (1786); 'Elements of Conic Sections'; 'Mathematical and Philosophical Dictionary' (1795–6); 'Course of Mathematics' (1798–1811).

Hutton, Frederick Remsen, American mechanical engineer: b. New York 28 May 1853. He was graduated from Columbia in 1853 and is professor of mechanical engineering there. He has published: 'Mechanical Engineering of Power Plants' (1897); 'Heat and Heat Engines' (1899); 'Machine Tools.'

Hutton, James, Scottish geologist: b. Edinburgh 3 June 1726; d. there 26 March 1797. He studied medicine at Paris and Leyden, but on his return (1754) devoted himself to agricultural pursuits and to chemistry, from which he was led to mineralogy and geology. In 1768 he removed to Edinburgh, and there spent his time in scientific investigations. He published 'A Theory of the Earth' (1795) and 'A Theory of Rain' (1784); 'Dissertations in Natural Philosophy' (1792); 'Considerations on the Nature of Coal and Culm' (1777); and other works. See HUTTONIAN THEORY.

Hutton, Laurence, American editor and critic: b. New York 8 Aug. 1843; d. Princeton, N. J., 10 June 1904. He was privately educated, for some time devoted himself to the study of literature and to foreign travel, in the early 70's became a dramatic critic, and began contributions to periodicals of many sorts. From 1886 to 1898 he was literary editor of 'Harper's Magazine,' and subsequently he became lecturer in English literature at Princeton University. He was a well-known collector, possessing among various things a famous series of death-masks of historical personages. He was also an organizer and founder of the Authors' Club, and of the American Copyright League. Among his numerous writings were: 'Plays and Players' (1875); 'Literary Landmarks' (1885–1903), etc.

Hutton, Richard Holt, English essayist and journalist: b. Leeds 2 June 1826; d. Twickenham 7 Sept. 1897. The son of a Unitarian clergyman, he was educated at University College, London, and in Germany, for the Unitarian ministry, but, coming under the influence of F. D. Maurice, he entered the English Church. In 1861 he became editor of the 'Spectator,' which owed its prominence largely to him. Hutton's best work is in the critical 'Essays, Theological and Literary' (1871), and 'Essays on Some Modern Guides of English Thought' (1887), and in the biography of Sir Walter Scott in the 'English Men of Letters' (1878).

Hutton, William Holden, English Anglican clergyman and historian: b. Gate Burton, Lincolnshire, 24 May 1860. He was educated at Oxford where he was select preacher 1898–1900 and Bampton lecturer for 1903. He has published 'The Misrule of Henry III.'; 'Simon De Montfort'; 'St. Thomas of Canterbury'; 'William Laud'; 'Sir Thomas More'; 'Short History of the Church in Great Britain'; 'Constantinople'; etc.

Huttonian Theory, a view of geological processes first published by James Hutton (q.v.) in 1788, in his 'Theory of the Earth,' and developed in 1795. He was the first to distinguish between cosmogony and geology, believing the latter to be in no way concerned with "questions as to the origin of things." His view was that the upraised land of the globe must be worn away by atmospheric influences and the débris be finally deposited in the bed in the sea, where it is consolidated under great pressure; it is then forced upward by subterranean heat, acting with an expansive power, and thereby split and cracked, the fissures at the same time filling with molten mineral matter; and so the process goes on. Hutton was the precursor of Sir Charles Lyell, whose views were essentially the same, and who procured for them large acceptance among geologists. See UNIFORMITARIANISM.

Huxley, hŭks'lĭ, **Thomas Henry,** English biologist: b. Ealing, Middlesex, England, 4 May 1825; d. Eastbourne, Sussex, 29 June 1895. When he was 12 or 13, he wished to become a mechanical engineer; but a medical brother-in-law (Dr. Salt) took him in hand, and he commenced at this early age the study of medicine. Eventually he went to Charing Cross Hospital, and passed the first M. B. examination of the University of London. Stern necessity compelled him, as soon as his medical course was over, to seek at once, even before he was of age, some post or employment. At the suggestion of a fellow student, Huxley in 1846 applied for admission to the medical service of the navy, was admitted, and was in attendance at the naval hospital at Haslar. The next year he was appointed assistant-surgeon of the Rattlesnake, which was sent on an exploring and surveying cruise in the seas on the east and northeast of Australia. The voyage lasted four years, and gave Huxley an opportunity of gaining an almost unrivaled knowledge of marine zoology. Various papers on this subject were contributed by him to the Linnæan and the Royal Society (one of them gaining a medal from the latter body, of which he was elected a member in 1851), and a further result of his investigations was the important work published in 1859, entitled 'The Oceanic Hydrozoa.'

The Rattlesnake returned to England at the end of the year 1850 and Huxley found that the scientific papers he had sent home had already made him famous. By the aid of those who valued the promise given by his published work, he was allowed by the admiralty for

three years to draw pay as a navy surgeon whilst devoting himself to the working up of the results of his observations when at sea. In 1854 he was appointed lecturer or professor of natural history in the Royal School of Mines, a post long combined with that of naturalist to the geological survey. In 1855 he was appointed Fullerian professor of physiology to the Royal Institution, and delivered four courses of lectures in as many years; while he was also an examiner for seven years to the University of London. The posts of Croonian lecturer to the Royal Society and Hunterian professor in the College of Surgeons were likewise filled by him.

There is no doubt that Huxley was fortunate to obtain at 27 a post, worth nearly a thousand a year, in London, and unburdened with any excessive duties. He had to give during winter (October to end of February) a course of lectures on five days of the week, and attend in his study at the Museum in Jermyn Street, but had not the cares of a laboratory. He carried out his researches alone, and consequently was able to arrange the employment of his day in his own way. He wrote largely for the press upon such topics as belonged to his branch of science; lectured frequently in other places besides Jermyn Street; and took an active and important part in various government commissions, to which his official position rendered it proper that he should be appointed. His lectures to workingmen, in 1860, on the 'Relation of Man to the Lower Animals,' gave rise to much discussion, and led him to treat the subject in his 'Evidence as to Man's Place in Nature' (1863). By this time the Darwinian theory had given rise to much excited controversy, and Huxley's thorough-going Darwinism brought many a bitter attack upon him. In 1862 he was appointed by government to assist in inquiring into the effects of the acts regarding trawling for herring; and his labors and advice had much influence in determining the course of fishery legislation and administration. In 1870 his name became more prominent than ever on the publication of his collection of papers entitled 'Lay Sermons, Essays, and Reviews,' which met with fierce denunciation in many quarters. In this year he presided over the Liverpool meeting of the British Association, and was also elected a member of the first London School Board. In 1872 he was elected Lord Rector of Aberdeen University; in 1875–6 lectured on natural history in Edinburgh University.

In 1883 Huxley received the crowning honor of his life, being elected president of the Royal Society. But ill health soon compelled him to give up his official work. In 1885 he retired from his professorship, from his fishery post, and from the presidency of the Royal Society, and confined himself to such work as he could perform in his study at Eastbourne (where in 1890 he built himself a house), or in the Engadine, where he usually spent the summer.

He produced between 1885 and his death in 1895 a large series of brilliant and interesting essays, especially on the relation of science to Hebrew and Christian tradition, and on the evolution of theology and of ethics. During this period he was president of the Marine Biological Association, in the founding of which he took an active part, and in 1892 was made a member of the Privy Council.

In 1888 Huxley received the Copley medal of the Royal Society, and in 1894 the Darwin medal. Huxley was one of the first scientists of his time; his chief and most valuable work was in the direction of the popularization of science, particularly of the Darwinian theory; he was active also in lines of social and political reform, and in the development and organization of scientific education. His works include 'Oceanic Hydrozoa' (1859); 'Evidence as to Man's Place in Nature' (1863); 'Elementary Physiology' (1866); 'Anatomy of Vertebrated Animals' (1871); 'Elementary Biology' (with Dr. H. N. Martin); 'Anatomy of Invertebrated Animals' (1877); 'Physiography' (1877); 'Hume' (1878); 'The Crayfish' (1880); and numerous essays and addresses on scientific and sociological subjects. Consult: the 'Life,' by Mitchell; 'Life and Letters,' by L. Huxley; and Clodd, 'Thomas Henry Huxley.'

Huygens, hoi'gĕns or hī'gĕnz, **Christian,** Dutch mathematician and physicist: b. The Hague 1629; d. there 8 June 1695. He studied at Leyden, and at Breda, where he went through a course of civil law from 1646–8. Among his most important contributions to science are his investigations on the oscillations of the pendulum, and his 'System of Saturn,' in which he first proved that the ring completely surrounds the planet, and determined the inclination of its plane to that of the ecliptic. In 1690 he published important treatises on light and on weight. His 'Traité de la Lumière' was founded on the undulation theory, but in consequence of the prevalence of the Newtonian theory was long neglected till later researches established its credit.

Huygens' Principle. See LIGHT.

Huysmans, hīs-mäns, **Jorris Karl,** French novelist: b. Paris 5 Feb. 1848. He studied law and entered the French civil service, but abandoned it for literature. At first a pronounced realist, he turned to idealism and even mysticism. He first attracted notice by the story 'Pack on Back'; then followed 'Martha' (1876); 'The Vatard Sisters' (1879); 'The Ménage' (1881); 'Down There' (Là-bas) (1889).

Hwang or **Hoang-ho,** hwäng'hō, or **Yellow River,** China, a large river which rises in the mountains of north Tibet, in the Koko-Nor territory, about lat. 34° 30′ N., and lon. 97° 30′ E. It derives its name from the vast quantities of yellow mud continually carried down by its waters. After a winding course, north, east, and south, of about 2,600 miles, it flows since 1853 into the Gulf of Pe-chi-li, prior to that year its outlet being in the Yellow Sea. It is a turbulent, turbid, and impracticable stream, but little used for navigation and subject to disastrous floods, to prevent which and the former frequent changes in its bed and outlet, great expense is incurred maintaining artificial embankments.

Hy'acinth (1) A genus (*Hyacinthus*) of lilies with corolla-like, bell-shaped, six-cleft perianth, six stamens fixed in the tube of the perianth, and dry capsular fruit. The Oriental hyacinth (*H. orientalis*), one of the chief favorites of florists' flowers, is a native of Asia Minor, Syria, and Persia. It is now naturalized in some parts of the south of Europe. It has broad linear leaves,

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and a scape with a raceme of many flowers pointing in all directions. The flowers in cultivation exhibit great variety of color, chiefly blue, purple, and white. They are very beautiful and very fragrant. The fragrance is strongest about or after 11 o'clock at night. Among cultivated hyacinths are many with double flowers. The hyacinth has been cultivated from a remote period. It was introduced into Europe, probably by the Dutch, about the beginning of the 16th century. The grape-hyacinth is a somewhat different plant of the genus *Muscari*, of which *M. racemosum* is common in gardens. (2) See ZIRCON.

Hyacinthe, Père, pār ē-ä-sänt. See LOYSON, CHARLES.

Hyænodon, hī-en'ō-dŏn, a genus of primitive carnivorous mammals (creodonts), fossil in the upper Eocene and lower Miocene rocks of Europe and the western United States, of which several species are known by well preserved skeletons. The skull was relatively very large and long, with great canines and strong hyena-like molars, but the brain-cavity was very small. The feet were fully five-toed, had powerful claws, and the animal, which must have somewhat resembled a small, cat-like bear, was partly plantigrade. The remains of *H. cruentus* are numerous in the White River beds of North Dakota.

Hyams, Henry Michael, American lawyer and politician: b. Charleston, S. C., 1805; d. 1875. In 1828 he went to New Orleans, studied law, and after 15 years of country practice in Alexandria, La., resumed his residence in New Orleans, where his investments in landed property made him wealthy. In politics he was originally an old line Whig, but on the outbreak of Know-Nothingism joined the Democratic party. In 1855 he was elected to the State Senate; in 1859 he was chosen lieutenant-governor; the first Israelite to hold such an honor in the United States. He was devoted to the Southern cause, sent his sons to fight in the Confederate army, and after the war found his large fortune vanished. Prepared to begin life anew, he resumed the practice of law until his death.

Hyatt, Alpheus, American naturalist: b. Washington 5 April 1838; d. Cambridge, Mass., 15 Jan. 1902. He was graduated from the Lawrence Scientific School at Harvard in 1862, then entered the army and served during the war in the 47th Massachusetts regiment, being promoted to the rank of captain. After leaving the army, he resumed his studies under the instruction of Agassiz, and later studied abroad. In 1867 he went to Salem, where he was one of the founders of the Peabody Academy of Sciences and one of the curators of the Essex Institute. In 1870 he was made custodian of the collections of the Boston Society of Natural History, becoming curator in 1881. He was also connected with Boston University, was manager of the Teacher's School of Science, had charge of a laboratory of natural history founded by the Women's Educational Society at Annisquam, and was for several years professor of zoology and palæontology at the Massachusetts Institute of Technology. In his later life he had charge of invertebrate fossils in the Museum of Comparative Zoology at Cambridge. He was a member of the American Academy of Arts and Sciences, of the National Academy of Sciences, and of the American Society of Naturalists. He was one of the founders of the last mentioned society and its first president (1883); he was also one of the founders and editors of the 'American Naturalist.' His most distinctive work was the investigation of the development of the fossil *Cephalopoda* and of the fossil and semi-fossil *Planorbis* on Steinheim Lake, Germany, from which investigations he deduced laws of growth very important to the evolutionary theory. His works include 'Observations on Polyzoa' (1866); 'Fossil Cephalopods of the Museum of Comparative Zoology' (1872); 'Revision of North American Poriferæ' (1875–7), the only work on North American commercial sponges; 'Genesis of Tertiary Species of Planorbis at Steinheim' (1880); 'Genera of Fossil Cephalopoda' (1883); 'Larval Theory of the Origin of Cellular Tissue' (1884); 'Genesis of the Aretidæ' (1889); 'Bioplastology and the Related Branches of Biologic Research' (1893); 'Phylogeny of an Acquired Characteristic' (1894); 'Cephalopoda' (1900).

Hy'att, John Wesley, American inventor: b. Starkey, N. Y., 28 Nov. 1837. After an education in the common schools he became a printer and then an inventor. He perfected a composition billiard ball (1865), secured a "bonsilene" compound (1878), a water-purifying system, and a method of dissolving pyroxylin. He has secured about 200 patents for his inventions.

Hybridity, the crossing of two individuals of distinct species. The result of the intercrossing of species is a hybrid, for example, the mule, which is the result of breeding the horse with the ass. As the mule is invariably sterile, the infertility has always been supposed to be a test of species. But this is not an invariable rule, as not a few so-called "good" species have been crossed with one another. It may be set down as a general proposition that the difficulty of crossing increases the more distant the systematic relationship of the species experimented with. Also these difficulties are, says Hertwig, by no means directly proportional to the systematic divergence of the species.

Nature tends to keep species separate, in the higher animals, as well as among insects, etc.; mating is usually prevented by the structure of the parts concerned with sexual union; also the principle of preferential mating comes into play among mammals as well as insects, as often between males and females, even of closely allied species, or varieties. When there is no structural differences there may exist an aversion which prevents any union of the sexes.

Artificial Hybridization.— Many experiments have recently been made on the lower marine animals in which the eggs are fertilized in the sea without sexual union, by placing the eggs of starfish and sea-urchins, etc., in a watch-glass and adding the sperm of the males, thus securing artificial fertilization. In this way hybrids have been obtained from species belonging to quite different genera, while it has been found that in some cases closely related species will not cross. For example, among the sea-urchins the spermatozoa of *Strongylocentrotus lividus* readily fertilize the eggs of a species of Echinus,

but only rarely those of the more closely allied *Sphærechinus granularis*. Hybrids have been obtained from different genera of fishes, as those between the salmon and brown trout. It appears that salmon eggs have been fertilized by trout sperm, but not trout eggs by salmon sperm. According to Hertwig eggs have been fertilized by sperm belonging to species of different families, orders, and possibly classes. For example, the eggs of a flounder (*Pleuronectes platessa*) and of *Labrus rupestris* have been fertilized by the sperm of the cod; frog's eggs (*Rana arvalis*) by sperm of a triton, and even, it is said, the eggs of a starfish by milt from a sea-urchin; in such cases, however, the hybrids die during or at the close of segmentation of the yolk.

Fertility of Hybrids.— While the mule and many other hybrids are sterile, there are some known exceptions. Hybrids of hares and rabbits have continued fruitful for generations, and also hybrids obtained from the wild buck and she-goat, from the Chinese goose (*Anser cygnoides*) and the common goose (*A. domesticus*); from *Salmo salvelinus* and *S. fontinalis; Cyprinus carpio* and *Carassius vulgaris*, as well as between the two silkworm moths, *Philosamia cynthia* and *P. ricini*, the Arrhindy worm. In this country Caton has hybridized the common Virginian deer with the Ceylon deer and the Acapulco deer, and states that the hybrids seemed perfectly healthy and prolific. Ewart states that the Indian buffalo and the American bison produce fertile hybrids with the European wild ox.

In the human species it is a well-established fact that marriages between remote varieties or races tend to sterility, while crossing between allied races are fertile, and such unions are most beneficial. Thus the most mixed white races are the most fertile and vigorous. Ewart thinks that as there are no definite limits between species and varieties, there can be "no fundamental difference between a hybrid and a cross, nor yet any *a priori* reason why any given hybrid should be sterile, or any given cross fertile." He also states that sterility has in some cases been slowly acquired, in others abruptly, but how it has been acquired is not known.

As the result of breeding thousands of moths Standfuss states that in no case observed by him has the female of a true hybrid been shown to be fertile. On the other hand, the occurrence of undoubted cases of fertility in male hybrids has been proved by crossing the male hybrids with the females of both parent species.

Ewart's Experiments with crossing the Zebra and Horse, and the Wild Ass and Horse. — A Burchell's zebra stallion, "Matopo," became the father of nine zebra hybrids by mares of various sizes and breeds. The hybrids exhibited a curious blending of characters, which seemed to have been derived partly from their actual and partly from their remote ancestors; some of the hybrids strongly suggest their zebra sire, others their respective dams, "but even the most zebra-like in form are utterly unlike their sire in their markings."

According to 'Nature,' August 1903, he succeeded in 1902 in securing a male wild ass (kiang) from Central Asia and a couple of Mongolian pony mares, one a yellow dun and the other a chestnut. The wild ass was mated with the dun Mongol mare, a brownish-yellow Exmoor pony, and a bay Shetland-Welsh pony. The kiang hybrid in its long legs, slender joints and speed took after its kiang parent. The mane and tail "are exactly what one would expect in a mule." This kiang hybrid also differs from the wild horse (Przewalsky's horse) in not neighing like a horse. The result is to prove that the wild horse is not a kiang-pony male, but a "good" species. Also in accordance with Mendel's law (see under HEREDITY) the kiang proved to be dominant, the Exmoor pony recessive.

Hybridity in Plants.— The method of hybridizing hermaphroditic flowers is to cut away their stamens before they are ripe, and then enclose the flower in a paper bag. After the stigma has ripened the pollen is placed on it, the bag is again tied over the flower and not removed until the seed begins to form. Great advantages and improvements have resulted from hybridizing plants, chief among which are many new varieties of cultivated plants, increased size and vigor, hardiness, or adaptation to warmer climates, and increased resistance to disease, as well as increase in odor of flowers and the quality and flavor of fruits.

Thus far the cause of infertility in animals is unknown, but botanists attribute the frequent sterility of plants to the imperfect formation of the pollen. Standfuss' experiments with moths agree with Focke's statement as to the great variability of the offspring resulting from the crossing of a plant hybrid with one of the parent species. In plants, as discovered by Mendel, the proportion of the pure races is constantly increasing in the successive generations descended from a hybrid. Malformations and sports are much more frequent, especially in the floral organs in hybrids, than in individuals of a pure descent. Double flowers appear to be formed especially easily in hybrids. Recent experiments and results in the study of hybridity show how intimately the subject bears on heredity (q.v.) and the origin of species.

Consult: Bailey, 'Plant Breeding' (New York 1896); De Vries, 'Die Mutationstheorie' (Leipsic 1901–3); Bateson, 'Mendel's Principles of Heredity' (Cambridge, England, 1902) contains a bibliography of the subject.

ALPHEUS S. PACKARD,
Late Professor of Zoology, Brown University.

Hydatid, hī'dā-tĭd. See BLADDERWORM; TAPEWORM.

Hyde, Edward, British colonial governor in America: b. England about 1650; d. North Carolina 8 Aug. 1712. In 1710 he arrived as governor of the Albemarle district of North Carolina province. The provincial governor, by whom he was to be commissioned, was dead, and Thomas Carey, formerly a deputy-governor, had undertaken an armed insurrection. Hyde, at the request of the better class of the population, took office as governor, and, assisted by Spottswood, governor of Virginia, crushed the revolt. Not long after massacres by the North Carolina Indians compelled him to seek aid from Virginia and South Carolina.

Hyde, Edward Wyllys, American mathematician: b. Saginaw, Mich., 17 Oct. 1843. He was graduated from the civil engineering school

of Cornell University in 1872, was instructor in civil engineering there in 1871–3, assistant professor of mathematics in the University of Cincinnati in 1875–8, and professor from 1878. Besides extensive contributions to mathematical journals, he wrote: 'Skew Arches' (1875); 'Directional Calculus' (1890); 'A Portion of Higher Mathematics' (1896).

Hyde, William Dewitt, American college president: b. Winchendon, Mass., 23 Sept. 1858. He was graduated from Phillips Exeter Academy in 1875, from Harvard in 1879, and studied theology at Union and Andover. After completing his theological studies he was pastor for a time at Paterson, N. J. In 1885 he became president of Bowdoin College; at that time he was the youngest college president in the United States, and was not widely known. He has since won a high reputation as a scholar and an able executive, the college having grown largely in numbers and resources during his administration. He has written 'Practical Ethics' (1892); 'Social Theology' (1895); 'Practical Idealism' (1897); 'The Evolution of a College Student' (1898); 'God's Education of Man' (1899); 'The Cult of Optimism' (1900).

Hyde Park, London, a park in the West End, adjoining Kensington Gardens. It derived its name from having been the manor of the Hyde belonging to the Abbey of Westminster, and contains nearly 400 acres. It was opened to the public shortly after the Restoration in 1660, and abounds with fine trees and pleasing scenery. The sheet of water called the Serpentine River was made between 1730 and 1733 by order of Queen Caroline. It is much frequented in summer for bathing, and during frosts for skating. Other attractive features of the park are the fashionable drive, bridle path, and promenade of Rotten Row, the Ladies' Mile, and Marble Arch.

Hyde Park, Mass., town in Norfolk County; on the Neponset River, and on the New York, N. H. & H. railroad; about four miles southeast of Boston. The town contains four small villages. It was incorporated as a town in 1868. The chief manufactures are rubber goods, paper, morocco, cotton and woolen goods, curled hair, chemicals, dyestuffs, looms, and machinery. It is a residential suburb for many of the Boston business men. It has good schools and a free library which contains about 14,200 volumes. Pop. (1890) 10,193; (1900) 13,244.

Hyde Park, Vt., village in the town of Hyde Park; county-seat of Lamoille County; on the Lamoille River and on the Boston & M. railroad; about 31 miles northeast of Burlington and 23 miles north of Montpelier. The stone-quarries nearby are a source of industrial wealth. The manufactures are flour, lumber, dairy products, and leather. Pop. village (1900) town, 1,472.

Hyder Ali, hī'dėr ä'lē, Indian Mohammedan prince: b. Bangalore about 1728; d. Chittore, 7 Dec. 1782. Having deposed Kandih Rao, he was chosen rajah of Mysore in 1762, and he so greatly extended his dominions, that in 1766 they contained 84,000 square miles, and afforded an immense revenue. His reign was passed in wars with the English and with the Mahrattas. A treaty which he made with the East India Company in 1769, was violated in 1780, and, forming an alliance with the Mahrattas, he obtained the services of French officers, and took Arcot on the 31st October of the same year. He was defeated by Sir Eyre Coote, 1 June 1781. He was succeeded by his son Tippoo Saib (q.v.).

Hyderabad, hī-dėr-ạ-bäd', or **Haidarabad,** hī-dạ-rạ-bäd', India. (1) One of the largest native states occupying the greater part of the Deccan plateau of southern India, in possession of the Nizam, a Mohammedan prince, and frequently called the NIZAM'S DOMINIONS. It is bounded north by Berar, northeast by the central provinces, southeast by Madras, and west by Bombay. Area, 82,698 square miles; pop. (1901) 11,141,142. The chief rivers are the Godavery in the north and the Kistnah in the south. The soil generally is fertile but poorly cultivated; the principal crops are rice, wheat, maize, sugarcane, tobacco, cotton, and fruits. Indigo is manufactured, and the forests yield valuable timber; there are coal and iron deposits as yet little exploited, and diamonds and other gems are found. The ruler belongs to the dynasty founded by Asaf Jah, a distinguished soldier, whom the Emperor Aurungzebe made viceroy of the Deccan in 1713 with the title of Nizam or Regulator.

(2) HYDERABAD, the capital, is on the Musi River, at an elevation of 1,672 feet above the sea, about 400 miles in a direct line southeast of Bombay, with which it is connected by rail. It is wall-girt, and its chief buildings are the extensive nondescript palace of the Nizam, the handsome British Residency, the Charshinar, or Four Minarets, built about 1590 as a Mohammedan college, but now used for warehouses; and the Jumma Musjid or cathedral mosque, a reproduction of that at Mecca. Pop. (1901) 448,466. (3) HYDERABAD, the capital of a district of Sindh, British India, on the east bank of the Indus, is a well fortified town connected by rail with Karachi, 105 miles to the southwest. Pop. (1901) 69,378.

Hy'dra, a minute fresh-water polyp, living on the stems and underside of submerged leaves. The body is a club or vase-shaped sac, the mouth at the upper end surrounded by a crown of from five to eight long tentacles armed with lasso or nettling cells buried in the skin. The hydra feeds on minute crustacea, etc., which become paralyzed when swimming in contact with the arms of the hydra, thus being easily drawn by the creature into its stomach. The body is very retractile, and the hydra can slowly move from one place to another, by detaching the end of the body. The sexual cells are, during the reproduction season, developed in the skin, appearing as circular swellings, one (male) just below the tentacles, the other mass, corresponding to the ovary of higher animals, farther down the body. The hydra is famous from its power of regenerating parts of its body. Trembly in 1744 experimented upon this animal; he cut them in two, also into slices, and found that each bit became a new hydra, finally he turned one inside out, the stomach-lining becoming the skin, this experiment having recently been successfully repeated. This is due

to the lack of differentiation in the tissues and organs of the body, there being no distinct nervous, or circulatory system, the hydra being the most generalized member of its class, except the Protohydra, which has no tentacles.

Hydrangea, hī-drăn'jē-a, a genus of shrubby plants of the order *Saxifragaceæ*, with about 30 species indigenous to eastern Asia and temperate America. They have large simple leaves and very large cymes of flowers, the outer ones being infertile. The *H. vulgaris* grows on the Alleghanies, and in other parts of the United States. *H. nivea*, a more ornamental shrub, is most abundant in the region of the southern Alleghanies, but is found as far north as Pennsylvania. The *H. quercifolia*, distinguished by its lobate leaves, inhabits the country bordering on the Gulf of Mexico. The best-known species is *H. hortensis*, the Japan rose. The fruit is a multilocular capsule.

Hy'drants. See VALVES AND HYDRANTS.

Hydras'tis, an herb, the rhizome and rootlets of which are used as a bitter stomachic tonic and a tonic to the uterus in various diseases. In poisonous doses it stops the heart-action.

Hy'drate, in chemistry, a compound containing one or more molecules of the radical "hydroxyl" (OH). In these compounds, the water may be considered as playing the part of an acid, and the compounds themselves are entirely analogous to salts. Thus water, H_2O, combines with sodium oxid, Na_2O, according to the equation $Na_2O + H_2O = 2NaOH$; the reaction being accompanied by the liberation of considerable heat. The sodium hydrate (NaOH) that is produced is quite a different substance from the simple oxid, Na_2O, and it cannot be resolved into Na_2O and water by the action of heat alone. In organic chemistry hydrates are met with very frequently. The large and exceedingly important class of substances collectively known as the alcohols, for example, are hydrates of organic radicals. (See ALCOHOL.)

The word "hydrate" is also used in a less definite manner, to signify any compound which contains water, or from which water can be expelled by the action of heat. Thus salts or minerals which are associated with water of crystallization are said to be "hydrated." When an aqueous solution of a salt, containing an excess of the salt in the free state, is cooled until it freezes, a mechanical mixture of ice and of the precipitated salt is obtained, which is known as a "cryohydrate," although it is not a definite chemical compound.

Hydraulic (hī-drâ'lĭc) **Cement.** See CEMENT.

Hydraulic Crane. See HOISTING APPARATUS.

Hydraulic Engine, or Hydraulic Motor, an engine or motor driven by water under pressure. The water is admitted at a high pressure at the beginning of the stroke, and exhausted at a low pressure at the end of the stroke, thus giving a reciprocating motion to the plunger. The velocity of the piston has to be kept low to avoid injurious shocks in suddenly bringing the column of water to rest. Working under greater pressure than steam-engines — 700 pounds to the square inch is not an uncommon pressure — the hydraulic pressure engine can be built much smaller than an equivalent steam-engine. An additional advantage of the hydraulic engine for intermittent work is the comparative ease with which it may be started or stopped; hence it is commonly used for capstans, winches, cranes, and drawbridges. Single action in the hydraulic engine avoids shock at dead centres; and the three-cylinder single-acting form is in common use, since the three cranks make the turning force uniform and make it possible to start the engine from any position. Another form, of very recent development, is the turbine (q.v.).

Hydraulic Engineering, that branch of civil engineering which deals with the application to the use and convenience of man of the natural laws governing liquids. A liquid is a substance appreciable to the senses of sight and touch, and the particles composing which are incompressible and offer no resistance to interchange of position from any external force applied to them. The typical liquid is water, and the generic term hydraulics, used to denote the science and practice of handling liquids, is derived from a Greek word which means "pertaining to water." There are three distinct sets of laws or principles of science which have to be considered: hydrostatics, which relates to liquids at rest; hydraulics, which relates to liquids in motion; and hydrodynamics or hydromechanics, which relates to the mechanical effects produced upon other substances by liquids when acted upon by external forces.

The science of hydraulics is entirely modern. There is no evidence, either traditional or documentary, that the principles governing the action of liquids either at rest or in motion were studied and formulated at all prior to the days of Archimedes, 2,200 years ago. A few of the facts of both hydrostatics and hydraulics were established experimentally, so that aqueducts to convey water long distances were built by the Romans, and possibly before them by the Phœnicians and the Greeks; but no record remains of any elucidation of principles or formulation of laws. After the destruction of Rome in 475 A.D. even what had been known seems to have been lost for more than 1,000 years. As late as 1630 Galileo said that the laws governing the motions of the stars were better understood than those controlling the movement of water on the earth.

Hydrostatics.— It was Galileo who discovered and formulated the important law of hydrostatics that the pressure exerted by a column of fluid on any square unit of the surface which confines it is equal to the weight of a column of one unit square and of the height of the surface of the liquid above the point at which the pressure is measured, no matter whether the horizontal area of the column at that point is greater or less than at other points in its height. If the confining walls of the column are horizontal at any point, or if they are inclined to the perpendicular, the pressure of the liquid at that point is the same, whether upward or downward, as it is laterally against a vertical wall, and the wall at that point must be of such thickness that it will resist that pressure.

Where the pressure is upward the resisting force of the wall is increased by its own weight, and where the pressure is downward the resisting force is diminished by the weight of the wall itself. It is essential therefore to the stability of a wall which is surrounded by a liquid mass that the adjacent liquid should be excluded from passing under the wall so as to permit of an upward pressure which would tend to lift the wall from its base.

In all mechanical problems there are three units of comparison needed: the units of time, of distance, and of weight. The unit of time in modern science is the second, or $\frac{1}{86400}$ part of the average day. The unit of distance which is generally used in England and America is the foot, which is subdivided into twelfths, called inches, or into thousandths, while the unit of weight is the pound, which is arbitrarily fixed by law. In France and Germany the unit of distance is the metre, which is supposed to be one ten-millionth part of the distance from the pole to the equator, and is 3.28 feet long, and is subdivided into thousandths, while the unit of weight is the gram or cubic centimetre, which is the $\frac{1}{1000000}$ part of the weight of a cubic metre of pure water. Efforts are making by scientists to secure the universal adoption of the metric system of measures and weights, but in the English-speaking countries the foot and the pound are the only standards generally used and understood. In hydraulic science the basic hydrostatic facts are that a cubic foot of pure water weighs 62.417 pounds, and that to exert a pressure of one pound on every square inch of surface a column of water must be 2.307 feet high.

Hydraulics.— The instant that an orifice is made in the barrier confining a volume of liquid the particles of the liquid begin to move in the direction of the orifice. The theoretical velocity with which they issue from the orifice was discovered in 1644 by Torricelli, a pupil of Galileo, to be equal to that acquired by a cubic unit of the liquid in falling through the height between the surface of the liquid and the orifice. It was not until 1738 that Bernoulli formulated the fundamental expression for the acceleration of gravity, $v = \sqrt{2gh}$, in which v represents the speed per second of time, h represents the distance of the orifice below the surface of the liquid, and g is a quantity determined by experiment to be the velocity acquired by any body in falling freely in a vacuum, from a state of rest, in one second of time. Taking the foot as the unit of distance, $g = 32.16$ and $\sqrt{2g} = 8.020$, while if the metre is the unit, $g = 9.80$ and $\sqrt{2g} = 4.427$.

The students of hydraulic problems soon discovered that the conditions under which the movements of fluid take place modify materially the theoretical results obtained from the formulæ based on the laws of gravitation only. For 260 years they have been striving by a combination of reasoning and experimentation to formulate the laws which govern the movements of water under varying conditions of form and character of material composing the enclosing channels in which the movements occur. The value of v, as found to exist in practice, is only a fractional part of the theoretical value, and is designated by the expression $v = c\sqrt{2gh}$, in which c is a numerical coefficient which varies with the form of the orifice or channel through which the water passes, and with the character of the material through which the orifice is made. The reason of this is that the particles of the liquid which are in contact with the restraining solid material are retarded in their fall by the solid, and they in turn retard the next adjacent particles of fluid, the amount of retardation decreasing as the distance from the immovable solid increases. This retarding effect varies also with the roughness of the limiting solid, and with the velocity at which the initial movement, due entirely to the force of gravity, takes place. The quantity of water discharged is equal to the product of the velocity by the area of the orifice or $q = ac\sqrt{2gh}$. The value of c under the most favorable conditions has been found from numerous carefully conducted experiments to be about 0.60, or in other words, only about 60 per cent of the amount of water which the theoretical calculation of the velocity due to the head indicates as possible to be passed through an orifice in the side or bottom of a vessel or reservoir containing a mass of water, can be actually so passed. After passing the orifice of entry to a long channel, a new set of conditions is encountered in conveying water for long distances, as in a pipe or open canal. Gravity is the impelling force as before, and to ensure flow there must be a difference of elevation between the extremities of the channel, but the retarding forces are numerous, consisting of variations in the slope of the channel, in the proportion which the length of the wetted perimeter of the channel bears to the area of the waterway, and in the irregularity of the surface over which the water flows.

The fundamental formula for the velocity of the flow in channels of all kinds which is now accepted was suggested by Chézy in 1775 and is

$$v = c\sqrt{rs}$$

in which v represents the mean velocity of the fluid, r represents the hydraulic radius, as it is termed, or the area of waterway divided by the length of the wetted boundary of the channel, and s represents the slope of the surface, or the difference of elevation of the two ends of any section of channel, divided by the length of the section. The value of c is determined by experiments on the discharge of channels of different forms, materials, and dimensions. It is purely experimental. In the last 100 years numerous carefully conducted series of observations have been made by hydraulicians with the object of determining an exact mathematical expression for this coefficient under different conditions. The formula which so far seems to approach most nearly to the obtaining of a definite result is that proposed by Kutter, a German scientist, about 1868, in which the dominant element is a variable quantity designated as n, the value of which depends solely on the degree of irregularity in the wet surface bounding the cross section of the channel. In applying this formula to any channel the engineer must assume that value for n which has been determined by experiment to belong to a channel most nearly approaching in roughness the one under consideration, and from this he will be able to deduce with a very con-

siderable degree of accuracy the value of *c*, and use this to determine the velocity and discharge.

Hydrodynamics or Hydromechanics.— These are terms applied to the science which treats of the dynamic effect produced upon other substances by the arrest of the movement of fluids coming in contact with them. A stationary column of water exerts a pressure only; a moving column exerts a dynamic pressure proportional to the velocity with which the mass is moving. If an obstacle is interposed to water flowing in a channel of any kind, the force exerted by the water in removing that obstacle can be utilized in such a way as to produce a mechanical energy or work. The simplest form of this is the undershot wheel, where the pressure of the water flowing in a stream causes vanes or paddles attached to a shaft to revolve the shaft, and from this, by mechanical appliances, the circular motion can be directly utilized to exert energy either by revolving or reciprocating movement of machines. The breast-wheel and the overshot wheel utilize the power generated by a fall or head of water of from one half to two thirds of the diameter of the wheel. The turbine wheel invented in France by Fourneyron in 1833 revolutionized water-power engineering, utilizing as it does nearly the entire energy of any great head or fall of water by discharging the fluid from a pipe against revolving vanes so shaped as to afford the greatest resistance to the attacking current and the least to the discharging current. When the impulse of movement of machines. When the impulse of the moving liquid, which is that due to the product of its weight by its velocity, is at right angles to the interposing surface, it is equal to double the pressure exerted by the fluid in a state of rest. As the angle between the current and surface becomes oblique the pressure diminishes. The same rule holds good with reference to submerged surfaces exposed to the impact of waves and currents in deep water, so that the hydrodynamic forces present to the naval architect, as well as to the hydraulic engineer, innumerable problems delicate and difficult of solution.

Hydraulic Engineering.— The improvement of natural watercourses on the face of the earth is the most ancient and the most extensive of the works which have called for the exercise of hydraulic engineering. The remains of works for restraining the flood-waters of rivers, antedating all historical records, have been discovered in Egypt and China. In countries where the rainfall is so distributed throughout the year that alternate periods of extreme wetness and drought of long continuance occur, the retention of the excess of water in the wet season and its gradual delivery for irrigation purposes during the season of drought was extensively carried on at an early date. In Egypt, 2,320 years before the Christian era, Lake Mœris was constructed as a storage reservoir for retaining the waters of the Nile, and the prosperity of that country has ever since depended upon the maintenance and progressive improvement of its system of irrigation. The earlier works, while remarkable for their extent and magnitude, were not characterized by any particular skill in design or economy in construction. During the latter part of the 19th century and since the beginning of the present, under the control of French engineers, some very fine examples of dams and irrigation canals have been constructed. The Assuan dam is 90 feet high at the deepest point of the valley it crosses; 6,400 feet long, of granite, founded on solid rock; and it impounds water for the irrigation of 2,500 square miles of land 350 miles farther down the stream, where another dam, 48 feet high and 3,930 feet long, diverts the water on to the lands to be benefited.

In India, from very early ages, irrigation has been practised on an extensive scale, and enormous reservoirs were constructed for the storage of water at least as far back as 500 B.C. There are about 90,000 such reservoirs or their remains which were constructed before the British occupation of India, and 2,000 were built by English engineers in the last half of the 19th century. In Italy about 4,000,000 acres of land are under irrigation, and it is to the Italian engineers of the 18th century that hydraulic engineering is largely indebted for the elucidation of principles and the application of the same to practice so as to produce the greatest efficiency at the least expense.

For the successful conduct of irrigation works there is needed not only a knowledge of the laws of hydraulics, but also a thorough study of the meteorological conditions which have prevailed in the region under consideration for a long series of years, and likewise of the topography and geology of the region.

In the United States the importance of this has been fully recognized only within the last 20 years; but during that period the general government has devoted a good deal of attention to the subject, and has caused surveys, both topographical and geological, to be made of the arid region lying west of the 100th meridian of longitude; while a series of measurements of the rainfall and the run-off of the streams is being instituted, which will furnish the engineer with data necessary to an intelligent designing of irrigation works. This will undoubtedly prove of great benefit, inasmuch as not more than 7 per cent of the 70,000,000 acres in the United States susceptible and in need of irrigation are now supplied with it. In the works so far constructed are seen numerous efforts at improvement in design and methods of construction, some of which have not yet stood the test of time long enough to determine whether they will be effective. The careful observations which have been made and are still being made have resulted in a decided advance in knowledge of hydraulic principles.

In passing to the consideration of the next oldest class of hydraulic works, that for the regulation of rivers to protect and reclaim the riparian lands, the questions to be considered by the hydraulic engineer are materially changed. Large storage reservoirs are needed as in irrigation projects, but their capacity and arrangement with reference to the fluctuations of the natural flow of the stream must be very different. The channels, too, for the conveyance of the water are differently proportioned, and are likely to be required to be constructed of different material. In irrigation canals a low velocity of flow is desirable to avoid abrasions of the banks, and the sizes of the channel are proportioned to convey definite quantities of water steadily. In river regulation the channels must be designed

to carry constantly varying quantities of water at different speeds of current, and the banks must be fortified against injury from sudden fluctuations of level in the water surface and from abrasion by floating material or accretion by deposit. The construction of levees or embankments along the banks of a river and parallel to its current is the earliest and simplest of the methods of river improvement; but it is only within the last 200 years that this has been reduced to a science, and the most effective and economical methods of design and construction formulated. If the stream improved is of sufficient size to be navigable, the conditions of the problem are again changed. The course of the channel in places may have to be altered to avoid rapids of too steep descent for passage of boats, and a sufficient depth of water must be maintained at all times and in all places for boats of definite dimensions and draft. Where such artificial channels are necessary it is important that they should be so proportioned that the passage of the largest boat at the maximum permissible speed should not create a wave which would injure the banks or retard the progress of the boat.

River improvements of this class led to the construction of entirely new artificial channels or canals connecting different navigable streams or bodies of water. There are some very ancient examples of such structures. The Royal Canal of Babylon was built 650 B.C., and about 102 B.C. the Fossa Mariana, connecting the River Rhone and the Mediterranean Sea, was built. In the 8th century was built the Grand Canal of China, about 650 miles long, utilizing several canalized rivers on its way, and thus creating an inland navigation system of 1,000 miles. On this canal there were several inclined planes, up and down which loaded boats were passed from one level to another. Locks were first invented in 1439 by Philip Visconti, an Italian engineer. Prior to this time there was but one method of overcoming differences of elevation in navigable channels which had been constructed so as to afford long and nearly level stretches on which boats could pass in either direction, with approximately the same motive power, and with sudden changes of elevation at the ends of such levels. That method was the transhipment of cargoes, the Chinese method of inclined planes not being economical in the then state of the mechanic arts. Between 1750 and 1830, however, a number of inclined planes were built in England and America in cases where the lift of locks was so great as to necessitate a great wastage of water and loss of time. Since 1876 several vertical lifts have been constructed where very great heights had to be overcome, compressed air being the power medium. The invention of locks gave a great impetus to canal construction, and all over Europe large systems of internal navigation were constructed. Indeed the improvement of river channels was neglected for a long time, and canals were built parallel to rivers, and the opinion was expressed by an eminent English engineer, near the end of the 18th century, that «rivers were created for the purpose of feeding canals.»

During the first half of the 19th century about 3,000 miles of canals were constructed in the United States. Much experience in hydraulic construction was thus had, and many improvements in methods of construction were introduced; but there cannot be said to have been much advance in hydraulic science in this direction. In the matter of river improvement, however, the work done by the United States government on the Mississippi, and the records kept of the results attained, were of great scientific value, and enabled the Mississippi River Commission of 1879 to formulate the principles which should be observed in the regulation of large rivers of that class. Both in Europe and America during the last 30 years there has been great advance made in careful observation of the phenomena of rainfall, evaporation, seepage, and infiltration as affecting the run-off of rivers and the fluctuations in their flow at different seasons of the year and for periods of years. The action of flowing water on different materials and modes of construction has been also observed more systematically than ever before, with the result of a decided advance in hydraulic science and its practical application to the economical and effective improvement of river regulation in the interest of water transportation.

The question of the regulation of smaller non-navigable streams, so as to prevent injury to the territory along them from escaping floods, has of late been receiving attention. It is considered by some engineers that it will be practicable, by the construction of large storage reservoirs with restricted outlets, so to restrain the discharge at points along the course of a stream that sudden and great floods may be prevented. Experience has not yet proved the practicability of such an automatic regulation of the flow, but there is little question that before long efforts will be made to accomplish this object, or at any rate to acquire data from which a practicable scheme may be devised.

It is in the application of hydraulic science to the comfort and convenience of the individual rather than of the community that the most striking progress has been made during the last few generations. The fostering of agriculture and the improvement of means of transportation of heavy freights are of benefit to the public at large, but the furnishing of pure and wholesome water for household consumption in large quantities and at reasonable cost affects the health, the comfort, and the general condition of the individual directly. There are remains of structures which were evidently designed to supply water to large communities in the oldest partly civilized nations, but these are of crude design and display evidences of lack of knowledge of hydraulic principles. The Romans, about 500 B.C., built numerous aqueducts to convey water from distant sources, not only to the Imperial City itself, but also to the larger cities in their provinces; but for several hundred years after the fall of the Roman empire there did not appear to have been any works built for supplying water to communities. It was not until 1582 that London was furnished with water by Peter Morrys, who pumped it from the Thames and supplied a portion of the city. The grant under which he did so is still held by his successors.

There has been steady progress in the art of supplying water to towns during the last 300 years and now the questions which the

hydraulic engineer is required to consider in the design and construction of any waterworks embrace a great variety of subjects. It is necessary to consider:

1. The quantity of water likely to be needed. There is not yet any consensus of opinion among engineers on this point, the estimates varying from 100 to 150 gallons per day for each resident of the district to be supplied, at the expiration of 20 years from the inauguration of the supply. The prospective population is estimated from the records of the past growth of the district and the growth of districts of similar character of occupation.

2. The possible sources whence the required quantity of water can be obtained.

3. The character of the water obtainable from each source, as regards its chemical constituents, in order to judge of its economical as well as its sanitary value. It sometimes happens that a water otherwise acceptable is so charged with certain chemicals that the amount of soap required for washing with it is greatly in excess of that required by another water more difficult to procure, so much so that the cost to individual consumers for its constant use will be greater than the cost to the community of the introduction of the other supply.

4. The character of the water biologically; the number and nature of the organisms which are found in it. This is most important from the sanitary point of view. The identification of certain organisms as pathogenic or disease-producing is of recent origin; it marks a decided advance in sanitary science and is of great interest to the hydraulic engineer, since it is found that the removal of the injurious organisms from water can be effected by filtration, and it is the engineer's function to design or construct works for filtration through sand or other material which experiment proves to be adapted to the purpose.

5. The quantity of water obtainable from each source which appears generally suitable, the area of the watershed, the amount of annual rainfall upon it, the distribution of the rainfall through the year, the geological and topographical features of the surface, the range of temperature of the air, and the amount of evaporation must all be taken into consideration. Whenever the minimum rate of daily run-off from the watershed exceeds the maximum daily consumption to be provided for, reservoirs must be constructed to retain the stream-water in times of excessive flow, and deliver the excess gradually as required. The location of such reservoirs requires a thorough acquaintance with the topography of the district, and their construction demands a high order of both theoretic and practical acquaintance with the action of water on various materials and with the form and method of their collocation. The construction of dams of earth and masonry has been the subject of careful study within the last few years, and the general principles have been pretty well established; but there still remain a number of unsettled problems due largely to the progress of the mechanical arts and the introduction of new modes of construction. Just how far, for instance, combinations of metal and masonry, which assure strength with a reduction in amount of material and cost, can be depended upon for durability under the action of water in motion, can only be learned after the lapse of more time from the introduction of this class of construction.

6. The means of conveying the water from the source to the point where it is to be used. The conditions of this problem are unlike those which are encountered in rivers, or in canals for either irrigation or navigation. A nearly uniform quantity of water must be continuously carried a long distance at as great a velocity as is consistent with safety and economy. It must be protected from loss by evaporation and by leakage of the channels, and protected from pollution on its route. These conditions are best fulfilled by an enclosed conduit or pipe of masonry or metal, with a smooth interior surface, laid on a uniform grade so that there will not be any upward pressure tending to lift the covering of the conduit. The relations between different values of n, which can be obtained by using different classes of material and of construction, and values of c, obtainable by using different grades and alignments, have been for more than 30 years the subject of carefully conducted experiments by scientists, and it is the function of the hydraulic engineer to apply to the special case he has in hand the use of the materials which are available and the mode of construction practicable in the case, in accordance with the latest results of scientific research. Up to the present time the best form and material for large conduits seem to be masonry conduits of horseshoe form, with smoothly plastered interior surface; or steel-plate circular pipes with as few irregularities caused by rivet-heads as possible, laid on uniform grades, which will ensure a velocity of two miles per hour in the water flowing in the conduit.

7. On reaching the point of distribution an entirely different set of conditions is encountered. The water heretofore concentrated in large masses has to be distributed over a wide area in a great number of small pipes in which orifices are opened and shut at irregular intervals of time, these pipes, moreover, being under a great head of water producing a pressure of 50 to 100 pounds per square inch, and consequently a high velocity of efflux from any orifice. The problem to be solved is so to arrange the connections and sizes of these pipes that, under the ordinary conditions of use, the pressure in the pipes will not be materially altered at any time, and a constant supply may be kept up in the entire system. As illustrating the magnitude and complication of the distribution system in a large city, the conditions existing on Manhattan Island alone, in the city of New York, may be cited. There were there, in 1900, an area of 12,576 acres, 682 miles of pipes for the delivery of water, with 130,000 taps or orifices from which water is drawn at irregular intervals. The development of such a system as this involves the exercise of not only theoretical knowledge of the principles governing the flow of water under all conditions, but also a thorough acquaintance with materials of construction and the methods of using them to produce the best results at the least expenditure.

An interesting and important branch of hydraulic engineering is that which deals with larger masses of water than any of those so

far considered. The water of the ocean, when agitated by the winds and by terrestrial forces not thoroughly comprehended as yet, exerts a dynamic force which must sometimes be restrained and sometimes guided so as to produce results in a desired direction. Along the seacoasts of all countries there are places where the conformation of the shore and the nature of the contiguous lands render the creation of harbors desirable, but where the tidal waves and littoral currents come in conflict in such a way as to make the approach from the sea dangerous to vessels. To lessen the destructive effects of the great masses of water in motion, impelled by either the wind or the tidal currents, breakwaters or piers of stone projecting from the shore are built with good results. The massiveness which such structures are required to possess may be judged from the fact that it has been learned that the foundation for a breakwater must extend out to where there is from 18 to 20 feet of water at low tide; that the height of the waves by which it is likely to be assailed may be from 10 to 20 feet; and that the impact of the wave on the opposing structure may be as high as 6,000 pounds to the square foot. In the open sea it is not likely that waves as high as this are formed, or that the force exerted by them is nearly as great, but the problem of the form and resisting power of the hull of ships has to be considered from the standpoint of the dynamic effect of the water which is impelled by the wind and waves against the hull, as well as the resistance offered by the water to the passage of the hull through it.

The problem of the resistance of the water to a vessel passing through it enters into the consideration of the navigation of canals and inland waters as much or possibly even more than it does into ocean navigation. The more rapidly a vessel passes through a small channel, the greater is the work to be done in the displacement of the bulk of water occupied by the hull. The displaced water is prevented from flowing off by the adjacent banks and shallow bottom, and the pressure required to propel the boat is so increased that it is found that a greater velocity than three miles per hour is not economical.

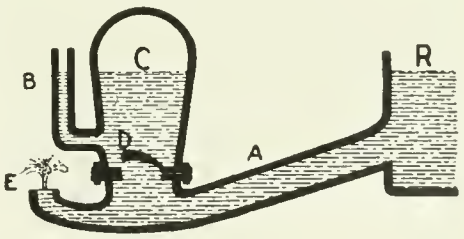
Hydromechanics, as already stated, relates to the mechanical effects which may be produced by utilizing the force exerted by water in motion to generate power. In hydraulic works, distinctively so called, the effort is constantly made to diminish the mechanical effect of the moving water so as to avoid injury to surfaces and substances unprepared to resist it. In hydrodynamic works the effort is made to concentrate all the power obtainable from the moving water and transmit it to machines which do effective work. The difficulty of transmitting the power long distances without great loss has hindered utilization in many cases where a great head of water is available in some out-of-the-way spot, but recent improvements in electrical transmission have made such water-powers available for use, and many developments of hydraulic generation of electricity have been made, while others are now in course of construction. The utilization of Niagara Falls is a prominent instance of work of this class, and the latest installation in progress there is noteworthy for its boldness and promise of economical effectiveness, the head on the turbine wheels being obtained by sinking a vertical shaft on the shore a short distance above the falls and discharging the water through a tunnel run under the bed of the river to the precipice behind the Horseshoe Fall.

In the present state of hydraulic science more attention is being paid than ever before to the obtaining of closely accurate results of experiments conducted by skilled observers, in which the aid of electricity is used to register all phenomena in a manner never possible heretofore. Great as the advances have been during the last 25 or 30 years, equal or greater progress in the elucidation and practical application of principles may be expected within the next quarter of a century.

J. James R. Croes,
Past Pres. Am. Soc. Civ. Eng'rs.

Hydraulic Press. See Hydrostatic Press.

Hydraulic Ram, a machine for raising water, the force being a greater body of water at a lower level. It consists primarily of two pipes, one, A, leading from the reservoir, spring, pond or other source of supply into C, an air-vessel, the opening being by a valve D; and the other pipe, B, leading out of this air-vessel. In the pipe A, or an extension of it is a ball valve E, smaller than the inside of the pipe. This ball valve E is forced shut by the free flow through A; the growing pressure forces D the valve into the air-vessel open; and the water flows into C the air-vessel and, to a less degree because of the smaller diameter of the pipe, into the discharge pipe B. The greater pressure on the air in C counteracts the force of the liquid column from A and the valve D closes. The force of the compressed air in C is then exerted to drive water from the air-vessel into the discharge pipe B. The efficiency of a hydraulic ram is seldom more than two thirds, so that 150 units of water falling 15 feet will lift 15 units only 100 feet, instead of 150 feet, as it theoretically should. The ram was invented in 1797 by Montgolfier and is commonly used where there is no regular waterworks but a plentiful supply of water.



Hydraulics, the branch of mechanics dealing with liquid flow in pipes and channels. The particles of fluids flow over each other with less friction than over solid substances; and as each particle is under the influence of gravitation no quantity of homogeneous fluid having its surface free can be in a state of rest unless every part of the surface is level. When water flows in a current, as in rivers, it is in consequence of the inclination of the channel, but all such motion is affected by the form of the channel and the friction of its sides. Experi-

mental investigation gives various coefficients, whereby the resistance to the flow of water in pipes or channels can be calculated. As water in descending follows the same laws as other falling bodies its motion is accelerated; in rivers, however, the velocity and quantity discharged at different depths is not as the square roots of those depths, the friction against the bottom diminishing the rapidity of the flow. But the law of the proportionality of the velocity of discharge to the square root of the depth applies, however, to the spouting of water through jets. Thus, if a hole be made in the side of a vessel of water, the water at this orifice, which before was only pressed by the simple weight of the perpendicular column above it, will be pressed by the same force as if the water were a solid body descending from the surface to the orifice.

Machines to raise water may be divided into four classes. Machines in which water is lifted in vessels by the application of some mechanical force to them were the earliest hydraulic engines; a type is the Persian wheel, a large vertical wheel, turned by animal power or by running water, and having buckets attached to the rim, and moving in a reservoir of water. The buckets are filled at the bottom and emptied at the top, so that the water is raised a height equal to the diameter of the wheel. The common dredges for rivers and harbors are modifications of this kind of machine. The Archimedian screw, the screw-pump and the bucket-engine or chain-pump are all on the same principle. The chain-pump usually consists of a succession of long links of metal rods revolving like an endless rope over two wheels, one under water. On this chain, between each joint, is fixed a flat piece of wood or metal, usually square, supported and kept in place by the projecting arms of the wheels; the wheel not under water is turned by a winch, which causes the whole chain to move, one side of it passing upwards, while the other side is continually descending in the same direction. The ascending side of the chain is made to pass through a box or pipe, one end of which is immersed in the water, the other end nearly reaching the upper wheel; this box corresponds in shape with the size of the plates, which fit pretty closely and form the pump. The succession of plates passing upward through the trunk forms a succession of cavities which are filled with water and are constantly discharged at the top. This pump will only work in deep water, and cannot drain a reservoir to the bottom; but it has the advantage of not becoming choked with sand or weeds. If the top and bottom wheels of this machine be retained, while the tube or trunk is taken away, and a number of small boxes or buckets be attached to the chain instead of the plates the machine then becomes a bucket-engine, which is only another form of the Persian wheel already described.

In the next class, more commonly called pumps, the water is raised by the pressure of the atmosphere. These act by removing the air from the surface of the water, which may thus be raised to the height of about 32 feet. Whenever it becomes necessary to raise water to greater heights, the third class of machines, or those which act by pressure on the water, are employed. The common suction-pump consists of a hollow cylinder A, of wood or metal, which contains a piston B, stuffed so as to move up or down in the cylinder easily, and yet be air-tight: to this piston there is attached a rod which reaches at least to the top of the cylinder when the piston is at the bottom. In the piston there is a valve C, and at the bottom of the cylinder there is another valve D also rising upwards, which covers the orifice of a tube fixed to the bottom of the cylinder, and reaching to the well from whence the water is to be drawn. This tube is commonly called the suction-tube, and the cylinder the body of the pump. When the piston is at the bottom of the cylinder there can be no air, or very little between it and the valve D. But the air in the cylinder being very much rarefied, the pressure of the valve D on the water at the bottom will be much less than that of the external atmosphere on the surface of the water in the well; therefore the water will be pressed up the pump

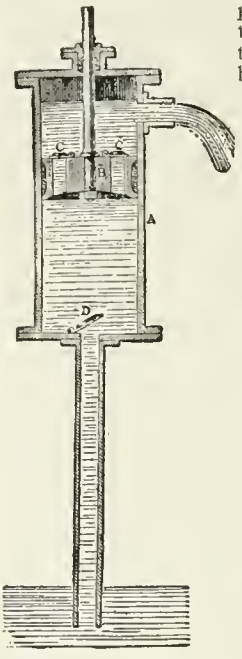


Fig. 1.—Suction Pump.

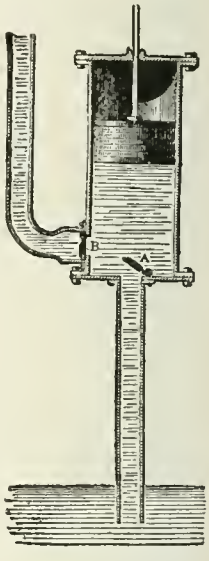


Fig. 2.—Forcing Pump.

to a height not exceeding 32 feet. As the valves shut downward, the water is prevented from returning. The quantity of water discharged in a given time is determined by considering that at each stroke of the piston a quantity is discharged equal to a cylinder whose base is the area of a cross section of the body of the pump, and height the play of the piston. Thus if the diameter of the cylinder of the pump be 4 inches, and the play of the piston 3 feet, then by mensuration we have to find the content of a cylinder 4 inches diameter and 3 feet high, the area of the cross section of the cylinder will be .08733 square feet; hence $.08733 \times 3 = .26199$ the content of the cylinder in cubic feet and the quantity of cubic feet of water discharged by one stroke of the piston.

The lifting-pump, like the suction-pump, has two valves and a piston, both opening upwards; but the valve in the cylinder, instead of being placed at the bottom of the cylinder, is placed

in the body of it, and at the height where the water is intended to be delivered. The bottom of the pump is thrust into the well a considerable way, and when the piston is at the bottom as its valve opens upwards, there will be no obstruction to the water rising in the cylinder to the height which it is in the well, for water will always endeavor to come to a level. Now when the piston is drawn up the valve in it will shut, the water in the cylinder will be lifted, the valve in the barrel will be opened, and the water will pass through it, and cannot return as the valve opens upward; another stroke of the piston repeats the same process, and in this way the water is raised from the well. But the height to which it may be raised is not in this, as in the suction pump, limited to 32 feet. To ascertain the force necessary to work this pump, we are to consider that the piston lifts a column of water whose base is the area of the piston, and height the distance between the level of the water in the well and the spout at which the water is delivered.

The forcing-pump constitutes the third class. It can raise water to any height. The piston of this pump has no valve, but there is a valve at the bottom of the cylinder, as is shown at A. In the side of the cylinder, and immediately above the valve A, there is another valve B opening outward into a tube, which is bent upward to the height at which the water is to be delivered. When the piston is raised the valve in the bottom of the pump opens, and a vacuum being produced, the water is pressed up into the pump on the principle of the suction-pump. But when the piston is pressed down the valve A at the bottom shuts, and the valve B at the side which leads into the ejection-pipe opens, and the water is forced up the tube. When the piston is raised again the valve B shuts and the valve A opens. In this form the discharge is not continuous. To make it so an air-vessel is fastened to the top of the eduction pipe. The air-vessel is a box, with a valve opening upwards into it and covering the top of the pipe. A tube is fastened into the top of the box, and reaches nearly to the bottom; it rises out of the box, and is furnished with a stop-cock. If the stop-cock be shut, and the water be sent by the action of the pump into the air-vessel, it cannot return because of the shutting of the valve at the bottom of the box; and because of the space occupied by the water, the air in the box is condensed, and will consequently exert a proportionate pressure on the water in the air-vessel, and force it up through the tube. The stream of water issuing will therefore be continuous, the pressure being continuous.

The fourth class of hydraulic machines for raising water consists of such engines as act either by the weight of a portion of the water which they have to raise, or of any other water that can be used for such purpose, or by its centrifugal force, momentum, or other natural powers. The centrifugal pump consists of a drum or wheel containing a series of curved vanes; this wheel is encased in a circularly-shaped casing, gradually enlarging toward the outlet. The wheel with its vanes being rapidly rotated causes the water to be impelled outward into the casing and ultimately discharged from the outlet. This machine is very similar in form to the vortex-wheel or turbine, the direction of flow of the water being, however, in the reverse direction.

An ingenious form of pump called the *pulsometer* has lately been devised and extensively employed. It consists essentially of a double chamber, having a ball-valve at top, and clack-valves at bottom. Steam is admitted to one of the chambers and presses out the water contained there. Condensation then taking place a vacuum is formed, and the ball falls over and closes the opening through which the steam entered, and water flows up through the clack-valves and again fills the chamber. The steam in the meantime acts upon the water contained in the adjoining chamber. Condensation then taking place there the ball falls back to that side, and the operations go on alternately, the result being a steady stream of water sucked into one chamber after another, and then forced out and upward by the steam pressure. The water is drawn into the machine from the centre. To the fourth class also belongs the hydraulic ram (q.v.).

Water-wheels are either vertical or horizontal. The former class is undershot, overshot, or breast-wheel, as the water is fed to it from below, above or at the middle of the wheel.

The undershot wheel, the oldest form, acts chiefly by the momentum of the water, the weight of the water being scarcely called into action, and so can be used where there is a great supply of water always in motion. It is the cheapest of all water-wheels, and is more applicable to rivers in their natural state than any other form of the wheel; it is also useful in tide-currents, where the water sets in opposite directions at different times, because it receives the impulse equally well on either side of its floats. In the overshot wheel the circumference is furnished with a series of buckets, into which the water is delivered from above. The buckets on one side being erect, will be loaded with water, and the wheel will be thus set in motion; the mouths of the loaded buckets being thus turned downwards by the revolution of the wheel, will be emptied, while the empty buckets are successively brought under the stream by the same motion and filled. The breast-wheel differs from this in receiving the water a little below the level of the axle, and in having floats instead of buckets. In these two wheels the weight of the water is used as well as its momentum, and a much greater power is therefore produced with a less supply of water than is necessary for the undershot wheel. In order to permit these wheels to work with freedom, and to the greatest advantage, it is necessary that the back or tail water, which is discharged from the bottom of the wheel, should have an uninterrupted passage off; otherwise it accumulates and forms a resistance to the float-boards.

Turbines or horizontal water-wheels are very suitable for high falls of water, as the action of such wheels depends upon the impulse of the water and not upon its direct weight as in the overshot wheel. Turbines have been divided into three classes: parallel-flow, where the water is supplied and discharged vertically; outward-flow, where the water acts from the centre outward; and inward-flow, where the water acts from the outside, the currents flowing inward toward the centre. In all cases the greatest effi-

ciency is obtained when the water acts upon the blades of the wheel without causing a shock, and leaves the wheel without having any whirling motion. See HYDRODYNAMICS; HYDROSTATICS.

Hy'drazine, or Di-Amidogen, a substance having the formula N_2H_4 (or $H_2N.NH_2$), obtained (together with oxalic acid, $H_2C_2O_4$,) by heating an aqueous solution of the complicated substance known as triazoacetic acid $(C_3H_3N_6)_3(COOH)_3$. It is a gas with a peculiar penetrating odor, but the properties of the pure substance are imperfectly known, on account of the avidity with which it combines with water to form the hydrate, $N_2H_4.H_2O$, and the consequent difficulty of isolating it. Hydrazine is a powerful base, combining with acids to produce numerous definite crystalline salts. Among these the sulphate, $N_2H_4.H_2SO_4$, and the two hydrochlorids, $N_2H_4.2HCl$ and $N_2H_4.HCl$, are important. The hydrate may be prepared by boiling the sulphate with a solution of caustic soda. It is a fuming liquid, somewhat oily in appearance, and boiling at 245° F. The hydrate reduces cold ammoniacal solutions of silver nitrate, and also reduces Fehling's solution. It attacks glass, cork and india rubber, but may be kept in silver vessels.

(2) The substances derived from hydrazine by replacing one or more of its hydrogen atoms by compound radicals are also called "hydrazines." If only one hydrogen atom is replaced the hydrazine is said to be "primary." If two hydrogen atoms are replaced, the hydrazine is said to be "secondary." The radical which replaces the hydrogen may belong to the fatty series, or to the aromatic series. One or more of the hydrogen atoms may also be replaced by a metal, such as sodium. The most important of the organic hydrazines is phenyl hydrazine, in which one of the hydrogen atoms is replaced by the aromatic radical phenyl, C_6H_5. This substance, which has the formula $(C_6H_5)HN.NH_2$, is an oily liquid, which solidifies to monoclinic tablets at 73° F. It mixes with alcohol, ether, benzene and chloroform, but hardly at all with water. It reduces Fehling's solution in the cold, and is very poisonous. A secondary hydrazine is "symmetrical" when the two substituted radicals are attached to different nitrogen atoms; it is "unsymmetrical" if they are attached to the same nitrogen atom. Thus $(C_6H_5)HN.NH(C_2H_5)$ is the symmetrical secondary hydrazine of phenyl (C_6H_5) and ethyl (C_2H_5), while $(C_6H_5)(C_2H_5)N.NH_2$ is the unsymmetrical secondary hydrazine of the same radicals.

Hy'dride, a chemical substance consisting of hydrogen combined with a metal, or some simple or compound metallic base.

Hydriod'ic Acid, an acid composed of hydrogen in combination with iodine, and having the formula HI. Hydriodic acid is analogous to the more familiar hydrochloric acid, both in its chemical structure and in its general properties. It may be prepared by the direct union of hydrogen and iodine at a red heat. A more convenient method, however, consists in passing sulphuretted hydrogen gas (H_2S) through water in which a little pulverized iodine is suspended. The reaction is $H_2S + 2I = 2HI + S$. Fresh supplies of iodine are added from time to time, and the liberated sulphur is finally removed by agitation and filtration, the sulphuretted hydrogen remaining in solution being also removed by the application of a gentle heat. The aqueous solution so prepared possesses strongly acid properties, and combines with bases to form salts called iodides. From it, or by other methods that are given in the larger treatises on chemistry, pure hydriodic acid, free from water, may be prepared. The pure acid is a colorless gas, with an odor similar to that of hydrochloric acid gas. It has a density about 63 times as great as that of hydrogen, and at a temperature of 32° F. it condenses to a liquid when subjected to a pressure of four atmospheres; the liquid so obtained freezing to a solid mass at about 67° F. below zero. The specific heat of the gas, at ordinary temperatures, is about 0.055 (at constant pressure), and the ratio of its specific heat at constant pressure to its specific heat at constant volume is 1.397. It dissolves freely in water, the specific gravity of a saturated aqueous solution, at 32° F., being about 2.00. The aqueous solution is colorless when pure, but it is slowly decomposed by sunlight, becoming dark from the liberation of iodine.

Hydriodic Ether (more correctly known as "iodide of ethyl"), a heavy, colorless liquid with a sharp, pungent taste and a penetrating ethereal odor, obtained by acting upon pure ethyl alcohol ($C_2H_5.OH$) by iodine, in presence of phosphorus. It has the formula C_2H_5I, boils at 162° F. (under ordinary atmospheric pressure), and has a specific gravity of about 1.946. When not quite pure it becomes brownish upon exposure to light, from the liberation of iodine. In chemistry, hydriodic ether (or ethyl iodide) is largely used as a fundamental substance in the preparation of the various other compounds of ethyl.

Hydrobro'mic Acid, or **Hydrogen Bromide,** a compound having the formula HBr, and analogous in its general properties to hydrochloric and hydriodic acids. Hydrogen and bromide do not combine directly, even in strong sunlight; but when hydrogen that is charged with bromine vapor is burned, hydrobromic acid and water are formed. Hydrogen and bromine may also be made to combine by electric sparks, or by passing the mixed gases over hot platinum. The most convenient way of preparing the acid, however, is by the action of bromine upon water, in the presence of phosphorus, the reaction being $4H_2O + 5Br + P = 5HBr + H_3PO_4$. Phosphoric acid, it will be seen, is formed at the same time; but the two are easily separated by heat. Pure hydrobromic acid, when free from water, is a colorless gas, having a density about 39.1 times as great as that of hydrogen. Under ordinary atmospheric pressure it condenses into a liquid at 99° F. below zero, and at a slightly lower temperature it crystallizes. It dissolves freely in water, a saturated solution, at 32° F., having a specific gravity of 1.78. A concentrated aqueous solution of hydrobromic acid fumes strongly in the air, but does not decompose. Hydrobromic acid is a powerful acid, forming, with metallic bases and with organic radicals, definite salts called "bromides." The bromides of the alkalies are greatly used in medicine as sedatives. Bromide of silver is also extensively used in photography, in the manufacture of sensitive dry-plates.

Hydrocar'bons, compounds consisting solely of carbon and hydrogen. They are exceedingly numerous, and many of them occur in nature, both in petroleum, asphaltum, and other similar minerals, and in the essential oils of plants. The hydrocarbons can be broadly divided into two general classes, according to the way in which the carbon atoms that they contain are connected to one another. In the fatty series, the atoms are all connected in open chains, while in the aromatic series the carbon atoms are connected with one another in such a manner as to form closed rings. (See FATTY COMPOUNDS and AROMATIC COMPOUNDS.) As a class, the hydrocarbons are insoluble in water; they cannot be saponified; and they are neutral, and do not combine with acids to form salts.

The classification of the hydrocarbons is as yet incomplete; but the greater number of those that are known can be included in one or another of the following groups:

1. The *Paraffins,* having the general formula C_nH_{2n+2}. The lowest member of this series is methane, or marsh gas, CH_4, and many other members of the series are known, each containing one carbon atom and two hydrogen atoms more than its immediate predecessor. (See PARAFFINS.)

2. The *Olefines,* having the general formula C_nH_{2n}. Ethylene, C_2H_4, is the simplest member of this series.

3. The *Acetylene* series, having the general formula C_2H_{2n-2}. Acetylene gas, C_2H_2, is the simplest representative of this series.

The foregoing all belong to the fatty subdivision. To them we may add:

4. The *Benzene* series, having the general formula C_nH_{2n-6}, and

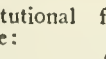
5. The *Terpenes,* a class of substances having the general formula $C_{10}H_{16}$. Both of these latter series belong to the aromatic subdivision of the general hydrocarbon group.

The known hydrocarbons having any one general formula may be ranged in a series, whose members exhibit a sort of regular progression in their properties. For example, the first eight members of the normal paraffin group may be arranged as follows:

		Boiling point.
Methane	CH_4	(Gaseous)
Ethane	C_2H_6	"
Propane	C_3H_8	"
Butane	C_4H_{10}	34° F.
Pentane	C_5H_{12}	100° F.
Hexane	C_7H_{16}	158° F.
Heptane	C_8H_{14}	210° F.
Octane	C_8H_{18}	255° F.

A series of this sort is said to be "homologous."

The paraffins are said to be "normal" when they contain but two methyl groups, (CH_3). Thus normal propane, C_3H_8, has the constitutional formula $CH_3.CH_2.CH_3$; and it is not possible to arrange its atoms in any other way. In proceeding from this hydrocarbon to the next in the same series (that is, butane, C_4H_{10},) we may substitute the methyl group, CH_3, for a hydrogen atom in the CH_2 of the propane, or for a hydrogen atom in one of the CH_3 groups. Hence we may have either of the two following constitutional formulas for the hydrocarbon butane:



or

$$CH_3—CH_2—CH_2—CH_3.$$

The latter compound, which contains only two CH_3 groups, is called "normal butane"; while the former, which contains three such groups, is known as "isobutane." Two butanes, each having the empirical formula C_4H_{10}, are therefore possible, and both are actually known. When we pass to the higher members of the paraffin group we find that a far greater number of isomeric forms can exist, according to the way in which the new CH_3 group is introduced, in generating the new hydrocarbon from the one next below it in the general series. Thus octane, C_8H_{18}, can exist in 18 different isomeric forms, and tridecane, $C_{13}H_{28}$, in no less than 802.

Hydrochlo'ric Acid, an important compound of hydrogen and chlorine, which under the names "spirit of salt" and "muriatic acid," has been known in aqueous solution from very early times. It has the chemical formula HCl, and may be formed by exposing a mixture of equal volumes of hydrogen and chlorine to diffuse daylight, the combination taking place quietly under these circumstances, but explosively under the influence of direct sunlight. A more convenient and usual method of preparing hydrochloric acid is by treating common salt ("sodium chlorid," NaCl) with strong sulphuric acid (H_2SO_4). The reaction is as follows: $NaCl + H_2SO_4 = HNaSO_4 + HCl$. Pure hydrochloric acid is a colorless gas, 1.269 times as heavy as an equal volume of air at the same temperature and pressure. At a temperature of 50° F. it condenses, under a pressure of 40 atmospheres, to a colorless liquid, which boils, under ordinary atmospheric pressure, at 171° F. below zero, and solidifies at a temperature about 6° below the boiling point. The specific heat of the gas at constant pressure (compared with water) is about 0.19; and the ratio of its specific heat at constant pressure to its specific heat at constant volume, at ordinary temperatures, is 1.389. Hydrochloric acid gas was first prepared, in an approximately pure state, by Priestley, in 1774; but it was believed to be an oxid of a new element (provisionally called "murium") until Davy, in 1810, showed that it is a compound of hydrogen and chlorine.

Hydrochloric acid gas is exceedingly soluble in water. If a dry glass flask, which is completely filled with the dry gaseous acid, be brought mouth downward under water, and the stopper is then removed, solution takes place with such extreme rapidity that the water is often drawn into the flask suddenly enough to break it. By passing a stream of the gaseous acid into water, an aqueous solution may be prepared which has a specific gravity, when saturated, of 1.21. The commercial acid is commonly known, to the present day, as "muriatic acid." Large quantities of it are obtained as a by-product in the manufacture of sodium carbonate from common salt; but the acid so produced is not entirely pure, and the traces of iron and other impurities that are present give it a yellowish tinge. Aqueous hydrochloric acid is largely used in the laboratory, and also in the

arts in the manufacture of a great variety of substances.

Hydrochloric acid combines with metallic bases to form salts which are known as "chlorids." Common salt (chlorid of sodium, NaCl) is the most familiar and the most abundant example, in nature, of this class of substances. The chlorids of silver, gold, mercury, barium, aluminum, platinum, and ammonia are also important, and are described under MERCURY, ALUMINUM, etc.

Hydrocyan'ic Acid, or **Prussic Acid,** an exceedingly poisonous substance, discovered by Scheele in 1782. It has the chemical formula HCN, and may be formed by passing a series of electric sparks through a mixture of nitrogen and acetylene (q.v.). The reaction in this case is $2N + C_2H_2 = 2HCN$. The pure acid is more conveniently prepared by passing sulphuretted hydrogen gas, H_2S, over dry mercuric cyanide, $Hg(CN)_2$, hydrocyanic acid and mercuric sulphid being formed, according to the equation $Hg(CN)_2 + H_2S = 2HCN + HgS$. As thus prepared, hydrocyanic acid is a volatile liquid, boiling at 80° F. and freezing at 5° F., and possessing a peculiar smell of bitter almonds. It is so intensely poisonous that a single drop of the anhydrous acid produces instant death when swallowed, and its vapor, even when mixed with considerable quantities of air, is also exceedingly poisonous. It mixes readily with water, ether, and alcohol. Although it is called an acid, and forms salts that are known as "cyanides," it is very weak in its acid properties. It does not redden litmus paper, and its salts are readily decomposed by other acids.

Among the more important compounds of hydrocyanic acid are potassium cyanide and mercuric cyanide. Potassium cyanide, KCN, may be formed by passing nitrogen gas over a white-hot mixture of charcoal and potassium carbonate, the reaction being:

$$K_2CO_3 + 2N + 4C = 2KCN + 3CO.$$

It is more conveniently prepared, however, by strongly heating potassium ferrocyanide (see below), which breaks up into potassium cyanide, carbide of iron, and free nitrogen. Potassium cyanide is a white salt, soluble in water and in alcohol, and exceedingly poisonous. It is much used in electroplating as a solvent for gold and silver, and also in the extraction of gold from certain ores by the process known as "cyaniding." It melts without decomposition, and in the molten state it is a powerful reducing agent. For this reason it is often used as a flux in welding, and in other metallurgical operations.

Mercuric cyanide, which is also very poisonous, is used in medicine, and is prepared by dissolving mercuric oxid in an aqueous solution of hydrocyanic acid.

Allied to hydrocyanic acid are two other acids, known respectively as "ferrocyanic acid," $H_8Fe_2(C_3N_3)_4$, and "ferricyanic acid," $H_6Fe_2(C_3N_3)_4$, which are not of any importance in the arts in the free state, but whose potassium salts are much used. Potassium ferrocyanide, or yellow prussiate of potash, $K_8Fe_2(C_3N_3)_4 + 6H_2O$, is prepared on a large scale by heating a mixture of nitrogenous organic matter and caustic potash, and treating the mass with freshly prepared ferrous carbonate. Crude cyanide of potassium is formed in the first instance, and this combines with the ferrous carbonate to form the yellow prussiate of potash and potassium carbonate, from which the yellow prussiate may be obtained in large crystals, by evaporation. When pure, the yellow prussiate is not poisonous. It is used, in the arts, as a source of Prussian blue, and also for the manufacture of potassium cyanide, which is liberated when the yellow prussiate is strongly heated.

Potassium ferricyanide, or red prussiate of potash, $K_6Fe_2(C_3N_3)_4$, is prepared by passing chlorine gas through a solution of the yellow prussiate, two molecules of potassium being thereby abstracted from it, with the formation of potassium chlorid as a secondary product. The red prussiate is used in the manufacture of sensitive paper for making blue-prints.

Hydro-ferricyanic (fĕr-ō-sī-ăn'ĭk) **Acid, and Hydro-ferrocyanic Acid.** See HYDROCYANIC ACID.

Hydrocele, hī'drō-sēl, a collection of serous fluid forming tumors around the testicle or spermatic cord. During fœtal life the testicle pushes the peritoneum before it as it descends from the abdomen into the scrotum. Along the spermatic cord the sac is usually obliterated, but if it is not it may become distended with fluid. The pouch of the peritoneum normally remains alongside of the testicle, and is called the tunica vaginalis. Distentions of these pouches may be congenital, but ordinarily they begin after maturity and probably are due to some fault in the blood-vessels, allowing the escape of the serum. Symptoms are due to the weight of the tumor, and the only danger lies in the possibility of the injury and rupture of the sac. Aspiration of the fluid, followed by the injection of a few drops of carbolic acid, may accomplish a cure, but partial removal of the sac may be necessary.

Hydrodynamics (ὕδωρ, water; δύναμις, force), or *Hydromechanics*, is that part of Dynamics which treats of the motion or rest of fluids under the action of forces. A perfect fluid is defined as a body whose parts are perfectly free to move under the action of the smallest forces, or otherwise, as a body such that the reactions between any two portions of it are normal to the surface separating them. If there is any tangential drag tending to prevent the one portion of the substance from slipping past the other, the fluid is said to be *viscous*. A perfect fluid is an abstraction, like the material particle or the rigid body, but many of the ordinary fluids, like water, alcohol, air, and other gases, are so slightly viscous that for many purposes they may be considered as perfect. The normal reaction, which alone we suppose to be present, is called the *pressure*, and is measured by the limit of the ratio of the force exerted on an element of surface to the area of the element, when both diminish without limit. The usual gravitational unit of pressure is the pound-weight per square inch, the usual scientific, absolute unit (see MECHANICS), is the dyne per square centimeter. The pressure of the atmosphere may be considered as equal to one million dynes per square centimeter.

The fundamental theorem of hydrodynamics is that the pressure on an element of surface is independent of the direction of the normal to the surface. This may be proved by consider-

ing the equilibrium of a small tetrahedron, $ABCD$, Fig. 1, and resolving the forces on its

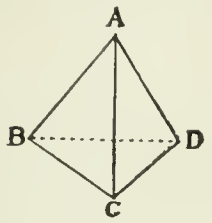


FIG. 1.

faces in the direction BD. The pressure being normal, the forces on ABD, BCD have no component along BD, while if the pressures on ABC, ACD, and the areas of those sides are respectively p_1, p_2, S_1, S_2, their normals n_1, n_2, we have for equilibrium $p_1S_1 \cos(n_1, BD) = p_2S_2 \cos(n_2, BD)$. But $S_1 \cos(n_1, BD)$, $S_2 \cos(n_2, BD)$ are the projections of the areas on a plane perpendicular to BD, which are equal, therefore $p_1 = p_2$. If there are other forces applied to the fluid besides the pressure, such, for instance, as its weight, these will be proportional to the volume of the tetrahedron, and when its size is diminished indefinitely, the volume vanishes to the third order of small quantities, and may thus be neglected in comparison with the area, which is of the second order, so that the result is not affected.

HYDROSTATICS.—We will first consider hydrostatics, or that part of our subject which deals with fluids at rest. Suppose that the fluid is subject to the action of forces whose components along the coordinate axes are equal to X, Y, Z per unit of mass. These we call bodily forces. Now consider the equilibrium of an infinitesimal rectangular parallelopiped, Fig. 2, whose edges, parallel to the coor-

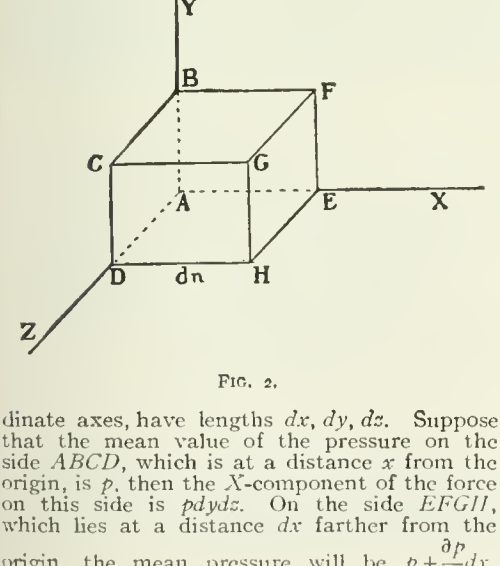


FIG. 2.

dinate axes, have lengths dx, dy, dz. Suppose that the mean value of the pressure on the side $ABCD$, which is at a distance x from the origin, is p, then the X-component of the force on this side is $pdydz$. On the side $EFGH$, which lies at a distance dx farther from the origin, the mean pressure will be $p + \frac{\partial p}{\partial x}dx$, and the component on the face $EFGH$, acting on the parallelopiped, being in the opposite direction will be $-\left(p + \frac{\partial p}{\partial x}dx\right)dydz$. Now if the density of the fluid is ρ, the amount of matter in the parallelopiped, being the product of the density and volume, will be $\rho dxdydz$, and the force exerted upon it in the X-direction will be $X\rho dxdydz$. We must therefore have for equilibrium

$$pdydz - \left(p + \frac{\partial p}{\partial x}dx\right)dydz + \rho X dxdydz = 0,$$

and passing to the limit by decreasing the dimensions, p will be the pressure at any point, and dividing by $dxdydz$, we have

$$\rho X = \frac{\partial p}{\partial x}.$$

In a similar manner we have

$$\rho Y = \frac{\partial p}{\partial y}, \qquad \rho Z = \frac{\partial p}{\partial z}. \tag{1}$$

Thus the fluid can be in equilibrium only under the influence of bodily forces such that the components of the bodily forces, multiplied by the density, are the derivatives of the same function of the coordinates. Now there is in general a physical relation between the pressure of a fluid and the density at any point. If we put

$$P = \int \frac{dp}{\rho}, \quad \frac{dP}{dp} = \frac{1}{\rho},$$

we have

$$\frac{\partial P}{\partial x} = \frac{dP}{dp}\frac{\partial p}{\partial x} = \frac{1}{\rho}\frac{\partial p}{\partial x}, \quad \frac{\partial P}{\partial y} = \frac{dP}{dp}\frac{\partial p}{\partial y} = \frac{1}{\rho}\frac{\partial p}{\partial y},$$
$$\frac{\partial P}{\partial z} = \frac{dP}{dp}\frac{\partial p}{\partial z} = \frac{1}{\rho}\frac{\partial p}{\partial z},$$

and our equations (1) become

$$X = \frac{\partial P}{\partial x}, \quad Y = \frac{\partial P}{\partial y}, \quad Z = \frac{\partial P}{\partial z}. \tag{2}$$

Now this is the condition that the bodily forces are *conservative* (see MECHANICS). In that case the potential energy for unit mass is called the *potential* of the forces, and will be denoted by V. Thus we shall have $P = -V$ + const., and $dV = -dP = -\frac{dp}{\rho}$. If two fluids of different densities are in contact, we have at their common surface

$$-dp = \rho_1 dV = \rho_2 dV,$$

so that

$$(\rho_1 - \rho_2)dV = 0,$$

and since $\rho_1 - \rho_2$ is not zero we must have $dV = 0$, $dp = 0$. Consequently the surface of separation is a surface of constant potential and constant pressure. In the case of gravity we have, if the Z-axis is measured vertically upward, $V = gz$, so that the surfaces of constant V are horizontal planes, and a surface where water is in contact with the atmosphere must be a horizontal plane, or level surface, the pressure being the constant atmospheric pressure. If

we suppose the fluid to be incompressible, we have ρ constant, $P=p/\rho$,

$$(3) \qquad \frac{p}{\rho} = -V + \text{const.} = -gz + \text{const.},$$

$$(4) \qquad p = -g\rho z + \text{const.},$$

so that, if we neglect the atmospheric pressure, and count the depth from the plane $z=0$, we have the fundamental theorem for heavy liquids, namely, that the pressure is proportional to the depth. This may be proved experimentally by placing a well-fitting plate under a tube, Fig. 3, communicating with a

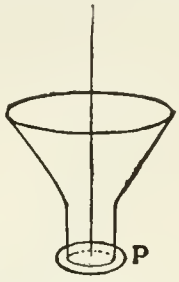


FIG. 3.

vessel of any shape, and holding the plate up by a wire hung from a balance, while water is poured in above. The weight required to hold the plate up is found to be independent of the shape of the vessel, and to depend only on the depth and the area of the plate. The vase and plate may also be immersed in liquid, while, instead of liquid within, weights are placed on the plate; the weight supported will then be proportional to the depth.

Consider now a gas, or compressible fluid, satisfying the law of Boyle and Mariotte,

$$p = a\rho.$$

Accordingly,

$$(5) \qquad P = \int \frac{dp}{\rho} = \int \frac{a\,d\rho}{\rho} = a \log \rho + \text{const.},$$

and

$$(6) \qquad V = gz = c - a \log \rho,$$

$$(7) \qquad \rho = \rho_0 e^{-\frac{gz}{a}}.$$

Thus as we ascend to heights in arithmetical progression the density decreases in geometrical progression, becoming zero at an infinite height. From equation (7) the barometric formula is obtained by which heights are found from barometer readings. The law of Boyle assumes constant temperature. It is, however, more likely that the temperature varies in accordance with what is called convective equilibrium, so that if a portion of air is hotter than the stratum in which it lies it will rise, and, cooling and expanding, will eventually find a layer of the same density and temperature as its own. The principles of thermodynamics give us the relation between pressure and temperature when the rarefaction is adiabatic, that is, when no heat is lost or gained by the air,

$$p = b\rho^{\kappa},$$

where κ is a constant for the gas, whose value is about 1.4. We then have

$$(8) \qquad V = gz = -\int b\kappa\rho^{\kappa-2}d\rho = c - \frac{b\kappa\rho^{\kappa-1}}{\kappa-1}.$$

Since $\kappa > 1$, ρ diminishes as z increases, and is equal to zero when $gz=c$, so that on this hypothesis the atmosphere has an upper limit.

Let us now consider the equilibrium of a solid body floating in a liquid. If we consider the body removed and the space that it occupied filled with water, since this water is in equilibrium, its weight is borne up by the pressure of the surrounding water, the effect of which is accordingly to apply to each portion of the water in question an upward force just equal to its weight. Now just the same forces must be the resultant of the pressures on the solid when it is substituted for the displaced water, so that it is borne up by a force equal to the weight of the displaced water. This is the Principle of Archimedes. Since the resultant of the weight of all the displaced water is a single force applied at its center of mass, the resultant upward thrust on the floating body is applied at a point coinciding with the center of mass of the displaced water. This point is called the *center of buoyancy* of the body. If the body is to be in equilibrium, according to the principles of statics of a rigid body, its weight must be equal to that of the displaced body, and its center of mass and center of buoyancy must be in the same vertical line. If the first condition is satisfied, but not the second, the body will float, but will be subject to a turning couple.

Suppose the body floats without being wholly immersed. A plane which cuts off from the body a volume equal to the volume of water having an equal weight is called a *plane of flotation*, and if we draw all such planes they will envelop a surface called the *surface of flotation*. For every plane of flotation there will be a center of buoyancy, and the locus of all these points is called the *surface of buoyancy*. Suppose the floating body is displaced from its position of equilibrium by rotation through a small angle $\delta\theta$ about an axis OX through O, Fig. 4, and let WL, $W'L'$ be the original and

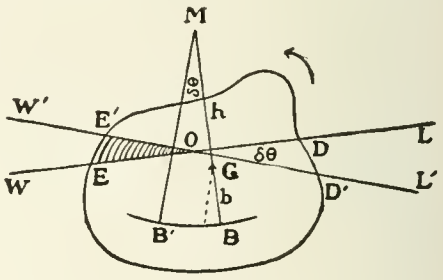


FIG. 4.

final planes of flotation. By turning the figure until either is horizontal both positions of the body may be shown. Let B be the original center of buoyancy, G the center of mass of the floating body. Then if B were the center of buoyancy in the second position,

the body would be acted on by the couple of which either arm would be the weight $W=mg$, and the arm the horizontal projection of BG, $b\delta\theta$, where $b=BG$. The moment of the couple tending to further displace the body will then be $Wb\delta\theta$. But this is not the only couple, for the immersed part is not the same as before, the volume of the wedge EOE' having become immersed, giving rise to an upward thrust, and the wedge DOD' having emerged and lost its buoyancy, both these causes giving rise to a turning moment in the same direction, and opposite to that previously found. Since the volume under water is to be the same in both positions, the volume of the wedges of immersion and emersion must be equal. Since the wedges are infinitely thin, the thickness at any point x, y in the plane of flotation is $s=y\delta\theta$. The condition for equality of volumes is then

$$\iint z\,dx\,dy=\delta\theta\iint y\,dx\,dy=0, \tag{9}$$

the integral being taken over the plane of flotation. This will be the case if the axis passes through the center of mass of the area of flotation. The thrust on any element of volume $d\tau=z\,dx\,dy$ being $g\rho\,d\tau$, the moment about the X-axis will be

$$L'=\iiint g\rho y\,d\tau=g\rho\delta\theta\iint y^2\,dx\,dy=g\rho\delta\theta S\kappa_x^2, \tag{10}$$

where κ_x is the square root of the mean of the squares of the distances of the elements from the X-axis, or the so-called radius of gyration of the area of flotation about the X-axis, and S is the area of flotation. In like manner the moment about the Y-axis is

$$M'=-\iiint g\rho x\,d\tau=-g\rho\delta\theta\iint xy\,dx\,dy. \tag{11}$$

There are always two axes at right angles to each other, called *principal axes*, for which the integral above vanishes, and for such an axis a displacement about it gives rise only to a couple about that axis. Subtracting this couple L' from the one previously found we obtain for the magnitude of the *righting couple*

$$L=g\delta\theta(\rho S\kappa_x^2-mb). \tag{12}$$

If is evident that in moving the point of application of the thrust from the center of mass of one wedge to that of the other, the center of buoyancy will be moved in a parallel direction, so that, in the limit, this direction being that of the plane of flotation, the line BB' will be parallel to that plane, or the tangent to the surface of buoyancy is parallel to the corresponding plane of flotation. It is also evident that the body is under the same forces that it would be if the surface of buoyancy were material and rested on a horizontal plane, for the reaction would be vertical and equal to the weight of the body.

If B' be the new center of buoyancy, and we draw verticals from B and B', they will be normals to the surface of buoyancy and will intersect at M, the center of curvature of the section of the surface of buoyancy. This point is called the *metacenter*, and its distance h_x above G the *metacentric height*. Evidently for stable equilibrium, or a positive righting couple, M must be above G. The arm of the couple being the horizontal projection of MG is equal to $h_x\delta\theta$ and we have $L=mgh_x\delta\theta$. Inserting this in equation (12) we obtain for the metacentric height

$$mh_x=\rho S\kappa_x^2-mb, \tag{13}$$

and dividing by m and writing $V=m/\rho$ for the volume of displaced liquid,

$$h_x=\frac{S\kappa_x^2}{V}-b. \tag{14}$$

The equilibrium is stable or unstable according as this is positive or negative.

For the displacement about the Y-axis we have in like manner a couple proportional to the angle of displacement, with a new metacentric height,

$$h_y=\frac{S\kappa_y^2}{V}-b, \tag{15}$$

where κ_y is the radius of gyration about the Y-axis. It is evident that the metacentric height is greater for a displacement about the shorter principal axis of the plane of flotation. Thus it is easier to roll a ship than to tip it endwise. The above theorems concerning the surfaces of flotation and buoyancy are due to Dupin.

If the floating body is totally submerged, like a submarine boat, only the first moment $mgb\delta\theta$ comes into play, S being zero, and the center of buoyancy becomes the metacenter. The stability is in this case only secured by placing the center of gravity low.

HYDROKINEMATICS.—We will now consider the motions possible to a fluid, without regard to the forces causing them. Let the velocity at a point be the vector q, with components u, v, w, and let us consider the quantity of fluid entering or leaving any closed surface in the unit of time. The amount of fluid which crosses the element of surface dS, Fig. 5,

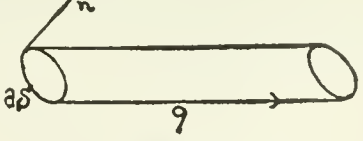


FIG. 5.

with a velocity q would in unit time, if q were constant, fill a prism on the base dS with a slant height q. If n is the normal to dS, the volume of this prism is $dSq\cos(qn)$, and the mass of fluid in it $dS\rho q\cos(qn)$, or using the formula for the projection of q on n (see MECHANICS, equation (12)),

$$dS\rho q_n=dS\rho\{u\cos(nx)+v\cos(ny)+w\cos(nz)\}.$$

Consequently if we consider any closed surface, whose outward normal is n, we have for the whole outflow in unit time the surface integral

$$\Phi=\iint\rho q_n\,dS=\iint\rho[u\cos(nx)+v\cos(ny)+w\cos(nz)]\,dS. \tag{16}$$

But we may find a different expression for the same quantity, by considering the ele-

ments of volume. Consider the parallelopiped of Fig. 2, and let u be the mean velocity on the side $ABCD$, $u+\frac{\partial u}{\partial x}dx$ on the opposite side $EFGH$. Then the inflow on the first side will be $\rho u dydz$, while the outflow through the second will be $\left\{\rho u+\frac{\partial(\rho u)}{\partial x}dx\right\}dydz$. The total outflow will thus be

$$\frac{\partial(\rho u)}{\partial x}dxdydz.$$

In a similar manner we find the outflow through the two remaining pairs of sides to depend on the other two components. From the whole surface we accordingly have the outflow

$$\left\{\frac{\partial(\rho u)}{\partial x}+\frac{\partial(\rho v)}{\partial y}+\frac{\partial(\rho w)}{\partial z}\right\}dxdydz,$$

and for the outflow per unit volume we have

$$\frac{\partial(\rho u)}{\partial x}+\frac{\partial(\rho v)}{\partial y}+\frac{\partial(\rho w)}{\partial z}. \tag{17}$$

On account of this kinematical interpretation, if we have any vector F, whose components X, Y, Z are functions of the coordinates of a point, the expression

$$\frac{\partial X}{\partial x}+\frac{\partial Y}{\partial y}+\frac{\partial Z}{\partial z} \tag{18}$$

is called the *divergence* of the vector, and will be abbreviated div F. Summing up the outflow for all the elements of volume inside the surface S, it is evident that the volume integral thus found must be equal to the surface integral Φ. Thus we have

$$\int\int \rho\{u\cos(nx)+v\cos(ny)+w\cos(nz)\}dS \tag{19}$$
$$=\int\int\int\left\{\frac{\partial(\rho u)}{\partial x}+\frac{\partial(\rho v)}{\partial y}+\frac{\partial(\rho w)}{\partial z}\right\}dxdydz.$$

This may be taken as a kinematical proof of the *Divergence Theorem*, due to Gauss and Green, in which, for any vector function which is continuous and has a definite value at every point in the volume within S,

$$\int\int\{X\cos(nx)+Y\cos(ny)+Z\cos(nz)\}dS \tag{20}$$
$$=\int\int\int\left\{\frac{\partial X}{\partial x}+\frac{\partial Y}{\partial y}+\frac{\partial Z}{\partial z}\right\}dxdydz,$$

or in more abbreviated notation,

$$\int\int F_n dS=\int\int\int \operatorname{div} F\cdot d\tau. \tag{20}$$

The surface-integral in (20) is called the *flux* of the vector F through the surface S. If we have any continuously distributed vector-function F, that is, one whose components X, Y, Z are continuous functions of the point x, y, z, we may draw curves having the property that at every point on a curve its tangent has the direction of the vector F. The differential equations of these curves are

$$\frac{dx}{X}=\frac{dy}{Y}=\frac{dz}{Z}=\frac{ds}{F},$$

and the curves are called *lines* of the vector F. For instance, lines of the vector q are called *lines of flow*. If we draw all the lines of the vector passing through a closed contour, we shall obtain a tubular surface called a *tube* of the vector, Fig. 6.

If the fluid is incompressible, as much fluid must flow out from as into any volume, so

FIG. 6.

that the total outflow is zero. The density is then constant, and we have, dividing (17) by ρ,

$$\operatorname{div} q=\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=0. \tag{21}$$

A vector whose divergence is zero is said to be *solenoidal* ($\sigma\omega\lambda\acute{\eta}\nu$, a tube), for its tubes have the property that the flux across a cap, or portion of a surface bounded by the tube, is the same wherever the surface be drawn. Analytically, applying the divergence theorem to the portion of space bounded by a portion of such a tube and two caps forming ends, since along the sides of the tube the normal component vanishes that portion of the flux in (20) is zero. Accordingly the flux through both ends is zero, or the flux out through one is equal to that in through the other. Or, looking in the direction of the vector-lines, the flux across any cap is the same. If we consider a tube of infinitesimal cross-section, and S is the area of a right section, since the flux is FS, which is constant for the tube, the magnitude of the vector F is inversely proportional to the area of the cross-section.

If the liquid is not incompressible the total outward flux is equal to the time-rate of decrease of the mass inside the surface S, so that, the mass in an element of volume $d\tau=dxdydz$ being $\rho d\tau$, we have

$$-\frac{\partial m}{\partial t}=-\frac{\partial}{\partial t}\int\int\int\rho d\tau=\int\int\rho q_n dS \tag{22}$$
$$=\int\int\int\operatorname{div}(\rho q)d\tau.$$

Now since the volume over which we integrate is independent of the time, we may differentiate under the integral sign; also, both integrals being taken over the same volume, we may combine them into one,

$$\int\int\int\left\{\frac{\partial\rho}{\partial t}+\operatorname{div}(\rho q)\right\}d\tau=0. \tag{23}$$

This equality holding for any volume whatever, the integrand must vanish, so that we have

$$\frac{\partial\rho}{\partial t}+\frac{\partial(\rho u)}{\partial x}+\frac{\partial(\rho v)}{\partial y}+\frac{\partial(\rho w)}{\partial z}=0. \tag{24}$$

This is the so-called *equation of continuity*, the term arising from the continuity of existence of mass, none being created or destroyed, but being conveyed without change from place to place.

Beside the surface- and volume-integrals dealt with above, we need to consider certain

line-integrals. If we resolve the vector q along the direction of the tangent to a curve running from A to B, and multiply by the length of the arc ds, and integrate from A to B along the curve, the line-integral

$$\int q_s ds = \int (u dx + v dy + w dz) \tag{25}$$

is called the *circulation* along the curve. If we describe the curve in the reverse direction, the integral changes sign. If the curve is a closed one, we shall prove the line-integral to be equal to a certain surface-integral over any surface S which has the contour in question as a boundary. Suppose first the contour is a plane curve and the surface is a plane. Let us divide the area up into infinitesimal rectangles by lines parallel to the axes of X and Y, Fig. 7. If we then find the circulation

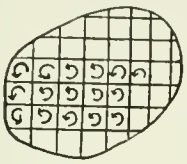


FIG. 7.

around each of the rectangles in the same direction, we shall have gone around all the sides common to two adjacent rectangles twice in opposite directions, so that those parts of the circulation will have destroyed each other, and there will remain only those parts which belong to the original contour. Accordingly the integral around the contour is equal to the sum of all these around the infinitesimal rectangular contours. Consider one of these, $ABCD$, Fig. 8. Along AC the

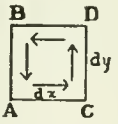


FIG. 8.

tangential component is u, and the contribution to the integral $u dx$. Along BD the value of u is $u + \frac{\partial u}{\partial y} dy$, and since we are going in the opposite direction the contribution to the integral is $-\left(u + \frac{\partial u}{\partial y} dy\right) dx$. Along AB the tangential component is v, and, since we are moving from B to A, the contribution to the integral is $-v dy$. Along CD the tangential component is $v + \frac{\partial v}{\partial x} dx$ and the contribution $\left(v + \frac{\partial v}{\partial x} dx\right) dy$. Adding these four we have

$$\left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right) dx dy,$$

and summing for all the rectangles,

$$\int q_s ds = \int\int \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right) dx dy, \tag{26}$$

which is a particular case of our theorem.

If the contour is not a plane curve, so that the surface S is not plane, let us by drawing a series of planes parallel to one of the coordinate planes divide it into infinitesimal strips, Fig. 9, and then by drawing planes alternately

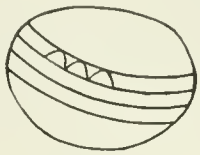


FIG. 9.

parallel to the two other coordinate planes divide each strip into infinitesimal triangles each having one side parallel to each coordinate plane. As before, the sum of the circulations around all the triangles is equal to the circulation around the contour. Let us consider one of these triangles, BCD, Fig. 10, and let A

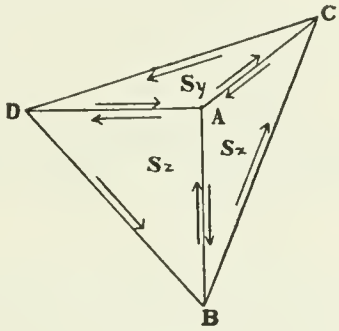


FIG. 10.

be the point from which lines drawn parallel to the coordinate axes will pass through B, C, D. Again, circulation around BCD is equivalent to the sum of the circulations around the triangles ABC, ACD, ADB, the projections of BCD parallel to the coordinate planes. Let the areas of these four triangles be respectively dS, $dS_x = dS \cos(nx)$, $dS_y = dS \cos(ny)$, $dS_z = dS \cos(nz)$, n being the normal to S. Then we have, applying (26) to the three contours,

$$\int_{ABCA} q_s ds = \left(\frac{\partial w}{\partial y} - \frac{\partial v}{\partial z}\right) dS_x,$$

$$\int_{ACDA} q_s ds = \left(\frac{\partial u}{\partial z} - \frac{\partial w}{\partial x}\right) dS_y,$$

$$\int_{ADBA} q_s ds = \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right) dS_z,$$

and consequently

$$\int_{BCDB} q_s ds = \left\{ \left(\frac{\partial w}{\partial y} - \frac{\partial v}{\partial z}\right) \cos(nx) + \left(\frac{\partial u}{\partial z} - \frac{\partial w}{\partial x}\right) \cos(ny) + \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right) \cos(nz) \right\} dS.$$

Summing up for all the infinitesimal triangles, we find the surface-integral over the surface S to be equal to the circulation around the contour.

$$(27)\quad \int (u\,dx + v\,dy + w\,dz) =$$
$$\iint \left\{ \left(\frac{\partial w}{\partial y} - \frac{\partial v}{\partial z}\right)\cos(nx) + \left(\frac{\partial u}{\partial z} - \frac{\partial w}{\partial x}\right)\cos(ny) + \left(\frac{\partial v}{\partial x} - \frac{\partial u}{\partial y}\right)\cos(nz) \right\} dS.$$

This is known as Stokes's theorem.

If we define a vector ω with the components ξ, η, ζ,

$$(28)\quad 2\xi = \frac{\partial w}{\partial y} - \frac{\partial v}{\partial z},\qquad 2\eta = \frac{\partial u}{\partial z} - \frac{\partial w}{\partial x},\qquad 2\zeta = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y},$$

we have the integrand in the surface-integral in (27),

$$2[\xi\cos(nx) + \eta\cos(ny) + \zeta\cos(nz)] = 2\omega_n,$$

as the component of 2ω normal to the surface S. The vector 2ω is called the *curl* of q, for the reason that if the lines of the vector «curl» about in any region, so that the tangential component along a closed curve always has the same sign, the surface-integral, and hence the curl, cannot vanish. We may write Stokes's theorem in the abbreviated form

$$(27)\quad \int q_s\,ds = \iint (\text{curl } q)_n\,dS.$$

As an example of the kinematical significance of the curl, let us consider a portion of fluid which revolves like a rigid body about the Z-axis. We then have $u = -ay$, $v = ax$, where a is a constant representing the angular velocity. We thus have

$$2\zeta = \frac{\partial v}{\partial x} - \frac{\partial u}{\partial y} = 2a.$$

Or applying Stokes's theorem to a circle with center on the axis of rotation, since $q = ar$,

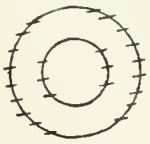


Fig. 11.

the line-integral is $2\pi r \cdot q = 2\pi r^2 a$, which is equal to the area of the circle multiplied by $2a$, which must represent the curl. Thus we

Fig. 12.

find that the curl of the velocity is twice the angular velocity with which an element of fluid is revolving. On this account the vector ω has received the name of *vorticity*, and fluid moving so that ω is not zero is said to move vortically. As the difference between vortical and non-vortical motion is very important, we may illustrate it as follows: It is possible that fluid may circulate in a region either vortically or non-vortically. Suppose that the fluid is filled with short straws represented by the short lines in Figs. 11 and 12; if, as the fluid moves about, these all remain parallel to their original direction, the flow is non-vortical, Fig. 11; if they turn, the flow is vortical, Fig. 12. Thus it is impossible to tell by merely looking at a diagram of stream-lines whether the flow is vortical or not.

It will be shown later that the divergence and curl of a vector function are characteristic of it, and that if they are known everywhere the complete nature of the vector is known. They are quite independent of each other, as is illustrated in Fig. 13, which shows regions where the divergence and curl are zero or not, independently.

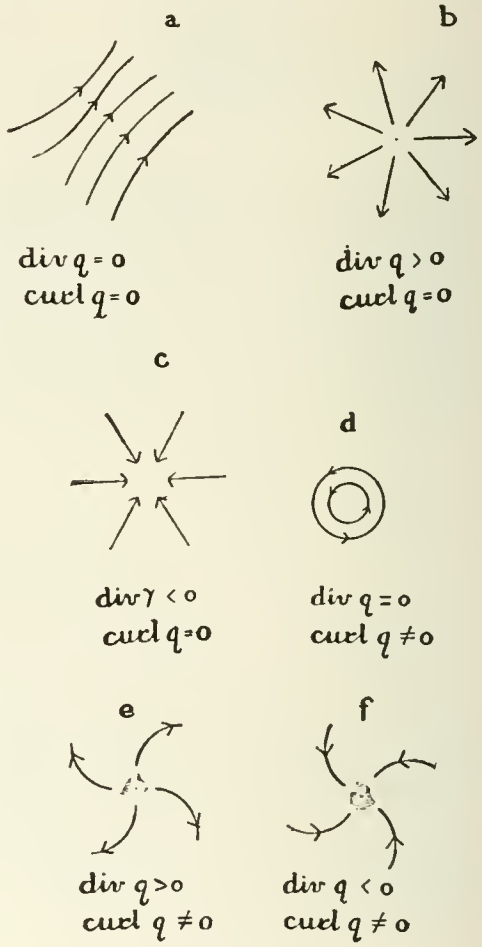


Fig. 13.

Non-vortical Motion.—Let us first examine non-vortical motion, that is, where curl $q = 0$ everywhere. If we connect A and B by any two curves ACB, ADB, the circulation around the

closed path $ACBD.1$ will be zero, hence the circulation from A to B will be the same by either path. Thus the circulation does not depend on the path, but only on the position of its ends, so that we have

$$(29) \qquad \int_A^B q_s ds = \phi_B - \phi_A,$$

which necessitates

$$q_s ds = u dx + v dy + w dz = d\phi$$
$$= \frac{\partial \phi}{\partial x} dx + \frac{\partial \phi}{\partial y} dy + \frac{\partial \phi}{\partial z} dz,$$

and therefore

$$(30) \qquad u = \frac{\partial \phi}{\partial x}, \quad v = \frac{\partial \phi}{\partial y}, \quad w = \frac{\partial \phi}{\partial z}.$$

The function ϕ is called the *velocity-potential*. The direction of the velocity q is everywhere normal to the equipotential surfaces $\phi = \text{const.}$, for if we move along the equipotential we have

$$d\phi = u dx + v dy + w dz = 0,$$

which is the condition that the vectors u, v, w, the velocity, and dx, dy, dz, the displacement, are perpendicular. According to the relation $q_s ds = d\phi$, we have the component of velocity in any direction $q_s = \frac{\partial \phi}{\partial s}$, equal to the space-rate of variation of potential in that direction; and since the velocity itself is equal to the rate of change of ϕ in the direction of the normal to the surface $\phi = \text{const.}$, a vector related to a function ϕ by the relations (30) is called the *gradient* of the function. A vector which is thus derived from a potential function is called a *lamellar* vector.

As an example of lamellar flow, let us take the case in which the velocity is directed radially outwards from a given point a, b, c with a value depending on the distance $r = \sqrt{(x-a)^2 + (y-b)^2 + (z-c)^2}$ from that point, $q = f(r)$. The equipotential surfaces are concentric spheres, and we easily find the potential to be $\phi = \int f(r) dr$. For, since the direction cosines of r are $\cos(rx) = \frac{x-a}{r}$, $\cos(ry) = \frac{y-b}{r}$, $\cos(rz) = \frac{z-c}{r}$, we have the components of the velocity,

$$(30) \qquad u = f(r)\frac{x-a}{r} = \frac{d\phi}{dr}\frac{\partial r}{\partial x} = \frac{\partial \phi}{\partial x},$$
$$v = f(r)\frac{y-b}{r} = \frac{d\phi}{dr}\frac{\partial r}{\partial y} = \frac{\partial \phi}{\partial y},$$
$$w = f(r)\frac{z-c}{r} = \frac{d\phi}{dr}\frac{\partial r}{\partial z} = \frac{\partial \phi}{\partial z}.$$

The flux out through any of the concentric spheres is $M = 4\pi r^2 q$, so that if the fluid is incompressible we must have

$$(31) \qquad q = \frac{M}{4\pi r^2}, \quad \phi = -\frac{M}{4\pi r},$$

where M is constant. The vector q is then solenoidal as well as lamellar, and the equation of continuity becomes

$$(32) \quad \text{div } q = \frac{\partial u}{\partial x} + \frac{\partial v}{\partial y} + \frac{\partial w}{\partial z} = \frac{\partial^2 \phi}{\partial x^2} + \frac{\partial^2 \phi}{\partial y^2} + \frac{\partial^2 \phi}{\partial z^2} = 0.$$

This equation for ϕ is known as Laplace's equation, and the sum of the three partial derivatives of second order, which will be abbreviated as $\Delta\phi$, is called the *Laplacian* of q. Obviously the above flow cannot extend as far as $r = 0$, for there the velocity would be infinite. Suppose that in a small region of volume τ at the center liquid is being created just fast enough to supply the outflow, so that the volume M is created per unit of time. Such a region is called a *source*, and the whole system of flow is called a *squirt*. The quantity M is called the *strength* of the source, and the strength per unit of volume $M/\tau = \sigma$ the *source-density*. If we have several sources, and add their potentials, the resultant velocity will be obtained as the gradient of the sum. Thus a complicated vector-field may be represented by its potential function. The sources may be continuously distributed through a portion of space, then σ, the source-density, will be a function of the position of the point, and the total strength will be

$$(33) \qquad M = \iiint \sigma d\tau,$$

while the total potential will be

$$(34) \qquad \phi = -\frac{1}{4\pi} \iiint \frac{\sigma d\tau}{r},$$

where r represents the distance from the element $d\tau$ to the point where ϕ is calculated. The total flux through any closed surface will be

$$(35) \quad \iint q_n dS = \iint \frac{\partial \phi}{\partial n} dS = \iint (\text{grad } \phi)_n dS,$$

or by the divergence theorem,

$$(36) \quad \iint q_n dS = \iiint \text{div } q \cdot d\tau = \iiint \Delta\phi \cdot d\tau$$
$$= \iint (\text{grad } \phi)_n dS.$$

Since this flux must be equal to the strength of all the sources within the surface of integration, we must have

$$(37) \qquad \iiint \Delta\phi \cdot d\tau = \iiint \sigma d\tau.$$

Now as this equality holds for any volume whatsoever, the integrands must be equal; accordingly we have

$$(38) \qquad \Delta\phi = \sigma,$$

as a consequence of equation (34). The equation (38) is called Poisson's equation. We may also prove the converse, namely, that if σ is given as a function of the point, the integral of equation (38) is given by (34). This is done by means of Green's theorem.

In the divergence theorem (20) let us put for the vector F the value $U \cdot \text{grad } V$, where U and V are two functions, both of which, with their derivatives, are finite, singly-valued, and continuous in the region of integration. Then we have

$$X = U\frac{\partial V}{\partial x}, \quad Y = U\frac{\partial V}{\partial y}, \quad Z = U\frac{\partial V}{\partial z},$$

$$\frac{\partial X}{\partial x} + \frac{\partial Y}{\partial y} + \frac{\partial Z}{\partial z} = U\Delta V + \frac{\partial U}{\partial x}\frac{\partial V}{\partial x} + \frac{\partial U}{\partial y}\frac{\partial V}{\partial y} + \frac{\partial U}{\partial z}\frac{\partial V}{\partial z},$$

$$(39)\quad \int\int F_n dS = \int\int U(\text{grad } V)_n dS$$
$$= \int\int U\frac{\partial V}{\partial n} dS$$
$$= \int\int\int \left\{ U\Delta V + \frac{\partial U}{\partial x}\frac{\partial V}{\partial x} + \frac{\partial U}{\partial y}\frac{\partial V}{\partial y} + \frac{\partial U}{\partial z}\frac{\partial V}{\partial z} \right\} d\tau.$$

Interchanging the functions U and V and subtracting from (39), we have

$$(40)\quad \int\int \left\{ U\frac{\partial V}{\partial n} - V\frac{\partial U}{\partial n} \right\} dS = \int\int\int \left\{ U\Delta V - V\Delta U \right\} d\tau.$$

The equations (39) and (40) are known as Green's Theorem. Let us apply it to two functions, one of which, U, is the reciprocal distance from a fixed point P, $U = 1/r$. Let us apply the theorem to the whole extent of space, bounded by the infinite sphere, with the exception of a portion bounded by a small sphere with center at P, which we exclude, on account of the infinite value of U at P. We must thus take the surface-integrals over the large and small spheres, the normals being in each case drawn away from the volume considered, or out in the first case, in in the second. Since the direction of the normal coincides with that of the radius of the sphere,

$$\frac{\partial(1/r)}{\partial n} = \pm\frac{\partial(1/r)}{\partial r} = \mp\frac{1}{r^2},$$

in the two cases respectively, while $dS = r^2 d\omega$, where $d\omega$ is the element of area of a sphere of radius unity, cut out by a cone of vertex P, having as base the element dS. Accordingly on either sphere

$$(41)\quad \int\int V\frac{\partial(1/r)}{\partial n} dS = \mp\int\int V d\omega,$$

and if V vanishes at $r = \infty$, the integral over the infinite sphere vanishes. If we now let the radius of the small sphere diminish without limit, the value of V to be taken is the value at P, so that

$$(42)\quad -\int\int V\frac{\partial(1/r)}{\partial n} dS = -V_P\int\int d\omega = -4\pi V_P.$$

On the other hand the surface-integral

$$\int\int \frac{1}{r}\frac{\partial V}{\partial n} dS = r\int\int \frac{\partial V}{\partial n} d\omega,$$

over the spheres vanishes for $r = \infty$, on account of the vanishing of $\frac{\partial V}{\partial n}$ to the second order, and for the small sphere in the limit, on account of the factor r. As for the volume-integrals we have seen in (31), (32), that any multiple of $1/r$ satisfies Laplace's equation, hence $\Delta(1/r) = 0$, so that finally

$$(43)\quad V_P = -\frac{1}{4\pi}\int\int\int \frac{\Delta V}{r} d\tau,$$

the integral being taken over all space. But this is the required theorem, the converse of (38).

Solutions of Laplace's equation can be found for the case of uniplanar flow, where the velocity is parallel to a given plane, and independent of the coordinate perpendicular thereto A plane diagram then represents the flow. If the given plane is that of X, Y, Laplace's equation becomes

$$(44)\quad \frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} = 0.$$

An infinite number of solutions are furnished us by the method of functions of a complex variable $x + iy$, where i is the imaginary defined by $i^2 = -1$.

If now we take any function $w = f(z)$ of the combination $z = x + iy$, on arranging it in powers of x, iy, all even powers of i will be real, all odd ones real multiples of i; accordingly w will be of the form $\phi + i\psi$, where ϕ, ψ are real functions of the two real variables x, y. Differentiating partially,

$$\frac{\partial w}{\partial x} = f'(z)\frac{\partial z}{\partial x} = f'(z), \quad \frac{\partial w}{\partial y} = f'(z)\frac{\partial z}{\partial y} = if'z = i\frac{\partial w}{\partial x},$$

$$\frac{\partial w}{\partial y} = \frac{\partial \phi}{\partial y} + i\frac{\partial \psi}{\partial y} = i\frac{\partial w}{\partial x} = i\frac{\partial \phi}{\partial x} - \frac{\partial \psi}{\partial x},$$

and equating real and imaginary parts,

$$(45)\quad \frac{\partial \phi}{\partial x} = \frac{\partial \psi}{\partial y}, \quad \frac{\partial \phi}{\partial y} = -\frac{\partial \psi}{\partial x}.$$

Differentiating the first equation by x, the second by y, and adding, we have

$$\frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} = 0,$$

and similarly

$$\frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\psi}{\partial y^2} = 0.$$

Thus either function ϕ or ψ derived from any function of a complex variable gives us a case of uniplanar flow of an incompressible fluid. From the equations (45) we obtain by cross-multiplication

$$(46)\quad \frac{\partial \phi}{\partial x}\frac{\partial \psi}{\partial x} + \frac{\partial \phi}{\partial y}\frac{\partial \psi}{\partial y} = 0,$$

which is the condition that the normals to the family of curves $\phi = \text{const.}$ and those of the family $\psi = \text{const.}$ intersect each other at right angles. Such families are called orthogonal. For instance, the function

$$(47)\quad w = \frac{1}{z} = \frac{1}{x + iy} = \frac{x - iy}{x^2 + y^2}$$

gives

$$(48)\quad \phi = \frac{x}{x^2 + y^2}, \quad \psi = \frac{-y}{x^2 + y^2},$$

and the curves

$$\frac{x}{x^2 + y^2} = \text{const.}, \quad \frac{y}{x^2 + y^2} = \text{const.}$$

are a set of circles tangent to the Y-axis and the X-axis respectively, the two sets intersecting each other at right angles.

The flux across any cylindrical surface whose generator has the length unity parallel to the Z-axis, and which intersects the XY-plane in a curve from A to B, is, if $\rho = 1$,

$$(49)\quad \Phi_{AB}=\int_A^B q_n ds=\int_A^B \frac{\partial\phi}{\partial n}ds$$
$$=\int_A^B\left\{\frac{\partial\phi}{\partial x}\cos(nx)+\frac{\partial\phi}{\partial y}\cos(ny)\right\}ds.$$

But if the normal lies on the right as we go along the curve, Fig. 14,

$$\cos(nx)ds=dy,\quad \cos(ny)ds=-dx.$$

Using these values and equations (45), we have for the flux

$$(50)\quad \Phi_{AB}=\int_A^B\frac{\partial\psi}{\partial x}dx+\frac{\partial\psi}{\partial y}dy=\psi_B-\psi_A,$$

so that the quantity of liquid crossing the surface does not depend on the curve joining

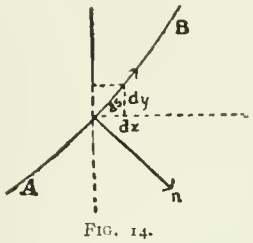


Fig. 14.

AB, but is the same for one as for another, as must be the case if the liquid is incompressible. The function ψ is called the *flux-function*, and since if $\psi_B=\psi_A$, no liquid crosses, it is evident that the curves $\psi=$const. are stream-lines. It is evident from equations (45) that either of the two functions ϕ, ψ may be taken for the velocity-potential, the other being taken for the flux-function. Functions satisfying equations (45) are called *conjugate functions*, and the two states of flow just described are called conjugate. In the case just investigated, the two conjugate flows happened to be identical; this is not generally the case.

For instance, consider the function $w=\log z$, and introducing polar coordinates r, θ,

$$(51)\quad w=\log z=\log(x+iy)$$
$$=\log\{r(\cos\theta+i\sin\theta)\}=\log\{re^{i\theta}\}=\log r+i\theta.$$

Thus we may put

$$(52)\quad \phi=\log r,\quad \psi=\theta,$$

obtaining a radial flow, or uniplanar squirt, with circular equipotentials, or

$$(53)\quad \phi=\theta,\quad \psi=\log r,$$

obtaining a circular flow with radial equipotentials.

Vortical Motion.—Let us now free ourselves from the restriction that the curl of the velocity vanishes. There will then be no velocity-potential in regions where there is curl. Lines whose tangent has everywhere the direction of the vector ω, the vorticity, are called *vortex-lines*, and tubes generated by such lines vortex-tubes, tubes of infinitesimal cross-section being termed vortex-filaments. The fluid within such a tube is called a vortex. Since the curl of any vector is solenoidal, as is seen by differentiating the equations (28) to find the divergence, the vorticity is a solenoidal vector and its tubes have the solenoidal property that the vorticity in any filament is inversely proportional to the area of the cross-section of the filament. The product $S\omega$, which is constant for the filament, is called the strength of the filament. Consequently the vorticity cannot vanish at any point on a tube, nor can the cross-section. The vortex-tubes must accordingly be closed, or end at a free surface of the liquid, as do those vortices formed by an oar at the surface of water.

The properties of vortex-motion were first investigated in an important paper by Helmholtz in 1858. Following him we shall now show that any continuous flow vanishing at infinity may be represented as the sum of a lamellar and a solenoidal part, and that the solenoidal part may be represented as the curl of another vector. Suppose that ϕ be the potential of the lamellar part, Q the vector with components U, V, W, whose curl represents the solenoidal part. Then we assume

$$(54)\quad \begin{aligned} u&=\frac{\partial\phi}{\partial x}+\frac{\partial W}{\partial y}-\frac{\partial V}{\partial z},\\ v&=\frac{\partial\phi}{\partial y}+\frac{\partial U}{\partial z}-\frac{\partial W}{\partial x},\\ w&=\frac{\partial\phi}{\partial z}+\frac{\partial V}{\partial x}-\frac{\partial U}{\partial y}.\end{aligned}$$

Finding the divergence of q we have

$$(55)\quad \operatorname{div} q=\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}=\Delta\phi,$$

since the divergence of the curl vanishes. But by (43) we have

$$\phi=-\frac{1}{4\pi}\int\int\int\frac{\Delta\phi}{r}d\tau=-\frac{1}{4\pi}\int\int\int\frac{\operatorname{div} q}{r}d\tau.$$

Since q represents a continuous flow, div q is finite. Accordingly we find that the lamellar part of the flow is completely determined by the distribution of its divergence.

Secondly, find the curl of q,

$$(56)\quad 2\xi=\frac{\partial w}{\partial y}-\frac{\partial v}{\partial z}=\frac{\partial}{\partial y}\left\{\frac{\partial\phi}{\partial z}+\frac{\partial V}{\partial x}-\frac{\partial U}{\partial y}\right\}$$
$$-\frac{\partial}{\partial z}\left\{\frac{\partial\phi}{\partial y}+\frac{\partial U}{\partial z}-\frac{\partial W}{\partial x}\right\}$$
$$=-\Delta U+\frac{\partial}{\partial x}\left\{\frac{\partial U}{\partial x}+\frac{\partial V}{\partial y}+\frac{\partial W}{\partial z}\right\}.$$

Since the vector Q is as yet undetermined except as to its curl, let us assume it to be solenoidal, which will make the divergence in (56) vanish, giving

$$(57)\quad 2\xi=-\Delta U,\quad 2\eta=-\Delta V,\quad 2\zeta=-\Delta W.$$

As before, we find the integrals of these equations to be

$$(58)\quad U=\frac{1}{2\pi}\int\int\int\frac{\xi}{r}d\tau,\quad V=\frac{1}{2\pi}\int\int\int\frac{\eta}{r}d\tau,$$
$$W=\frac{1}{2\pi}\int\int\int\frac{\zeta}{r}d\tau.$$

The integrals are to be taken over all space, but as any part of space where the vorticity vanishes will contribute nothing to the integrals, we may suppose them restricted to the vortices. Thus we see that the solenoidal part of the flow q, which is due to the vortices, is completely determined by the distribution of curl q. Thus the statement is justified that

a continuous vector - function is completely determined by its divergence and curl. Kinematically we may say that any flow is the resultant of squirts and vortices. The vector Q, whose components are formed in the manner of potentials from the components of 2ω, is called the *vector-potential* of 2ω.

Thus the velocity due to a vortex is the curl of the vector-potential of twice the vorticity. We may find this velocity by differentiation. Let us distinguish the point of integration from the point for which the potentials are calculated, and by which we differentiate, by attaching an accent to the coordinates of the former. We have

$$(59)\quad u=\frac{\partial 1V}{\partial y}-\frac{\partial V}{\partial z}$$
$$=\frac{1}{2\pi}\left[\frac{\partial}{\partial y}\int\int\int\frac{\zeta'}{r}d\tau'-\frac{\partial}{\partial z}\int\int\int\frac{\eta'}{r}d\tau'\right]$$
$$=\frac{1}{2\pi}\int\int\int\left\{\zeta'\frac{\partial}{\partial y}\left(\frac{1}{r}\right)-\eta'\frac{\partial}{\partial z}\left(\frac{1}{r}\right)\right\}d\tau'.$$

Thus the portions of velocity contributed by the element of the vortex $d\tau'$ are

$$du=\frac{1}{2\pi r^3}\{\zeta'(y'-y)-\eta'(z'-z)\}d\tau',$$
$$(60)\quad dv=\frac{1}{2\pi r^3}\{\xi'(z'-z)-\zeta'(x'-x)\}d\tau',$$
$$dw=\frac{1}{2\pi r^3}\{\eta'(x'-x)-\xi'(y'-y)\}d\tau'.$$

These are immediately seen to be, aside from the factor $1/2\pi r^3$, the projections of the parallelogram whose sides are the vectors ω', and r the vector from x', y', z' to x, y, z. If dq be the magnitude of the resultant, we accordingly obtain

$$(61)\quad dq=\frac{\omega'\sin(\omega' r)}{2\pi r^2}d\tau',$$

the direction of dq being perpendicular to both ω' and r, as shown by (60).

Let us take for the element of volume $d\tau'$ a length ds of a vortex-filament of cross-section S. Then $d\tau'=Sds$, and since $S\omega'=\kappa$, the strength of the filament

$$(62)\quad dq=\frac{\kappa ds\cdot\sin(\omega r)}{2\pi r^2}.$$

The velocity is connected with the vorticity in the same way that the magnetic field due to an electric current is connected with the current-density, equation (62) giving us the magnetic field produced by a current of strength $\kappa/2\pi$.

Hydrodynamics.—We now arrive at the subject of Hydrodynamics proper, in which we take account of the forces that are capable of producing the states of flow that have been previously described. Suppose that the coordinates of a particle are x, y, z, then $u=\frac{dx}{dt}$, $v=\frac{dy}{dt}$, $w=\frac{dz}{dt}$. The principles of dynamics tell us that the product of the mass by the acceleration of any particle is equal to the resultant of all the forces applied to it. Taking the mass contained in the element of volume $d\tau$, and the resultant of the bodily forces and pressures, as found under the treatment of hydrostatics,

$$(63)\quad \rho d\tau\frac{d^2x}{dt^2}=\rho d\tau\frac{du}{dt}=\left(\rho X-\frac{\partial p}{\partial x}\right)d\tau,$$

from which we obtain the equation with two similar ones,

$$\frac{du}{dt}=X-\frac{1}{\rho}\frac{\partial p}{\partial x},\quad \frac{dv}{dt}=Y-\frac{1}{\rho}\frac{\partial p}{\partial y},$$
$$(64)\quad \frac{dw}{dt}=Z-\frac{1}{\rho}\frac{\partial p}{\partial z}.$$

By the derivative $\frac{du}{dt}$ is meant the rate of change of velocity of a particular particle as it moves about. If we have any function F of the position of a particular particle, we may write its derivative

$$(65)\quad \frac{dF}{dt}=\frac{\partial F}{\partial t}+\frac{\partial F}{\partial x}\frac{dx}{dt}+\frac{\partial F}{\partial y}\frac{dy}{dt}+\frac{\partial F}{\partial z}\frac{dz}{dt},$$

where $\partial F/\partial t$ would be the rate of change of the function if the particle were at rest. The derivatives $\frac{dx}{dt}$, $\frac{dy}{dt}$, $\frac{dz}{dt}$ are the velocity-components u, v, w. Accordingly we have

$$(66)\quad \frac{dF}{dt}=\frac{\partial F}{\partial t}+u\frac{\partial F}{\partial x}+v\frac{\partial F}{\partial y}+w\frac{\partial F}{\partial z}.$$

We call this mode of differentiation *particle differentiation*.

Introducing this terminology, our equations of motion become

$$\frac{\partial u}{\partial t}+u\frac{\partial u}{\partial x}+v\frac{\partial u}{\partial y}+w\frac{\partial u}{\partial z}=X-\frac{1}{\rho}\frac{\partial p}{\partial x},$$
$$(67)\quad \frac{\partial v}{\partial t}+u\frac{\partial v}{\partial x}+v\frac{\partial v}{\partial y}+w\frac{\partial v}{\partial z}=Y-\frac{1}{\rho}\frac{\partial p}{\partial y},$$
$$\frac{\partial w}{\partial t}+u\frac{\partial w}{\partial x}+v\frac{\partial w}{\partial y}+w\frac{\partial w}{\partial z}=Z-\frac{1}{\rho}\frac{\partial p}{\partial z}.$$

These equations are due to Euler. These three equations, with the equation of continuity, (24), and the physical relation between ρ and p furnish five equations for the determination of the five variables u, v, w, ρ, p as functions of x, y, z, t.

Subtracting from both sides of the first of equations (67) the quantity

$$\frac{\partial}{\partial x}\left(\frac{q^2}{2}\right)=\frac{1}{2}\frac{\partial}{\partial x}\{u^2+v^2+w^2\}=u\frac{\partial u}{\partial x}+v\frac{\partial v}{\partial x}+w\frac{\partial w}{\partial x},$$

we obtain

$$(68)\quad \frac{\partial u}{\partial t}+w\left(\frac{\partial u}{\partial z}-\frac{\partial w}{\partial x}\right)-v\left(\frac{\partial v}{\partial x}-\frac{\partial u}{\partial y}\right)$$
$$=X-\frac{\partial P}{\partial x}-\frac{\partial\left(\frac{q^2}{2}\right)}{\partial x}.$$

If the bodily forces are conservative and derived from a potential V, the right-hand member is the derivative of the quantity $-(V+P+q^2/2)=U$, and inserting the values of ξ, η, ζ,

$$\frac{\partial u}{\partial t}+2(w\eta-v\zeta)=\frac{\partial U}{\partial x},$$
$$(69)\quad \frac{\partial v}{\partial t}+2(u\zeta-w\xi)=\frac{\partial U}{\partial y},$$
$$\frac{\partial w}{\partial t}+2(v\xi-u\eta)=\frac{\partial U}{\partial z}.$$

If the motion is *steady*, that is, independent of t, the time-derivatives vanish. Then multiplying the equations (69) by dx, dy, dz re-

spectively, adding and integrating along any curve, we obtain on the right the difference between the terminal values of $V+P+q^2/2$. If the curve is either a stream- or vortex-line, that is, if dx, dy, dz are proportional either to u, v, w, or to ξ, η, ζ, the sum on the left will also vanish, so that along a stream-line or a vortex-line we have $V+P+q^2/2=\text{const.}$ If the motion is non-vortical, the left-hand side of (69) vanishes, so that the above sum is constant throughout the fluid. In this case

$$V+P+\tfrac{1}{2}q^2=\text{const.}, \tag{70}$$

this result being called Daniel Bernoulli's theorem.

If the fluid is incompressible, $P=p/\rho$, and if there are no bodily forces $V=0$, so that (70) becomes

$$\frac{p}{\rho}+\frac{1}{2}q^2=\text{const.} \tag{71}$$

Accordingly where the velocity is small the pressure is large and vice versa. By constricting the tube the velocity is made large and the pressure small. This is the principle of jet exhaust-pumps, like that of Bunsen, the air being sucked in at the narrow part of the jet. The same principle is used in the Venturi water-meter. The horizontal main being reduced in diameter in a certain portion and the difference of pressure at a point in that portion and in the main observed, the velocity is computed. If the pressure at the two cross-sections S_1 and S_2 is p_1, p_2, we have

$$p_1-p_2=\frac{\rho}{2}(q_2^2-q_1^2). \tag{72}$$

But since the flow is solenoidal, $S_1q_1=S_2q_2$. Combining with (72),

$$p_1-p_2=\tfrac{1}{2}\rho q_1^2\left\{\left(\frac{S_1}{S_2}\right)^2-1\right\}, \tag{73}$$

which determines q_1 in terms of the pressure-difference. The efflux in unit time is $\rho q_1 S_1$.

For the adiabatic expansion of a gas,

$$P=\frac{b\kappa\rho^{\kappa-1}}{\kappa-1}=\frac{b\kappa}{\kappa-1}\left(\frac{p}{b}\right)^{\frac{\kappa-1}{\kappa}}. \tag{74}$$

We may use Bernoulli's theorem to calculate the efflux of gas from a reservoir. If we consider a point in the reservoir where the pressure is p, so far from the orifice that the air may be considered at rest and if the velocity at the orifice is q and the atmospheric pressure p_0, we have

$$q^2=2b^{\frac{1}{\kappa}}\frac{\kappa}{\kappa-1}\left\{p^{\frac{\kappa-1}{\kappa}}-p_0^{\frac{\kappa-1}{\kappa}}\right\}, \tag{75}$$

which is the usual formula for the efflux of gases.

If the external force be gravity, $V=gz$, and we have for an incompressible fluid,

$$\frac{p}{\rho}+gz+\tfrac{1}{2}q^2=\text{const.} \tag{76}$$

If we again consider efflux from a reservoir whose upper free surface $z=z_1$ is so large that q is negligible, the pressure being that of the atmosphere, the same above and at the orifice where $z=z_2$, the velocity of efflux is given by

$$\begin{aligned}&\frac{p_0}{\rho}+gz_1=\frac{p_0}{\rho}+gz_2+\tfrac{1}{2}q^2,\\ &q^2=2g(z_1-z_2),\end{aligned} \tag{77}$$

or the velocity of efflux is that acquired by a body falling freely from a height equal to that of the free surface above the orifice. This is the theorem of Torricelli, one of the oldest on hydrodynamics.

Wave-motion.—The case of uniplanar waves may be dealt with by the method of the complex variable. We shall find that the waves travel with constant velocity a and that it will simplify the problem if we impose upon the whole fluid a horizontal velocity equal and opposite to that of the waves. The waves then stand still, and the motion is *steady*, as in the case of waves about an obstruction in a running river.

Let us consider waves in deep water. At a great depth the vertical motion will disappear, so that

$$u=-a, \quad v=0, \quad \phi=-ax.$$

The function

$$w=-az+Ae^{-ikz}=-a(x+iy)+Ae^{-ik(x+iy)}$$

gives

$$\phi+i\psi=-a(x+iy)+Ae^{ky}(\cos kx-i\sin kx).$$

$$\begin{aligned}\phi&=-ax+Ae^{ky}\cos kx,\\ \psi&=-ay-Ae^{ky}\sin kx.\end{aligned} \tag{78}$$

When $y=-\infty$ this makes $\phi=-ax$, as required. The free surface of the water being composed of stream-lines is represented by one of the lines $\psi=\text{const.}$, and if we take the origin in the surface its equation is

$$ay+Ae^{ky}\sin kx=0, \tag{79}$$

which shows that y is a periodic function of x with the wave-length $\lambda=2\pi/k$. The longer the wave-length, that is the smaller k, the more nearly does the exponential reduce to unity and the profile to a curve of sines. The velocity is given by

$$\begin{aligned}u&=\frac{\partial\phi}{\partial x}=\frac{\partial\psi}{\partial y}=-a-Ake^{ky}\sin kx,\\ v&=\frac{\partial\phi}{\partial y}=-\frac{\partial\psi}{\partial x}=Ake^{ky}\cos kx,\end{aligned} \tag{80}$$

$$q^2=u^2+v^2=a^2+A^2k^2e^{2ky}+2Ake^{ky}\sin kx. \tag{81}$$

So far we have merely kinematics. The dynamical relation required is that for steady motion,

$$\frac{p}{\rho}+gy+\tfrac{1}{2}q^2=C. \tag{82}$$

At the surface putting $p=0$ and making use of (79),

$$gy+\tfrac{1}{2}\{a^2+A^2k^2e^{2ky}-2a^2ky\}=C.$$

Since the surface passes through the origin, putting $y=0$,

$$C=\tfrac{1}{2}(a^2+A^2k^2).$$

$$(g-a^2k)y+\tfrac{1}{2}A^2k^2(e^{2ky}-1)=0. \tag{83}$$

This equation can be only approximately fulfilled, but if the height of the waves is so small in comparison with the wave-length that the square of $2ky$ may be neglected, developing the exponential gives

$$(g-a^2k+A^2k^3)y=0,$$

giving the relation between the velocity and the wave-length.

$$g-a^2k+A^2k^3=0. \tag{84}$$

If ky is small, the equation of the profile (79) is approximately

$$y=-\frac{A}{a}\sin kx, \tag{85}$$

so that the height of the waves above the origin is $B=\lambda/a$, inserting which in (84) gives

$$(86)\qquad a^2\left\{\frac{2\pi}{\lambda}\left(1-\frac{4\pi^2B^2}{\lambda^2}\right)\right\}=g.$$

For long waves we accordingly have $a^2=g\lambda/2\pi$, or the velocity of long waves in deep water is equal to the velocity acquired by a body in falling freely from a height equal to one half the radius of a circle whose circumference is the wave-length.

In order to study the motions of the individual particles of water let us now impress upon the motion given by (80) a uniform velocity a in the X-direction. Equations (80) now give the motion with respect to axes traveling with the waves, so that in order to obtain the motion with respect to fixed axes we have to add a to the u of (80) and replace x by $x-at$, obtaining

$$(87)\qquad \begin{aligned} u&=-Ake^{ky}\sin k(x-at),\\ v&=\ Ake^{ky}\cos k(x-at).\end{aligned}$$

If the displacement of a particle which when at rest was at x, y is ξ, η, the above values are $\frac{d\xi}{dt}$, $\frac{d\eta}{dt}$, and if we neglect the small change of velocity from x, y to $x+\xi$, $y+\eta$, we may integrate with respect to the time,

$$(88)\qquad \begin{aligned} \xi&=-Be^{ky}\cos k(x-at),\\ \eta&=-Be^{ky}\sin k(x-at).\end{aligned}$$

Thus each particle performs a uniform revolution in a vertical circle of radius Be^{ky} in the time $T=\frac{2\pi}{ka}=\frac{\lambda}{a}$. The rapidity of decrease of the motion as we go below the surface is seen by the fact that at a depth $y=-\lambda$ the amplitude has diminished in the ratio $e^{-2\pi}=.001867$. The form of the wave-profile is shown in Fig. 15, the crests being farther above the

Fig. 15.

level than the troughs are below it. As the height increases the waves become sharper at the crest.

Vortex-motion.—Let us consider the change in circulation along a line that always contains the same particles. We have

$$(89)\qquad \begin{aligned}\frac{d\phi_{AB}}{dt}&=\frac{d}{dt}\int_A^B(udx+vdy+wdz)\\ &=\int_A^B\left\{\frac{du}{dt}dx+u\frac{d}{dt}(dx)+\frac{dv}{dt}dy+v\frac{d}{dt}(dy)\right.\\ &\qquad\left.+\frac{dw}{dt}dz+w\frac{d}{dt}(dz)\right\}.\end{aligned}$$

Now consider an element ds which at a time later by dt has moved to a position ds', Fig. 16. Since one end has moved in the X-direction a distance udt and the other a distance

$$\left\{u+\frac{\partial u}{\partial x}dx+\frac{\partial u}{\partial y}dy+\frac{\partial u}{\partial z}dz\right\}dt$$

the new value of its X-projection is

$$dx'=x+dx+\left\{u+\frac{\partial u}{\partial x}dx+\frac{\partial u}{\partial y}dy+\frac{\partial u}{\partial z}dz\right\}dt-(x+udt),$$

from which we obtain the derivatives

$$(90)\qquad \begin{aligned}\frac{d}{dt}(dx)&=\frac{dx'-dx}{dt}=\frac{\partial u}{\partial x}dx+\frac{\partial u}{\partial y}dy+\frac{\partial u}{\partial z}dz,\\ \frac{d}{dt}(dy)&=\frac{dy'-dy}{dt}=\frac{\partial v}{\partial x}dx+\frac{\partial v}{\partial y}dy+\frac{\partial v}{\partial z}dz,\\ \frac{d}{dt}(dz)&=\frac{dz'-dz}{dt}=\frac{\partial w}{\partial x}dx+\frac{\partial w}{\partial y}dy+\frac{\partial w}{\partial z}dz.\end{aligned}$$

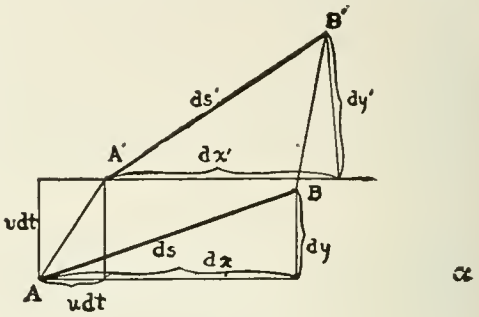


Fig. 16.

But the equations of motion (67) are, in abbreviated form,

$$(91)\qquad \begin{aligned}\frac{du}{dt}&=\frac{\partial(U+q^2/2)}{\partial x},\quad \frac{\partial v}{dt}=\frac{\partial(U+q^2/2)}{\partial y},\\ \frac{\partial w}{dt}&=\frac{\partial(U+q^2/2)}{\partial z},\end{aligned}$$

where $U=-(V+P+q^2/2)$. Accordingly,

$$(92)\qquad \begin{aligned}\frac{d\phi_{AB}}{dt}&=\int_A^B\left\{\frac{\partial(U+q^2/z)}{\partial x}dx+\frac{\partial(U+q^2/z)}{\partial y}dy\right.\\ &+\frac{\partial(U+q^2/z)}{\partial z}dz+\left(u\frac{\partial u}{\partial x}+v\frac{\partial v}{\partial x}+w\frac{\partial w}{\partial x}\right)dx\\ &\left.+\left(u\frac{\partial u}{\partial y}+v\frac{\partial v}{\partial y}+w\frac{\partial w}{\partial y}\right)dy+\left(u\frac{\partial u}{\partial z}+v\frac{\partial v}{\partial z}+w\frac{\partial w}{\partial z}\right)dz\right\}\\ &=\int_A^B\frac{\partial(U+q^2)}{\partial x}dx+\frac{\partial(U+q^2)}{\partial y}dy+\frac{\partial(U+q^2)}{\partial z}dz\\ &=(U+q^2)\Big]_A^B,\end{aligned}$$

which vanishes for a closed curve. Therefore if the bodily forces are conservative, the circulation around any closed curve moving with the fluid is independent of the time. If the circulation around a closed path is zero at one time, it remains zero, so that if the velocity-potential once exists, it always exists. This theorem is due to Lagrange.

From the equations (69), whose right-hand members are derivatives of the same quantity V, this quantity may be eliminated by differentiation. Differentiating the last equation by y, the second by z, and subtracting,

$$\begin{aligned}\frac{1}{2}\frac{\partial}{\partial t}\left(\frac{\partial w}{\partial y}-\frac{\partial v}{\partial z}\right)&+\xi\frac{\partial v}{\partial y}+v\frac{\partial\xi}{\partial y}-\eta\frac{\partial u}{\partial y}-u\frac{\partial\eta}{\partial y}-\zeta\frac{\partial u}{\partial z}\\ &-u\frac{\partial\zeta}{\partial z}+\xi\frac{\partial w}{\partial z}+w\frac{\partial\xi}{\partial z}=0,\end{aligned}$$

or otherwise,

$$(93)\qquad \begin{aligned}\frac{\partial\xi}{\partial t}+u\frac{\partial\xi}{\partial x}+v\frac{\partial\xi}{\partial y}+w\frac{\partial\xi}{\partial z}&=u\left\{\frac{\partial\xi}{\partial x}+\frac{\partial\eta}{\partial y}+\frac{\partial\zeta}{\partial z}\right\}\\ &-\xi\left\{\frac{\partial u}{\partial x}+\frac{\partial v}{\partial y}+\frac{\partial w}{\partial z}\right\}+\xi\frac{\partial u}{\partial x}+\eta\frac{\partial u}{\partial y}+\zeta\frac{\partial u}{\partial z}.\end{aligned}$$

On the right the coefficient of u, being the divergence of the vorticity, is zero, while that of ξ is by the equation of continuity equal to $\frac{1}{\rho}\frac{d\rho}{dt}$, so that equation (93) becomes

$$\frac{d\xi}{dt}=\frac{\xi}{\rho}\frac{d\rho}{dt}+\xi\frac{\partial u}{\partial x}+\eta\frac{\partial u}{\partial y}+\zeta\frac{\partial u}{\partial z},$$

which may be written, with its two companions,

$$(94)\qquad \begin{aligned}\frac{d}{dt}\left(\frac{\xi}{\rho}\right)&=\frac{\xi}{\rho}\frac{\partial u}{\partial x}+\frac{\eta}{\rho}\frac{\partial u}{\partial y}+\frac{\zeta}{\rho}\frac{\partial u}{\partial z},\\ \frac{d}{dt}\left(\frac{\eta}{\rho}\right)&=\frac{\xi}{\rho}\frac{\partial v}{\partial x}+\frac{\eta}{\rho}\frac{\partial v}{\partial y}+\frac{\zeta}{\rho}\frac{\partial v}{\partial z},\\ \frac{d}{dt}\left(\frac{\zeta}{\rho}\right)&=\frac{\xi}{\rho}\frac{\partial w}{\partial x}+\frac{\eta}{\rho}\frac{\partial w}{\partial y}+\frac{\zeta}{\rho}\frac{\partial w}{\partial z}.\end{aligned}$$

Thus the time-derivatives of $\frac{\xi}{\rho}$, $\frac{\eta}{\rho}$, $\frac{\zeta}{\rho}$ for a given particle are homogeneous linear functions of those quantities. By continued differentiation with respect to t and the substitution of the derivatives from these equations, we see that *all* the time-derivatives are homogeneous linear functions of the quantities themselves. Thus if at any time these quantities are zero, all their derivatives are zero, and developing by Taylor's theorem, we find that the function remains zero for all times. Thus if a particle is once not vortically revolving, it never can acquire such rotation under conservative forces.

Let us now consider two points A and B lying on the same vortex-line at a distance apart $ds=\varepsilon\frac{\omega}{\rho}$, where ε is a small constant. Since the particles lie on the vortex-line we have

$$(95)\qquad \frac{dx}{\xi}=\frac{dy}{\eta}=\frac{dz}{\zeta}=\frac{ds}{\omega}=\frac{\varepsilon}{\rho}.$$

For the difference of velocity at A and B we have

$$(96)\qquad \begin{aligned}u_B-u_A&=\frac{\partial u}{\partial x}dx+\frac{\partial u}{\partial y}dy+\frac{\partial u}{\partial z}dz\\ &=\varepsilon\left\{\frac{\xi}{\rho}\frac{\partial u}{\partial x}+\frac{\eta}{\rho}\frac{\partial u}{\partial y}+\frac{\zeta}{\rho}\frac{\partial u}{\partial z}\right\},\end{aligned}$$

or, by equations (94),

$$(97)\qquad u_B-u_A=\varepsilon\frac{d}{dt}\left(\frac{\xi}{\rho}\right).$$

Now at an instant later by dt, when the particles are at A' and B',

$$(98)\qquad \begin{aligned}dx'&=dx+(u_B-u_A)dt=\varepsilon\left[\frac{\xi}{\rho}+\frac{d}{dt}\left(\frac{\xi}{\rho}\right)dt\right],\\ dy'&=dy+(v_B-v_A)dt=\varepsilon\left[\frac{\eta}{\rho}+\frac{d}{dt}\left(\frac{\eta}{\rho}\right)dt\right],\\ dz'&=dz+(w_B-w_A)dt=\varepsilon\left[\frac{\zeta}{\rho}+\frac{d}{dt}\left(\frac{\zeta}{\rho}\right)dt\right].\end{aligned}$$

Therefore the projections of the arc ds' in the new position are proportional to the new values of the components of ω/ρ, as they originally were, so that the particles still lie on a vortex-line. Accordingly a vortex-line is always composed of the same particles of fluid. Also, since the components of ds have changed so as to be always proportional to the components of ω/ρ, if the liquid is incompressible the rotation is proportional to the distance between the particles. And whether ρ vary or not, if S is the cross-section of a vortex-filament, since the mass ρSds of a length ds remains constant, so does $S\omega$, the strength of the filament. Accordingly the strength of a vortex-filament is constant, not only at all points in the filament, but at all times, consequently a vortex existing in a perfect fluid is indestructible, however it may move. It is from this remarkable property of vortices discovered by Helmholtz that Lord Kelvin was led to imagine atoms as consisting of vortices in a perfect fluid.

From the kinematical properties of flow due to vortex-motion (62), we see that the velocity at every point of a circular vortex-ring, Fig. 17, due to all the elements of the vortex,

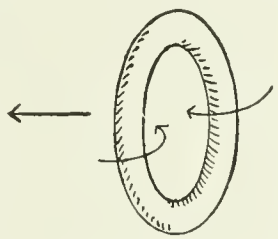


Fig. 17.

is in the same direction perpendicular to the plane of the ring, and in the direction in which the inside of the ring is turning; the ring therefore advances with a constant velocity, as if it were rolling in a tube which it just fits. We may verify this by an experiment due to Professor Tait, where smoke is suddenly forced out through a circular hole in a box provided with an elastic back. The smoky air rolling on the edge of the hole is endowed (by the friction, a *non-conservative* force) with a vortical rotation, and issues as a vortex-ring, which advances with approximately constant velocity for a considerable distance. That it consists always of the same air is seen by the smoke which it carries with it. Such a ring, on striking an edge or obstacle, is not destroyed or cut. Similar experiments can be performed with the rings formed by letting drops of ink fall into water. The loss of velocity finally obtaining in all these cases is due to the viscosity, that is, to non-conservative forces. The treatment of viscosity is beyond the scope of this article.

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Arthur Gordon Webster,
Professor of Physics, Clark University

Hydrofluor'ic Acid. See Fluorine.

Hydrofluosilicic (hī''drō-floo''ō-sĭ-lĭs'ĭk) **Acid.** See Fluorine.

Hy'drogen (Greek, «producing water,» in reference to the fact that in burning in air or oxygen, hydrogen forms water-vapor), a gaseous element, discovered by Cavendish in 1766. It was at first called «inflammable air,» the present name being due to Lavoisier. Hydrogen is

the lightest known substance, and it also has the smallest known atomic weight. The atomic weight of hydrogen is often taken as unity in stating the relative atomic weights of the different elements (see ATOMIC THEORY), but it is now more usual to assume the atomic weight of oxygen to be precisely 16, which amounts to making the atomic weight of hydrogen 1.0076. According to Regnault's experiments, hydrogen has a density equal to 0.06926 of that of an equal volume of air, at the same temperature and pressure. In absolute measure, the mass of a cubic centimetre of hydrogen, at the freezing point of water and under a pressure of 76 centimetres of mercury at Paris, is 0.00008957 gram, or 0.08957 milligram. Hydrogen has the chemical symbol H, and is one of the most abundant elements known. It occurs in the free state in volcanic gases, and in the sun and in many of the fixed stars. Free hydrogen is also present in the earth's atmosphere in exceedingly small amount. Water (or hydrogen monoxid) is its commonest and most abundant compound, and it is an essential constituent of nearly all organic tissues. Hydrogen may be prepared very easily by many methods. One of the most convenient of these consists in acting upon metallic zinc with dilute sulphuric acid, the reaction in this case being: $Zn + H_2SO_4 = ZnSO_4 + 2H$. Hydrogen is chemically inert towards most of the elements, at ordinary temperatures, but it combines with chlorine when exposed to light,—quietly in diffused daylight, and explosively under the direct action of sunlight. At elevated temperatures it combines with other elements also, and it burns in air (or oxygen) with the development of an intense heat, but with very little light; water being produced as the result of the combustion. Hydrogen has been both liquefied and solidified. Its critical temperature is estimated, by Dewar, to be about 402° F. below zero, and the same authority gives 15 atmospheres as the critical pressure. (See CRITICAL POINT, and GASES, LIQUEFACTION OF.)

Hydrogen combines with oxygen in two proportions. The monoxid, or common water, H_2O, is formed, as already noted, when hydrogen is burned in air or in oxygen. It is also formed in many of the double decompositions that occur in chemistry, as when metallic oxids or hydrates are dissolved in acids. Sodium hydrate, for example, combines with sulphuric acid according to the equation $2NaOH + H_2SO_4 = Na_2SO_4 + 2H_2O$, sodium sulphate and water being formed.

Hydrogen peroxid (or dioxid), H_2O_2, may be prepared by acting upon barium dioxid, BaO_2, with dilute sulphuric acid; the reaction being: $BaO_2 + H_2SO_4 = BaSO_4 + H_2O_2$. The barium sulphate that is formed at the same time is a heavy, insoluble substance, which is easily removed from the solution by filtration, or by settling and subsequent decantation. The aqueous solution of the peroxid may then be concentrated by evaporation over strong sulphuric acid, under the receiver of an air pump. When the water has all evaporated, the pure peroxid remaining behind has a specific gravity of 1.452, and is a colorless, oily liquid, devoid of odor, but having a disagreeable, metallic taste. The peroxid does not freeze, even when cooled to 0° F. At 70° F. it slowly gives off half its oxygen, passing into water. At 212° F. this change takes place very rapidly. Owing to the facility with which hydrogen peroxid gives off oxygen, it is used quite largely as a bleaching agent, and also, in surgery, as a disinfectant in the treatment of wounds.

When hydrogen is passed through boiling sulphur, combination takes place, with the formation of hydrogen sulphid, or sulphuretted hydrogen, H_2S. This compound is more conveniently prepared, however, by treating sulphid of iron, FeS, with dilute sulphuric acid, ferrous sulphate ($FeSo_4$) being formed at the same time. The reaction is: $FeS + H_2SO_4 = FeSO_4 + H_2S$. Sulphuretted hydrogen is a gas, devoid of color, but possessing an overpowering odor, suggestive of rotten eggs. It burns with a bluish flame, and is poisonous when inhaled in any considerable quantity, even though largely diluted with air. Under ordinary atmospheric pressure, sulphuretted hydrogen gas condenses, at 80° F. below zero, to a colorless liquid, which freezes to an ice-like solid upon being further cooled to 121° F. below zero. Liquefaction may also be induced at the ordinary temperature of the air by the application of a pressure of from 17 to 20 atmospheres. Sulphuretted hydrogen is an invaluable reagent in the chemical laboratory, where it is greatly used for separating the metals into groups, in inorganic analysis. (See CHEMICAL ANALYSIS.)

With carbon, hydrogen forms a large number of compounds which are collectively known as hydrocarbons (q.v.). With carbon and oxygen, and with carbon, oxygen and nitrogen, hydrogen forms compounds past enumeration. For further information concerning these, consult any treatise on organic chemistry, and also, in this encyclopedia, the articles FATTY COMPOUNDS and AROMATIC COMPOUNDS.

Hydrogen Peroxid, Hydrogen Sulphid, etc. See HYDROGEN.

Hydrograph'ic Surveying. See SURVEYING.

Hydrography, hī-drŏg'ra-fī (Greek *hydōr* or *hudor,* water, *grapho,* to describe), meaning literally a "description of water," is the name applied to that branch of physical geography which describes the water on the surface of the globe, whether occurring on land, as in springs, rivers, and lakes, or in seas and great oceans. It is sometimes used in a more restricted sense, and confined to a description of the bearings of coasts, of currents, soundings, islands, shoals, etc., with a more immediate view to navigation, and the construction of charts and nautical tables. Henry the Navigator was the first who constructed a tolerably reliable sea-chart, and laid the foundation of hydrography as a science. This was in the 15th century. In France and other countries, institutions specially formed for teaching navigation are called hydrographical schools. The hydrographic office is now an important department of the naval administration, its officers consolidating into available maps the results of the observations sent to them from time to time by those engaged in exploring expeditions, and by navigators from all parts of the world. See SURVEYING.

Hy'drolite. See GMELINITE.

Hydrom'eter, an instrument for determining the specific gravity of fluids. When a solid body floats in a liquid, and displaces a quantity of the liquid, it is supported by the same upward

pressure that formerly supported the liquid which it displaces. The weight of the solid body is thus equal to the weight of the liquid that it displaces. Hence, the depth to which

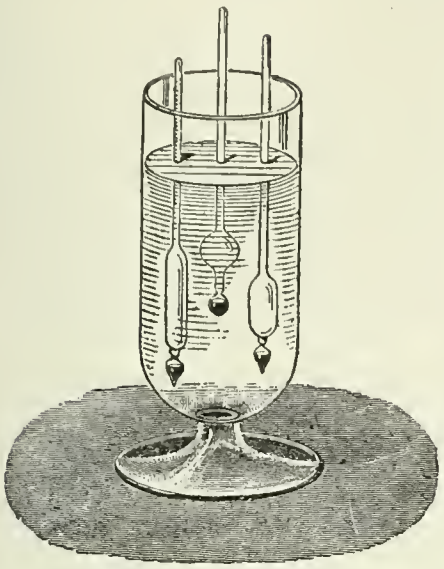


Fig. 1.— Forms of Hydrometer.

the same solid body is immersed in a liquid is greater as the density of the liquid is less, and less as the density of the liquid is greater. And, likewise, the weights required to immerse a given body equally deep in various liquids are inversely proportional to the densities of the liquids. On each of these principles a form of hydrometer is founded. One is called the constant weight hydrometer, the other the constant volume hydrometer. The first, usually made of glass, is shown in Fig. 1. It has a large hollow bulb, and below that a smaller bulb, weighted with mercury, to make the instrument float upright and it is surmounted by a cylindrical glass stem which is graduated, the divisions being usually marked on a piece of paper enclosed within the stem. The depth to which the hydrometer sinks in the liquid gives the density.

Of constant volume hydrometers, Nicholson's hydrometer, the best known, possibly, is adapted for determining the specific gravities not only of fluids, but of solids also. It is shown in Fig. 2. It consists of a hollow cylinder of metal, surmounted with a very fine metallic stem, to the top of which there is attached a plate or pan for weights. From the bottom of the metallic cylinder hangs a kind of cup or basket. The whole instrument is weighted so as to float upright. On the fine metallic stem there is a marked point: and by putting weights on the upper pan the hydrometer is always made to sink precisely to the point. If the weight of the instrument itself is known, and also the standard weight, or weight required to sink it to the marked point in distilled water, the calculation of the specific gravity of any liquid from an observation with the instrument is very easy. To determine the specific gravity of solids, the instrument is placed in distilled water and the solid body is put on the upper pan. Weights are then added till the hydrometer sinks to the marked point. But the standard weight of the instrument being known, it is plain that the difference between it and the weights that must be added on the upper pan to the weight of the body whose specific gravity is to be determined must be the weight in air of that body. The body is now transferred to the basket below the instrument, and the weight of the solid in water is similarly determined. From these data the specific gravity of the solid is calculated in the ordinary way. (See Specific Gravity.)

Hydrop'athy, a name for the treatment of diseases by the use of water. This name is now largely superseded by the term hydrotherapy (q.v.).

Hydrophobia (from Greek words meaning "fear of water"), an acute or subacute infectious disease, particularly of canine animals. It is usually communicated by a bite of the afflicted animal, and the contagion, the exact nature of which is unknown, is resident for the most part

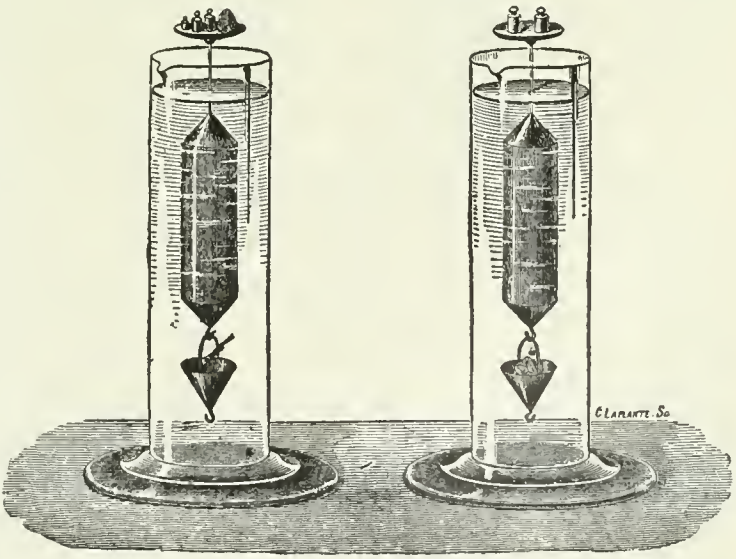


Fig. 2.— Nicholson's Hydrometer.

in the saliva, although it has been found in the peripheral nerves, the pancreas, and the suprarenal gland. It is frequently communicated to man, although the dog, wolf, fox, deer, cat, cow, and skunk are the animals most frequently affected; it has been known to occur also in the

horse, pig, birds, and other animals. Nine tenths of all the cases are contracted through the bites of rabid dogs. Hydrophobia may be produced, however, by wounds occurring during the dissection of rabid animals; it is said to have been caused by eating the flesh of animals that have died of the disease; and the milk of sucklings, animal and human, is thought to contain the virus. This poison has been found to be active in a dog 44 days buried, and in a rabbit buried 21 days.

In dogs the disease is comparatively common. In 1900 D. E. Salmon, chief of the United States Bureau of Animal Industry, determined that the disease was prevalent throughout the United States, and largely on the increase. The chief symptoms in dogs may be divided into two classes. Dogs suffer from furious rabies, and from dumb rabies. In the former Pasteur thought that the brain was involved; in the latter, the spinal cord. The furious form of the disease shows (1) a period of melancholy or depression; (2) a period of irritation; (3) a period of paralysis. The first varies from a few hours to two days. During this period the anxious and restless dog may also be cross. He hides from his master, obeys sullenly, and changes his position frequently. His appetite may not be at first affected, but it soon fails; he may lick everything in sight, or bite everything within reach, swallowing all sorts of foreign bodies. The period of irritation usually persists three or four days, during which the dog is spasmodically mad; restlessness increases, and the animal has an irresistible impulse to run away. During the running spells dogs may bite at everything in sight; at such times they usually seem fearless, and rarely avoid other dogs or people. If caged, they tear and chew on the bars, even breaking their teeth or fracturing their jaws. The bark is modified into a peculiar howl. During the third or paralytic period the dog is subdued and more sullen; the lower jaw becomes paralyzed and hangs down, saliva dripping from the mouth; the gait is staggering; from the fourth to the eighth day after the onset he dies of paralysis or exhaustion.

In dumb rabies the characteristic second stage may be entirely absent. The most persistent feature of dumb rabies is the dropped lower jaw, the paralysis of the jaw in the later stages preventing the dog from biting. Veterinarians see many cases of dumb rabies in dogs brought to them by owners who think that the trouble is caused by a bone in the throat. Beware of a dog that becomes listless and dull and hides away, is always on the go, prowling about and restless; one that is sullen and walks with his head down like a bear. A dog that scrapes incessantly and tears things up, and one that suddenly becomes excessively fond of its master, desiring to lick his hands and face, should be watched and guarded. A dog that has trouble in swallowing, that seems to have a bone in his throat, or, having wandered away from home, returns covered with dirt, exhausted and miserable, should be put under lock and key.

So far as the water-test is concerned, it is nonsense. The mad dog is often very fond of water; he is thirsty and rushes into water, thrusts his head into it; but he may have great difficulty in swallowing it, the act of swallowing usually bringing about severe convulsions.

In man the disease may go through somewhat similar stages, but the course is greatly modified; males are more likely to be affected than females, the difference in dress and exposure accounting for this; and two fifths of the subjects are below the age of 15. Bites on the face, neck, and hands are thought to be the most liable to develop the disease, and punctured wounds are more dangerous than lacerated wounds because of the difficulty in cleansing them. In man the period of incubation varies widely, from 20 to 60 days is the usual range, but six months may represent an extreme limit. In exceptional instances the period of incubation seems to have been greatly prolonged. The pathological changes recently discovered are found to be extremely characteristic, so that it is now even possible to diagnose rabies in a dog within a reasonable time after his death.

In all cases of suspected hydrophobia it is best not to kill the dog; but if, by accident or design, the death is accomplished the body should at once be sent to the health board authorities for a confirmation of the diagnosis. The characteristic changes, as described by Nèlis in 1900, consist in minute alterations in the spinal ganglion cells, especially in a proliferation of the endothelial cells of the ganglionic cell-capsule. These changes are considered characteristic of this disease, and are not known to occur in any other affection. The general treatment is both prophylactic and remedial. All stray dogs should be destroyed; or, if they have bitten anyone, they should be imprisoned and watched. It is best to have dogs muzzled or held in leash. In Germany muzzling has entirely eradicated hydrophobia. London in 1889 had 176 cases of hydrophobia. Muzzling was made compulsory, and in 1890 the number of cases of rabies had fallen to 44; in 1891 to 28; and in 1892 to 3. The muzzling was then allowed to lapse, owing partly to the sentimental agitation of many so-called lovers of dumb animals, and the cases of rabies increased, 25 persons dying of the disease in five years, while 174 patients were sent for treatment to the Pasteur Institute.

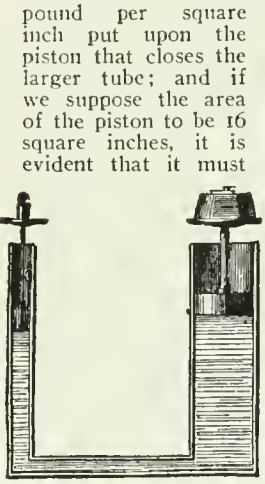
The direct treatment of the wound causing rabies is important. The poison seems to diffuse slowly, so that, if a ligature is promptly placed about the limb on the body side of the wound, a suction-cup or direct sucking may extract all of the virus. In the non-abraded mouth the virus is not very poisonous. If the wound is deep it is sometimes wise to make immediately a free incision, permitting the flow of blood to wash away the virus, and also allowing a more open surface for the actual cautery. One of the best cauterizing agents to use is strong nitric acid. The after-treatment will depend very largely on the promptness and thoroughness of the first treatment. If there is reason to believe that the early cauterization was ineffectual, the Pasteur method of treatment (see PASTEUR, LOUIS) is advisable. This is a complicated method which was elaborated by Pasteur about 1880. He found that the virus was present in the spinal cord of a rabid animal; that its virulence slowly diminished after the death of the animal; that the virus could be artificially weakened by passing it through a series of monkeys until it was powerless; and that, conversely, this virulence could be restored by inoculating the attenuated virus in a series of rabbits. Thus Pasteur made a weak virus and a strong one at will, and he later produced immunity to the virus by the use of

his attenuated material. The final plan that was adopted was to kill a rabbit by means of his strong virus, remove its spinal cord, cut this up into short sections, and dry it for varying periods of time. In this manner he secured a graded series of cord-sections of gradually decreasing virulence. These were emulsified in salt-solution and used to inject into animals or man, the weaker virus being first used and the stronger later. Two methods are now (1903) in vogue — the simpler method, for the less severe bites, in which 19 injections are given in 14 days; and the intensive method, for the severe bites about the neck and face and the large nerve-trunks, in which 28 injections are administered in 21 days. The serum-treatment of the disease is also rapidly becoming a possibility. Two Italian investigators, Tizzoni and Centanni, have made an anti-rabic serum that promises something for the future. For the present, however, the Pasteur method is the most reliable. It is certainly harmless, and is worthy of trial. The results are assuring, and the statistics, to most minds, convincing. It should not be forgotten that there is a false hydrophobia which is of purely hysterical origin, during an attack of which some patients have died. Consult: Bradford, 'Two Lectures on Rabies' ('Lancet,' 3 March 1900); 'Hydrophobia in Germany' ('Hygienische Rundschau,' 7 Nov. 1899); 'Report of Select Committee of the House of Lords on Rabies in Dogs' (Blue Book, 1887); Medical News' (15 Aug. 1903); Sixteenth Annual Report Bureau of Animal Industry (1899). See HYSTERIA.

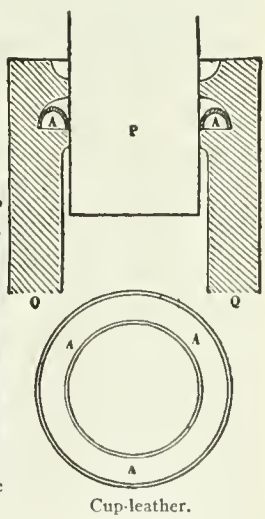
SMITH ELY JELLIFFE, M.D.,
Managing Editor Journal of Nervous and Mental Disease.

Hydrophytes, plants which grow in water or mud. They may be wholly submerged, completely without roots, and derive their sustenance wholly from the water; or may live amphibiously, rooted in soil and lifting some or all of their leaves into the air, and so differ only in a greater or less degree from land plants. Adaptations of water plants are especially to meet the difficulty of obtaining oxygen and of effecting pollination under water. In plants which grow wholly in or under water, roots, when present, are comparatively small and free from hairs, stems are slender and abound in air-spaces, and leaves are, as a rule, either long and narrow, or else greatly subdivided, so as to expose the greatest possible amount of surface. The cuticle of the leaf, also, is very thin, and lacks several of the structures, such as palisade cells and stomata, always present in aerial leaves. Water therefore enters easily into the tissues of the plant and carries with it a large amount, not only of oxygen, but of dissolved nutriment, so that in any oceanic plants, and plants of ponds and rivers, no roots whatever are developed, and these live practically independent of any connection with the land. The fertilization of submerged cryptogams is effected by the passing of generative elements through the water, but only a few submerged phanerogams make such use of the agency of the water. The pollen of the eel-grass (*Zostera*) has been modified for under-water efficiency. It does not form round grains, but elongated thread-like filaments which have the same specific weight as the water, and hence neither float nor sink, but move about at the level of eel-grass growth until they come in contact with the stigma of some neighboring flower. In the duckweeds and some other submerged plants, the male flowers break loose, rise to the surface and float away like little boats carrying pollen to the female blossoms, which at that time have risen to the surface but sink again as soon as fertilized. The hydrophytes show many examples of exceedingly wide distribution, as might be expected of oceanic plants, but is not so easily explained of those of fresh waters, many genera and species of which, nevertheless, are cosmopolitan.

Hydrostat'ic Press, a machine, sometimes called Bramah's press, from Joseph Bramah, its presumed inventor, which by the force obtained from water under pressure performs work, especially packing, as of cotton. Two tubes of unequal area are connected, and the whole vessel filled with water. Let the area of the smaller tube be one square inch, and let the piston that closes it be loaded with one pound. A pressure of one pound per square inch will be exerted on every part of the boundary of the fluid. There will thus be a pressure of one pound per square inch put upon the piston that closes the larger tube; and if we suppose the area of the piston to be 16 square inches, it is evident that it must be loaded with 16 pounds in order that the pressure to which it is exposed may be equilibrated. Thus a load of one pound on the smaller piston supports 16 pounds on the larger.



Principle of the Hydraulic Press.



Cup-leather.

The principle of the hydrostatic press was pointed out by Stevinus; but it was Bramah who, in 1796, by an ingenious contrivance, gave the principle practical application. A Bramah's press, as ordinarily constructed and used to provide immense pressure, is a simple enough contrivance. By means of a small pump water is pumped from a cistern through a small horizontal tube into the space that receives a large piston. The goods to which pressure is to be applied are placed between the plate attached to the large piston and an upper plate that is kept in position by powerful iron rods. The water-tight stuffing of the piston is the great difficulty in the construction of the machine, and it was the invention of a water-tight collar by Bramah that made the use of the press practicable. The diagram shows a section AA of the collar surrounding the piston P. The collar consists of a

circle of solid leather, which is stamped by means of a die into the half-ring, of which a section is seen. When pressure is applied the water fills the channel formed by the half-ring, and squeezes the inner side of the ring against the piston, and this takes place with greater force the greater the pressure to which the water is subjected.

Hydrostatics, the part of hydrodynamics that treats of the application of forces to fluids at rest. It is generally divided into two parts, one, hydrostatics proper, which deals with incompressible fluids, or liquids, and the other, which deals with compressible fluids, that is, with gases. The latter part of the subject is commonly called pneumatics.

The property of fluids which distinguishes them from solids, is want of rigidity. A fluid offers no permanent resistance to forces tending to change its shape. The particles of a fluid are mobile; and while in the case of liquids very considerable forces of cohesion are exhibited, yet the particles show great freedom to alter their relative positions, and to pass from place to place within the general mass. A very important property that follows from the nature of fluids is that of the equable transmission of pressure. Suppose a weightless liquid inclosed in a vessel A, which is fitted with a piston P. If pressure is applied to P it will be transmitted in all directions through the liquid. If other openings are made, and if they are fitted with pistons, it is evident that to keep each of these pistons in its place, pressure inward must be applied. The pressure that must be applied to any piston equal in area to the area of P is equal to the pressure on P; and if the area of one of the other pistons is greater or less than the area of P, the pressure required to keep it in its place is proportionately greater than or less than the pressure that is applied to P. This principle, which is the most important in hydrostatics, finds a practical application in the hydrostatic press (q.v.).

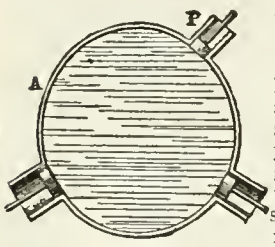


FIG. 1.

In measuring fluid pressure the area exposed to the pressure of the fluid is to be considered. If it were required to calculate the force that must be applied to the rod of one of the pistons in the figure in order to keep the piston in its place, it would be necessary to know the area of the piston and the pressure on it in grams per square centimetre. When the pressure over a given area is not uniform we must then know the law of variation, or at least the average pressure over the whole area, in order to calculate the whole pressure on it; and it will be readily understood that when, in such a case as this, the pressure per unit area at a point is spoken of, it is understood to mean the pressure which would be exerted on unit area were there found a unit of area pressed with a uniform pressure, the same as that at the point in question. Not only is pressure transmitted out to the surface or envelope of the liquid, as is shown in the figure, but within the fluid itself the particles are all pressed together. The pressure is transmitted to every point within the liquid and may be observed to be acting there. When a solid is immersed in the liquid it is pressed at every point of its surface in the direction perpendicular to the surface at that point, and, in the case of the hypothetical weightless liquid, with a pressure equal in amount per unit of the area to that applied from without to the liquid. The pressure about any point in a fluid is equal in all directions, and when any surface is exposed to the pressure, the direction of it is normal to the surface at every point.

In actual fluids, which have weight, it is evident, in the first place, that the lower layers of the fluid sustain more pressure than the upper layers. For whatever pressure the upper layers are exposed to is transmitted to the lower layers; and besides the lower layers have to support the weight of the superincumbent liquid. The most important case to consider is that of liquids having a free surface, that is, a surface exposed to the air. Here the surface itself is level. Otherwise there would be a tangential force which would make it flow down till the level state is reached. In every horizontal layer throughout the liquid the pressure per unit area is the same; and this is the case independently of the shape of any vessel in which the liquid may be contained. The pressure per unit area in any horizontal layer depends only on the height of the free surface of the liquid above the layer considered, and the specific gravity of the liquid; and it is equal to the weight of a column of the liquid of unit sectional area whose height is the height of the free surface. This principle gives rise to remarkable results. Take, for instance, an apparatus consisting of a pair of circular boards connected by a belt of pliable leather (like a pair of bellows), and having a small tube inserted into an opening near the bottom, and from it a tall tube rising perpendicularly. Heavy weights may be put on the upper circular board, and if water be then poured into the upright tube they will be raised up by the pressure from below of the water. For the pressure to which the under side of the circular board is exposed is equal to the weight of a column of water whose section is that of the circular board, and whose height is the difference of the heights of the under surface of the circular

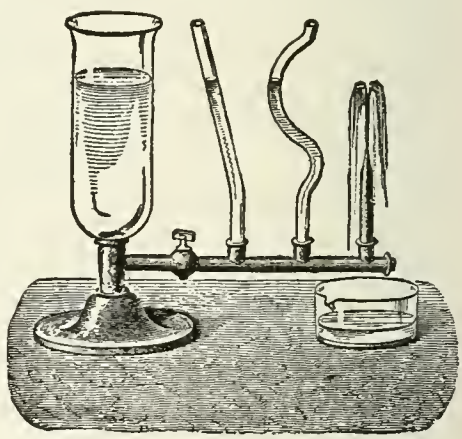


FIG. 2.

board and of the free surface of the water in the small upright tube. When shown in this form the principle here employed is often called the hydrostatic paradox, on account of the very great pressure that a very small quantity of water may be made to give rise to.

It is a well-known principle that liquids tend to find their own level. Thus, in the accompanying figure, showing a series of connected vessels, the liquid is seen to stand at the same height in the principal vessel and in the variously shaped tubes communicating with it, while from the short, narrow mouthed tube it spouts up to nearly the level of the water in the principal vessel.

When a solid is immersed either partially or wholly in a liquid a portion of the liquid is displaced. The solid is at the same time pressed at every point by the liquid, the pressure being always normal to the surface. The upward pressure on the solid is greater than the downward by an amount equivalent to the weight of the liquid displaced by the solid; for if, instead of the solid, the quantity of liquid displaced by it were present, its weight would be upborne by the pressure on every side. These pressures now act on the solid and whether or not the solid floats under their influence, as much of the weight of the solid as corresponds to this pressure is supported by the surrounding fluid. These considerations applied to the phenomenon of floating bodies illustrate the principle just explained; and the experiments that are made for the purpose of determining the specific gravity of bodies heavier than water also depend on that principle. See SPECIFIC GRAVITY.

If a body be immersed in water or other fluid, the resultant of the fluid pressures meets the surface at a point called the centre of pressure, which will coincide with the centre of gravity of the body if the body be horizontal, but will pass below it if the plane of the body is inclined to the fluid's surface.

The conditions of floatage and of stability of a body floating in a liquid are of great importance. A floating body displaces a certain quantity of the liquid, and the weight of the

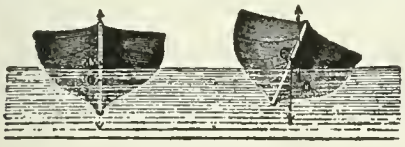


FIG. 3.

solid body is equal to the weight of the liquid that is displaced by it. To calculate how much of the body is submerged, and how much floats above the liquid, it is only necessary to consider what volume of the liquid would be equal in weight to the weight of the floating body. For example, the specific gravity of ice is about nine tenths of that of ordinary sea-water. Hence 9 cubic feet of sea water weigh as much as 10 cubic feet of ice. Thus in an iceberg nine tenths of the ice is under water, and one tenth is above the surface. In ships and other floating bodies the stability depends on the form of the body. A sphere of wood floating in water is indifferent as to position. The slightest force is sufficient to overturn it from any given position or to set it rotating in the water. With a ship or other body that must float with one side upward, the stability is quite as important as the floating power. The accompanying figure illustrates the conditions of stability. When a solid body is slightly displaced from its ordinary position of equilibrium, the forces that act upon it are seen to be twofold. First, there is the force of gravity on the solid acting vertically downward, which, if G be the centre of gravity, may be considered to act downward through that point; and secondly, there is the resultant of the upward pressures of the various portions of the liquid, which, if O be the centre of these upward parallel forces, may be considered as equivalent to a single force acting vertically upward through that point. In the figure these two equal parallel forces are seen to form a mechanical couple whose tendency is to right the boat, and bring it back into its ordinary floating position. But if the upward vertical line through O were on the other side of the downward vertical line through G, it is plain that the effect of the couple would be to carry the boat away from the position in which it ought to float; and the boat would thus be unstable.

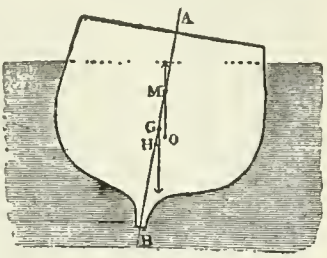


FIG. 4.

The metacentre is a point in a floating body of great importance, as its position determines whether the equilibrium is stable or unstable. Let A B in the figure be a line drawn through the points G and H, the centre of gravity of the floating body, and the centre of the figure of liquid displaced when the body is floating with A B vertical. Let the body be then slightly displaced, and let O be the new position of the centre of the figure of the displaced liquid, and let M be the point in which A B is cut by a vertical line through O: M is the metacentre when the displacement from the original position is infinitesimal. If the metacentre is above G then the equilibrium is stable; if it is below G the equilibrium is unstable, and the body being slightly displaced, it tends to fall farther and farther from its position of equilibrium.

Among the instruments and machines founded on the hydrostatic principles here laid down are the barometer, the siphon, the hydrostatic press, and the hydrometer (qq.v.).

Hydrotherapy (Greek, *ὑδωρ*, water, and, *θεραπεία*, cure), a method of treating diseases by the application of hot and cold water, which has come extensively into practice of late years, and is recognized by the medical profession as a very efficient therapeutic agent. The efficacy of water as a hygienic medicine has been recognized from the earliest times. Hippocrates, Celsus, and Galen regarded water as of especial value in the treatment of acute diseases; and during the Middle Ages the same view was advocated by many famous physicians. During the 18th century there was a growing belief in

its virtue as a curative agent, though rather in acute than in chronic diseases. Some physicians used water for internal treatment, others for external treatment, but hydrotherapy, as now understood, combines both methods. It was originated by Vincent Priessnitz, a Silesian peasant. When a boy of 13, having sprained his wrist, he applied it to the pump, and afterward bound a wet bandage upon it. As this became dry he rewetted it, and thereby reduced the inflammation, but produced a rash on the surface of the skin. Shortly afterward he crushed his thumb, and applied the wet bandage as before, and again an eruption showed itself. He concluded that the rash was an indication of impurity of blood; and having instituted a series of observations in regard to various wounds and ulcers on the persons of his neighbors, he was led to form a pathological theory, according to which disease is caused by an accumulation of morbific matter, which must be eliminated from the system by cold water applications and the observance of a strict regimen. His views were confirmed by an accident to himself, in which, through a cart running over him, he received some broken ribs and severe contusions, and was given up by the physicians; but on learning their opinion he tore off their bandages, and applied others wet with cold water. He also replaced his ribs by inflating his lungs while pressing his abdomen against the window-sill. Either through or in spite of this treatment Priessnitz recovered and the carrying out of this cold-water theory became the object of his life. In rapid succession he invented the sponge-bath, the wet-sheet packing, the sitz, foot, and arm baths, the douche, the steam-bath, the dripping sheet, the plunge, the dry-blanket packing, and other appliances of the hydropathic system. In 1829 he established, at his native village of Gräfenberg, a range of baths, which speedily grew in reputation, and attracted visitors from all parts of Europe. The Austrian government lent him its patronage, and all the opposition of the medical faculty was unable to stem the popularity of the new system. The original establishment at Gräfenberg soon expanded into an extensive suite of buildings, stretching along the slope of one of the Sudetic Mountains, and resorted to by troops of invalids, who sought to regain health by bathing, exercise, simple diet, and agreeable society. Similar institutions soon sprung up in other parts of Germany, and were at length introduced into England, a hydropathic society having been formed in London in 1842. At the present time hydropathic institutes exist in great number throughout the world, and so universal have hydrotherapeutic procedures become that a large body of quacks thrive on the prestige given to hydrotherapy by regular physicians. The theories of Preissnitz are now known to be fallacious.

The work of Winternitz and his disciples has put the general principles of hydrotherapy on a rational footing; there is little doubt, however, that hydrotherapy, like any other therapeutic agent, may be greatly abused. It is by no means a universal panacea. There are a large number of ways of applying hot and cold water to the body. One enthusiastic advocate has described over 300 separate kinds of application. In general, however, the water may be applied in the shape of tub-baths, ablutions, packs, rain-baths, and douches. These may be divided and subdivided as indicated. *Tub-baths* may be full, half, or local baths, as to the pelvis, the feet, the hands, etc. The full tub-bath is usually given at a temperature of 55° F., unless special indications are to be met. If the patient's reaction is not of the best, the temperature should be about 60° F., and vigorous friction of the skin should be maintained. The time spent should be short, 10 to 20 seconds. The full tub-bath is a strong tonic. In severe illness the tub-bath should be given only by a trained nurse under the physician's orders. Half-baths are taken at a temperature of 60°–75° F. After wetting the face and chest the patient sits in a tub about one third to one half filled with water, sufficient at least to cover the legs and the pelvis. The attendant splashes the cold water over the patient's body, maintaining at the same time a vigorous friction by means of a flesh-brush. The time is from one to five minutes, but the bath should not be continued if the teeth begin to chatter or if there is any evidence of defective reaction, as blueness of the lips, or thin pulse. Local cold baths, such as sitz-baths and foot-baths are very important hydriatric measures. The cold foot-bath, plunging the feet for from one to three minutes in cold running water, is of service in sluggish circulation of the feet, neurasthenia and hysteria. Warm full baths at a temperature of 90°–98° F., for a period of from 5 to 20 minutes are very useful as sedatives to the nervous system, particularly so in insomnia and nervousness from overwork, especially when taken at night. The best effect is obtained if they are taken at the time of retiring and are followed by a brief application of cold water, either in the shape of a half-bath, or a douche. After the bath the patient should wrap up in a linen sheet and a blanket to keep up the dilatation of the blood-vessels of the skin. Perspiration is to be avoided, save in particular instances.

Ablution.— This is one of the simplest of hydriatric measures. It is a valuable skin and nerve tonic, and is particularly adapted for children and women. It consists in the application of water to the body at a temperature of 50°–60° F., from the hollow of the hand, or by means of a bath-glove or wash-cloth. The entire body is gone over, one part after another being systematically treated. One to two minutes' application followed by vigorous rubbing with a coarse towel or flesh brush, is sufficient. Ablution is particularly valuable for reducing temperature, often bringing about quiet, restful sleep in tossing and fretful children.

Affusion.— In this treatment a volume of water from a pitcher or a pail is poured over the entire body, or upon certain parts, the patient sitting or standing erect in a tub or bath. The temperature should be 50°–60° F., and the whole procedure should not consume over 10 or 15 seconds. The reaction is obtained by rubbing. In certain muscular tremors, in neurasthenia, etc., this procedure is of service.

Packs or Compresses.—These may be dry or wet, general or local. The dry and wet packs are applied in the same manner. The patient is placed on a narrow bed or couch with a rubber sheet, a blanket, and a linen sheet beneath him, the blanket and sheet falling on each side of the couch. The sheet is then brought up and, with the arms to the side, wrapped thoroughly about him, the face alone being exposed. The blanket

is then wrapped about the patient in a similar manner. Cloths wrung out in cold water may be applied to the head. In a wet pack the sheet is first wrung out in cold water; in the dry pack it is frequently warmed. The object of the application is to bring about free perspiration, and this is the usual result. Hot drinks may be administered freely. The time given to the application will depend largely on the conditions to be met. If reduction of temperature alone is desired, the patient may remain in the pack until the perspiration is free, and he may then be wrapped up in a dry blanket. In certain uræmic states, and in infantile convulsions, a longer period may be necessary. The wet pack is an excellent procedure in the treatment of alcoholic excesses. The initial effect of a cold pack is constriction of the blood-vessels; this is soon followed by a dilatation which continues throughout the application and is the main cause of the free perspiration. The pulse-rate is reduced and the arterial tension falls. The stress of elimination is taken from the kidneys, the amount of blood within the brain diminishes, and sleep is encouraged. In the hot general pack a blanket only is used. This is wrung out in water at 140°–150° F., the temperature at the time of application not being over 105°–108° F. Local packs or compresses are of inestimable service in a variety of conditions. These are usually made of pieces of heavy muslin, canton flannel, or linen, varying in shape according to the site of application. They are wrung out in cold or hot water and applied to the head in headache, to the neck in sore throat, tonsillitis, diphtheria, earache; to the chest in pleurisy, pneumonia, neuralgias; to the heart in rapid overacting heart-action; to the stomach in indigestion; to the joints in sprains, rheumatism and gout; to the abdomen in gastroduodenal catarrh, irritable bladder, catarrhal appendicitis, colitis, peritonitis. Hot applications are particularly serviceable in painful menstruation. Hot water-bags have largely taken the place of hot compresses since they have been made so handy in shape and size and so reasonable in price.

The Douche.— This application is one of the best tonics, but requires special rooms for its use. These are found in the best appointed hydropathic institutes. The douche consists in the application of hot and cold water delivered through a hose. It combines the elements of the water, heat, cold, and force. The regulation of the pressure and temperature is an important feature in the scientific use of the douche.

Consult Cohen, 'Physiologic Therapeutics Hydrotherapy' (1902); Baruch, 'The Principles of Hydrotherapy' (1900); Kellogg, 'Hydrotherapy' (1902). See Bath and Bathing.

Smith Ely Jelliffe, M. D.,
Instructor in Pharmacology and Therapeutics, Columbia University.

Hydrozo'a, a class of *Cœlenterata* (q.v.) embracing the polyps, all of which bear a general resemblance to *Hydra* (q.v.). There are two alternating generations, that is, (1) the sessile asexual polyp, which (2) gives rise to a jelly fish or medusa. The hydroid polyp is like hydra, a two-layered vase-like sac, with a circle of tentacles around the mouth. This gives off by a budding process a bell-shaped medusa, which is much more highly organized than the polyp, having a well developed digestive and nervous system, and sense-organs (eyes and ears, or otocysts). The *Hydrozoa* are at present divided into seven orders, the most important of which are, besides *Hydraria* represented by hydra; the *Hydrocorallinæ* of which *Millepora* (q.v.) is the type; the *Tubulariæ* comprising *Hydractinia, Tubularia,* etc.; the *Campanulari* of which *Campanularia, Clytia,* and *Obelia* are examples. Near this group belongs the extinct order of *Graptolites,* which were floating forms living in the Paleozoic seas. The last order (*Siphonophora*) comprises the Portuguese man-of-war (q.v.) and other forms, which are beautiful transparent pelagic animals, very brightly colored and highly specialized.

Hyena, hī-ē'nä, one of a family (*Hyænidæ*) of carnivorous mammals, having relations in structure to the bears, the cats and the civets, familiar in Africa and southern Asia. They are of moderate size, have large, rather short heads, powerful forequarters, feeble and drooping hindquarters and short tails. The eyes are large, and have longitudinal pupils; the ears are long, erect, very open, and directed forwards. The teeth are numerous, massive, tuberculated, and well adapted to aid the muscular jaws crunch the strongest bones, as hyenas are able to do. Hyenas are nocturnal animals which pass the day in solitude in caves or other hiding places, which they quit at night in order to seek their prey in bands. Carrion is a favorite food, and the stench attracts the hyena by night as it does the vulture by day. In some cases they dig up dead bodies and devour them. They also prey on living animals, and flocks of sheep and goats suffer severely from their ravages in some localities. The common or striped hyena (*Hyæna striata*) is a native of Northern Africa and parts of Asia, even eastward to Burma. It is about the size of a large dog, brownish-gray and marked with transverse bands of dark brown on the body, which become oblique on the flanks and legs. The hair upon the line of the back is much thicker and stronger than on any other part, forming a sort of mane, extending from the nape of the neck to the origin of the tail. This species was well known to the ancients, who entertained many absurd notions respecting it, believing that its neck consisted of but one bone; that it changed its sex every year; that it could imitate the human voice, etc. It was formerly supposed that the hyena was untamable, but that it can be completely tamed there is not the shadow of a doubt. The spotted hyena (*H. crocuta*) has a considerable resemblance to the former species, but is larger, and is marked with numerous round blackish-brown spots instead of stripes, nor is the mane so large. This species inhabits many parts of Africa, and used to be peculiarly numerous around the Cape of Good Hope. There is another species, the brown hyena (*H. brunnea*), which differs from the preceding by having stripes on the legs, the rest of the body being of a dark grayish-brown. It also inhabits the south of Africa. An extinct species, the cave hyena, was abundant in England, France, and Germany anterior to the glacial epoch, and has left its remains in many caves of these countries. Though named *H. Spelæa,* it seems practically identical with the existing *H. crocuta.*

The fossil ancestry goes back into the tertiary whence it seems to have sprung from the same stock that gave rise to the viveroids. Consult writers upon nature and sport in Africa and India.

Hyena-dog, an African canine animal (*Lycaon pictus*), which takes its name from its hyena-like appearance in shape and color, and is also called Cape hunting-dog because it hunts in packs. It differs from the typical dogs in having only four toes on both the fore and hind limbs, and in its dental fauna, and it seems to be a comparatively recent immigrant into South Africa, since its bones are found in British caves. It preys upon antelopes, cattle, etc., and was a scourge to the early settlements, when it was more numerous and bold than now.

Hy'giene, broadly, the science and art of preserving health; as currently restricted, not by curing disease but by its prevention, through the removal of its generating causes. As we cannot remove them until they are known or truly inferred, the science advances *pari passu* with that of medicine, and had no general basis till the past century, during which unprecedented progress was made in all branches of medicine, than which none is more important than that of preventive medicine (q.v.). Still, good sense had been applied to it for ages, especially in regions where ignorance was speedy death. The Mosaic laws recognize the three great principles of cleanliness, isolation, and wholesome diet, with a thoroughness that leaves little to be desired. Hence, the Jews were almost immune for many centuries from the plagues which swept away their Christian neighbors; this was one reason why they were often suspected of starting or spreading the plagues. As in most ancient religions, these sanitary principles were part of their religious observances. In the 18th century some elementary ideas of hygiene had become known: the prevention of scurvy by lemon-juice and vegetable diet, of jail-fever by less crowding and more cleanliness, and of smallpox by inoculation, were among the foremost advances. Our new scientific acquaintance with ultimate causes for the first time enables us to make hygiene a true science on a basis of exact knowledge.

The subject naturally divides itself into two main branches, those of environment and of the person: though there are some items which belong to neither, and the two cannot always be separated.

Environment.— This includes (1) climate; (2) private: the site, construction, elevation, warming, water-supply, and purification of dwellings; (3) public: the cleaning of streets, disposal of the dead, prevention of befoulment either by excreta or sputa, and other methods of public sanitation. The third will be dealt with under another title by an expert authority on public health. See SANITARY SCIENCE.

Climatic conditions cannot to any extent be modified: they must be neutralized, when unsanitary, by other conditions pertaining to hygiene. All nations have more or less adapted their habits to their climate, unless acclimated so that they become part of its working: the hours of work or travel, the character of dwellings, the sites selected, the diet found wholesome by experiment, all form part of a hygienic system built up by social experience and tradition. Those unacclimated may have personal advice from predecessors; too often nothing but personal experience can be of any avail, and frequently that is only acquired by fatal results.

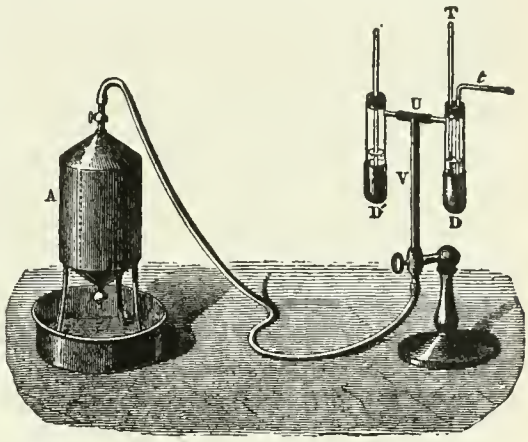
The subject of *dwellings* includes a number of considerations. The site, if possible, should not be one where the ground-water is near the surface, or freshets or tides set back the drainage of closets, or where there are great fluctuations in the level of the ground-water, which it is better to have nearer the surface and steady than lower and more unstable. "Made" land in cities is often unhealthy, but tenants cannot in practice exercise much choice; the city authorities should prevent bad results by thorough sewerage with a good fall. The construction most important to have right is the plumbing; including the drains at the bottom: it is a commonplace which need not be dwelt on, that leaking sewer-pipes and clogged drainage mean the infection of a house with disease-laden air. Paint is better than paper for walls, as it can be washed; and old paper should be scraped off before new is laid on. When possible, rooms should be large enough not to need incessant change of air; when not possible, as is usual in cities, plenty of windows and the fullest possibilities of draft should make up; if this, too, is not available, the best systems of artificial ventilation. Unhappily, science is very backward in this class of invention, and small, close, unventilated rooms shorten millions of lives and prematurely break down working power in even the civilized cities of the world. The normal supply should be at least 3,000 cubic feet of air per head each hour, and this largely increased in work or sickness. The volume of consumption and other scrofulous diseases, bronchitis, pneumonia, etc., is directly dependent on foul air, which also increases the virulence of all zymotic diseases. The ventilation of public buildings rests on the same principles, and has the same results. The warming of houses is of great importance, and is generally ill done, with disregard of ventilation. The vast majority of houses in America are grossly overheated even when the air-supply is enough, giving a sensitive skin which "catches cold" as soon as it touches fresh air. Little children especially are literally killed by thousands from overheating and overdressing. The water-supply is a matter of public concern: where there is a flat price, people do not stint themselves. Where there are meters, they often do; but closets should be kept fully flushed at any cost. In country houses, where city water and sewerage are not available, it is not necessary to insist on the frequent cleaning and disinfection of receptacles for excreta. Advice on this point is obtainable gratis from physicians, apothecaries, and others. If the dry methods are carefully used, they have many advantages in healthfulness over the elaborate city systems.

Personal Hygiene.— This has very many divisions: the most obvious are considerations of food, and drink, nerve stimuli, clothing, cleanliness, natural necessities, work and rest, and moral self-control. In the matter of diet, there can be no one rule: "at forty," says the proverb, "one is either a fool or a physician"; and each must use his own experience as a guide to whether meat is a necessity or vegetarianism an advantage, what foods agree with him, whether

dry meals give him heartburn or drinking with them impedes digestion, and whether he is eating so much as to make him heavy, impairing his capacity for work and enjoyment, or making his body gross. In general, probably professional and sedentary workers as a class overeat, and would find their minds more alert and their bodies freer from disorders with less gratification of appetite. Nerve stimuli, ranging from tea, coffee, and cocoa, to tobacco, alcoholic drinks, and opium, are hard to frame a general rule upon: they, too, have infinitely varied effects. Cocoa is most of a food; coffee with most is an agreeable stimulant, with many an active nerve-poison, producing heavy headaches and incipient stupor; tea is a real nerve-food on occasion and in small quantity, while taken steadily and largely it is a poison and a very mischievous one; tobacco sparingly used by grown men probably does little harm, and sometimes saves worse things, but should not be used by those under age, nor by those with weak nerves, and is highly injurious in heart disease, Bright's disease, and venereal diseases; alcoholic drinks suggest too many questions for discussion here; narcotics like opium, hashish, etc., as well as chloral and its like, should be used only on a physician's prescription. Clothing, if there is time and means, can be accommodated to changes of weather and occasion so as greatly to advance health; with most, there must be a rough average. Personal cleanliness within limits is a *sine qua non* of reasonable immunity from disease, and with delicate persons, of reasonably good ordinary health; but even this good thing can be irrationally overused and make mischievous. Too frequent hot baths in a northern climate are a great aggravator of lung-diseases, and one great city (Pittsburg) had a marked decrease of pulmonary complaints one winter when the water-supply broke down, and people resorted greatly to dry rubbing. Especially it is possible to use too much soap, and keep the natural oil of the skin washed away. Natural necessities should be attended to more constantly than they are: workmen especially often grudge the time, but the waiting till there is severe pressure often creates dangerous bladder and intestinal complaints. Work, for most, is not under their own control; but to some extent resting is, and the average American perhaps owes more to compulsory public holidays than he is aware. There is more temptation to overwork than to idle, for the average man. Exercise should be taken by the sedentary, even a homespun house-method being preferable to nothing. Grotius preserved his health in prison by whipping a top two hours a day. This should be one of the most rigidly imposed forms of self-control, which in all forms is all-important. Excessive sexuality, either of act or imagination, is simply destructive of will-power as well as bodily fibre; giving way to fits of anger or despondency is almost a recipe for entire nervous wreck. As to laziness, of mind or body, it is one of the worst and most incurable forms of this evil.

The management of children is really personal hygiene, only controlled by another than the subject, the care of the dead belongs to public hygiene; the prevention of disease belongs either to medicine, by the use of drugs like quinine or inoculations, or to house-hygiene as disinfection. The hygiene of the sick-room should be under the direction of the physician.

Hygrom'eter (Gr. "moisture-measure"), a meteorological instrument used to ascertain the quantity of moisture in the air. The first hygrometers, or rather hygroscopes (for they did not determine the quantity of humidity, but merely showed the difference between a dry day and a damp day), were constructed of catgut, hair, or other fibrous material, having the property of lengthening when wet, and contracting when dry. The first hygrometer properly so called was made by Professor Daniell. It consists of a glass tube, bent at right angles into arms of unequal length. Each arm terminates in a bulb, one bulb being two thirds filled with sulphuric ether, and the other bulb being, at the commencement of an experiment, empty. In process of construction the tube is exhausted of



Regnault's Hygrometer.

air, and is thus filled with vapor of ether through its entire length. A thermometer with a bulb immersed in the ether of the lower arm is inserted in the tube to register variation of temperature, and a second thermometer is attached to the stand of the instrument to show the temperature of the outer air. For use one bulb containing the sulphuric ether has a zone of polished gold, and the other bulb a muslin cover. If sulphuric ether be dropped on the latter, as it evaporates the bulb is cooled, and the vapor of ether is condensed within it from the other bulb; the temperature of which rapidly falls owing to evaporation from it. The operation is carried on, ether being dropped on the second bulb as is required, till the temperature of the first is so far reduced that dew from the surrounding air just begins to condense upon it. By means of the thermometer contained in the first bulb the temperature is read off at the instant at which vapor begins to condense, and the dew-point is thus obtained. The hygrometric condition, that is, the ratio between the quantity of moisture that the air actually contains and the quantity which it is capable of containing at the existing temperature is then easily deduced.

Regnault's hygrometer, shown in the above figure, is an important modification of Daniell's instrument. D and D' are two precisely similar cups or thimbles of polished silver; each is surmounted with a similar glass tube into which,

by means of a cork, two thermometers are fitted, and the bulbs of the thermometers are covered with ether. Through the cork in one of the tubes a small glass tube *t* passes, and is carried down below the surface of the ether; while a side tube establishes communication with the vertical tube U V which is connected with an aspirator A (or vessel into which air is sucked at the top to supply the place of water which escapes at the bottom). There are no corresponding side tubes connecting the left-hand tube of the hygrometer D′. By means of the aspirator a current of air is drawn through *t*, it therefore bubbles through the ether, causing evaporation and cooling the ether till the dew-point is reached. This is observed with great nicety by means of the silver cap; for the instant the dew commences to deposit, the brilliant polish of the silver is dulled. The temperature of the air is at the same time read off by means of the other thermometer in D′. Regnault's hygrometer, both from its construction and from the use of the aspirator, avoids the too great proximity of the observer, which, from the nature of the experiments, is objectionable.

Mason's dry and wet bulb hygrometer consists of two thermometers arranged side by side as in the figure. The dry bulb gives the temperature of the air at the time of observation; and the other bulb, which is covered with muslin, and kept moist by filaments of cotton carried from it into a small cistern of rain or distilled water, reduces the height of the mercury in its tube in proportion to the capacity of the air for drying, or taking up additional vapor. This instrument does not give the dew-point directly. The difference between the readings of the two thermometers is multiplied by a special factor for every temperature of the dry bulb.

Hyksos, hĭk′sōz, according to the Egyptian annals, a conquering nomadic race from the East, who, under Salatis, their first king, took Memphis, and rendered the whole of Egypt tributary. Their name probably means "foreign kings," the explanation "shepherd kings" being of later origin. The date of their invasion and conquest was about 1700 B.C., of their expulsion about 1600 B.C. The seat of their rule was the strongly garrisoned fortress of Avaris, on the northeastern border of the Delta. They followed Egyptian customs, and their six monarchs took Egyptian names. It seems likely also that a great part of Syria was subject to them. The only detailed account of them in any ancient writer is an unreliable passage of a lost work of Manetho, cited by Josephus in his rejoinder to Apion.

Hymans, Louis, loo-ē ē-măn, Belgian historian, journalist, novelist, and poet: b. Rotterdam 1829; d. Brussels 22 May 1884. He removed to Belgium in boyhood and rose rapidly to distinction as a Liberal journalist. He edited the Belgian 'Star' and the Parliamentary 'Echo' for some years, and was elected to Parliament in 1859. He wrote: 'History of the Marquisate of Anvers' (1848); 'Popular History of Belgium' (1860); 'Political and Parliamentary History of Belgium' (1869–70); two popular novels, 'André Bailly' (1861), and 'The Buvard Family' (1858); and some pleasing poems.

Hy'men, the god of marriage in Grecian mythology. The common legend is that he is the son of Apollo. No marriage took place without his being invoked to sanction it. He is described as having around his brows the flower of marjoram, in his left hand the flame-colored nuptial veil, and in his right the nuptial torch.

Hymenoptera, an order of Hexopoda or insects, considered by many entomologists to be the highest and most perfect expression of the insect type. The metamorphosis is complete and extensive. The larvæ are short, thick grubs, footless except in the saw-flies (*Tenthredinidæ*) and in most cases are carefully nurtured and fed in nests. The pupæ have nearly the form of the perfect insects. The imagos are of compact, highly complex construction, with the three regions well marked except that the first segment of the abdomen is united with the thorax. A considerable part of the large head is occupied by the conspicuous compound eyes besides which there are three ocelli. The jaws or mandibles are conspicuous biting organs, and the remaining mouth-parts usually form more or less of a proboscis with a large ligula or tongue. Although the wings are small they move with great rapidity and sustain the body in rapid and extended flight; there are two pairs (sometimes absent), membranous, veined and transparent. The genital appendages of the females are modified to form a sting or, more rarely, an ovipositor. Marked sexual dimorphism is very frequent especially among the social forms, in which a third class of individual, the worker or neuter, in reality imperfect females, also occurs. Many of the ant communities are still farther polymorphic. The order is one of great extent and exceptional interest, as it includes the ants, bees and wasps, the ichneumon-flies, gall-flies and saw-flies, divided into numerous families. Among the ants and bees are exhibited most remarkable and complex social states, which are described in the articles on these groups. The habits of the numerous species of wasps, and especially the varied architecture of their nests, are of nearly equal interest. A remarkable series of adaptations to special conditions are presented by the parasitic ichneumon flies and their allies, which lay their eggs within the bodies of the larvæ or even in the eggs of other insects, on the substance of which their own larvæ feed. Confining their parasitism to plants, the gall-flies produce by the irritation caused by their eggs or secretions deposited with them in the tissues of leaves, twigs or fruits, the familiar excrescences whose shapes are almost as numerous as the species which produce them. (See GALLS.) Finally, the saw-flies are least typical of the order but stand nearest to the main hexapod stem. Their larvæ have both thoracic and abdominal legs and closely resemble caterpillars; they are vegetarians and many of them are very destructive to plants.

Consult standard works of Entomology (see INSECTS), and the bibliographical list given by L. O. Howard in the appendix to his 'Insect Book' (New York 1902).

Hyndman, hĭnd′măn, **Henry Mayers,** English socialist and author: b. London 7 March 1842. He was educated at Trinity College, Cambridge; and entered journalism. He was special correspondent for the *Pall Mall Gazette* in the war of 1866 between France and Italy, and wrote leading articles in favor of free education in the Melbourne 'Argus' in 1869. In

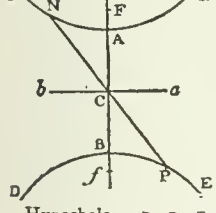
1881 he was one of the founders of the Social Democratic Federation, and has since been active in the Socialist movement, being the acknowledged leader of the Marxian Socialists in England. In 1884 he founded the paper 'Justice,' of which he is editor. His works include 'Historical Basis of Socialism in England' (1883); 'Socialism and Slavery,' a reply to Herbert Spencer; 'The Commercial Crises of the Nineteenth Century' (Social Science Series, 1892); and 'Economics of Socialism' (1896).

Hyne, Charles John Cutliffe, English novelist: b. Bibwry, Gloucestershire, 11 May 1866. He was graduated from Clare College, Cambridge, traveled widely both overland and by sea, and has published several rigorous stories, including: 'The Stronger Hand' (1896); 'The Adventures of Captain Kettle' (1898); 'Through Arctic Lapland' (1898); 'Further Adventures of Captain Kettle' (1899); 'The Filibusters' (1900); and 'Thompson's Progress' (1902).

Hypatia, hī-pā'shĭ-ạ, Greek philosopher of the eclectic school, daughter of Theon, a celebrated astronomer and mathematician, who was at the head of the Neo-Platonic school in Alexandria early in the 5th century. Such was her reputation that she became a preceptress in the school of Plotinus at Alexandria, and expounded the principles of his system to a numerous auditory of students from all parts of the East. Her house became the resort of all the persons of learning and distinction in Alexandria, and, among others, of Orestes the Prefect, between whom and Cyril, patriarch of Alexandria, a conflict respecting authority existed. A fanatical mob believing that Hypatia encouraged Orestes in his opposition to the patriarch, set upon and murdered her (March 415). Hypatia appears as the central figure of Kingsley's novel of the name (q.v.) (1853).

Hypatia, a work of historical fiction, by Charles Kingsley (q.v.), named from the principal character, the philosopher Hypatia (q.v.). The book presents a brilliant and stirring though not historically trustworthy picture of the 5th century of the Christian era, against the background of the learned city of Alexandria in Egypt.

Hyper'bola, in geometry, a curve formed by the intersection of a plane with two cones united at their apexes. The intersecting plane has such an inclination to the axis of the upper cone that it produces a similar section of the lower cone; the two branches thus formed are called opposite or conjugate hyperbolas. The two points where the branches approach nearest to each other are called the vertices, the straight line which joins them is called the major or transverse axis, and its middle point the centre of the hyperbola. A line of a certain definite length drawn through the centre and continued both ways at right angles to the major or transverse axis, is called the minor or conjugate axis. When the major axis is produced beyond the vertices two points called foci occur at equal distances from the centre, and the difference of their distances from any one point of the hyperbola is always equal to the major axis. Every line drawn from any part of the hyperbola to one of the foci is called a radius vector. If at one of the vertices a perpendicular to the major axis be erected, so as to be bisected by this axis and made equal in length to the minor axis, and if through the extremities of this perpendicular and the centre of the hyperbola two indefinite straight lines be drawn, these form what are called the asymptotes, which though they lie entirely outside the hyperbola, are always drawing nearer and nearer to it, but never actually reach it. The equation of the hyperbola referred to its centre and axis is $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$



Hyperbola — D B E, G A H, are opposite hyperbolas; F *f*, foci; C, centre; A B, major or transverse axis; *a b*, minor or conjugate axis; N C P, a diameter.

Hyperion, hī-pē'rĭ-ŏn, in Greek mythology, a Titan; son of Uranus and Ge, and father of Helios, Selene, and Eos. Homer and later poets apply the name as a patronymic for Helios himself. The attribute of beauty has therefore been connected with the name, as in Shakespeare's comparison of "Hyperion to a satyr."

Hyperion, in astronomy, the name assigned to the 7th satellite of Saturn, discovered in 1848, at the Harvard Observatory by G. P. Bond. It is outside the satellite Titan, whose mass causes perturbations in the orbit of Hyperion, which have proved to be a difficult problem in celestial mechanics, and a unique case in the solar system. They apparently give large eccentricity to Hyperion's orbit, and cause the apparent line of apsides to follow the conjunction points of Titan and Hyperion, in a direction contrary to the usual motion of this line.

Hyperion, a romance, by H. W. Longfellow, published in 1839. It is the tale of a young man in deepest sorrow, wandering from land to land in search of occupation for his mind, and forgetfulness of grief. This motive forms the thread of a story which connects a series of philosophical discourses, and romantic legends and poems. Many of these last are Longfellow's translations of German poems, and have found a place in his collected poems.

Hyperpyrexia, hī-pĕr-pĭ-rĕk'sĭ-ạ. See FEVER.

Hyperspaces. *Dimensionality.*—In order to make quite intelligible the concept variously denoted by such terms as hyperspace, space of higher dimensions or dimensionality, multidimensional space, *n*-space, *n*-fold or *n*-dimensional space, it is in the first place necessary to explain the meaning of dimensionality and to indicate the way in which the dimensionality, or number of dimensions, of a given space in a given element is determined or ascertained. Because, in order to determine the position of a *point* in a curve or straight line, it is necessary and sufficient to know *one* fact about the point, as, for example, its distance (with algebraic sign) from a fixed point or origin, a line is said to be a *one*-dimensional space of *points*. But instead of the point, we may choose for element of the space (line) a *pair* or a *triplet*, . . . or an *n-set* of points. In such cases, in order to deter-

mine the element, *i.e.*, to pick it out or distinguish it from among all others of its kind, it is necessary and sufficient to know *two* or *three*, . . . or *n independent* facts about it. Hence a line is a *two-* or *three-*, . . . or *n*-dimensional space of *pairs* or *triplets*, . . . or *n-sets*, of points. In like manner a flat pencil (totality of lines of a plane that have a common point) is a *one*-dimensional space of *lines*, while its dimensionality is 2 in line *pairs*, 3 in *triplets*, and so on. For like reasons a plane is a *two*-dimensional space of *points* or of *lines*. In *circles* its dimensionality is 3, in *conics* 5, in *curves of third order* 9, and so on. It is at once seen that the dimensionality of a given space depends on the entity chosen for primary element, the element, *i.e.*, in terms of which we elect to study and express the properties of the given space. Illustrations abound. A curved surface, as, say, a sphere, regarded as the envelope of (its tangent) planes, is a *two*-dimensional space of *planes*, while, conceived as the assemblage of (its tangent) lines, it is a *three*-dimensional space. The reader will observe that the term space is employed generically to denote any unbounded continuum of geometric entities. The generalization is, however, a natural one, for, for geometric purposes, ordinary space is viewed primarily as an assemblage of elements of one kind or another. To determine the position of a point in ordinary space, three independent data (as the distances of the point from three mutually perpendicular planes of reference) are necessary and sufficient. Ordinary space is, therefore, *three*-dimensional in *points*, and that is what is meant, consciously or unconsciously, when, without specifying the element (point), it is simply said that space is three-dimensional. But tri-dimensionality is in no strict sense a *definitive* property of ordinary space. For some little understood, probably economical, certainly extra-logical, reason, the point recommended itself to primitive man as the element par excellence with which to geometrize, and so it has become traditional and proverbial that our space is essentially, uniquely, characteristically, intrinsically, exclusively three-dimensional. Such, however, it is not. It is indeed *three*-fold in *planes* as in points, but in *lines* it is *four*-dimensional. So, too, it is *four*-fold in *spheres*, but in *circles* its dimensionality is *six*. In general, it is possible by proper choice of element to endow any given space with any prescribed dimensionality however high. Accordingly, if by hyperspace is meant a space of dimensionality greater than 3, the notion is simple and near at hand, we need not go beyond ordinary space to realize it, we detect it in the line, in the plane, in ordinary space, here, there, and yonder. Well, such *is* one of the recognized significations of the term. But it has 'another,' namely, hyperspace usually means a space whose *point* dimensionality is four or more. Now this latter meaning is *logically* and *conceptually* quite consistent with the other, it is indeed a special case of it; but a hyperspace of *points* is difficult or impossible to *picture*, to realize in *visual imagination*, and it is this non-logical circumstance that renders the term hyperspace at once so tantalizing, mysterious, baffling, and fascinating to the non-mathematician. To the mathematician, however, whose activities, so far from being confined within the limits of the visual imagination, lie for the most part quite beyond them, the conception in question offers as such no difficulty whatever, and it has long since established itself among the most approved of orthodox scientific notions.

Definition of Hyperspace of Points.—What, then, is a *hyperspace* of *points?* How is the notion arrived at? And what is its utility? The values of a single continuous variable x are familiarly representable by the points of a right line; the ordered *pairs* of values of two independent variables x_1 and x_2, by the points of a plane; and the ordered triplets of values of three independents x_1, x_2, x_3, by the points of ordinary space. To the analyst with geometric bias or predilection, the suggestion immediately and forcibly presents itself that there *ought* to be a space whose points would serve to represent, as in the preceding cases, all ordered sets of values of n independent variables x_1, x_2, . . . , x_n; and, not finding such a space present to *intuition*, *vision*, or *visual imagination*, he *posits*, or, if you prefer, he *creates*, one in *thought*. This done, it becomes immediately practicable to appropriate the terse, sensuous, stimulating language of geometry to the uses of analysis. Moreover, the hyperspaces serve as boundless playgrounds for the human spirit. They are immeasurable and immeasurably interesting fields for geometric research and exploration. In them light is found for the illumination of many otherwise dark or undiscovered properties of the lower, ordinary, spaces of intuition. By their study, the geometrician discovers how such higher and higher worlds would appear to a vision capable of beholding them.

Another Mode of Generating the Concept.—Another way, and, by virtue of its appeal to the intuition, possibly the best way, of arriving at the notion of hyperspaces of points, is the following: Posit two *points* (spaces of *zero* dimensionality in *points*). These determine a line, a space of dimensionality *one* in points. Next posit a point *outside* the line. The locus of all the points of all the lines determined by the posited point and the points of the given line is a plane, a space of *two* dimensions in *points*. Posit a point *outside* of the plane. The locus of all the points of all the lines (planes) determined by the posited point and the points (lines) of the given plane is a space (like our ordinary space) of *three* dimensions in *points*. Let the process continue. If intuition fail, reflect that in any case it is only a non-essential, extra-logical auxiliary, and hence proceed by positing *conceptually*, in *thought*, a point *outside* of the threefold space S_3, before obtained. The locus of all the points of all the lines (planes, 3-fold spaces) determined by the posited point and the points (lines, planes) of the given S_3 is a space of *four* dimensions in *points*. Obviously the principle of genesis here exemplified admits of endless application and leads directly to the concept of an n-fold space of points.

But we need not suffer ourselves to be dominated by the conception of point. Among possible elements, the point has no *logical* claim to preference or primacy, and the foregoing process is equally available for the generation of the concept of a space n-dimensional

in any other element, *e.g.*, the line. Posit two intersecting lines (spaces of *zero* dimensionality in *lines*). These determine a flat pencil, a *one*-fold space, of *lines*. Posit a line *outside* the pencil, *i.e.*, not belonging to it but going through its vertex. The assemblage of all the lines of all the pencils determined by the posited line and the lines of the given pencil is a hyperpencil (sheaf of lines), a *two*-dimensional space of *lines*. Next posit a line outside the sheaf (but cutting all of its lines). So is determined a 3-fold space of lines, the assemblage of lines of which each with the posited line determines a pencil. The next step leads to a 4-fold line space; the next, to a 5-fold line space; and so *in infinitum*.

It is clear that the lower spaces are contained in the higher, as points in lines, lines in planes, etc., or as lines in pencils, pencils in sheaves, etc., etc. It should be noticed, too, that any space S is *zero*-dimensional in such spaces S taken as *elements*. The complete understanding of the geometry of a space of k dimensions demands a study of the like variety of space of $k+1$ dimensions, and so on. In particular the point geometry of ordinary 3-fold point space is quite as much illuminated by that of 4-fold point space as is the point geometry of the plane by that of 3-space.

Coordinates, etc.—In point space of n dimensions the simplest coordinates of the point are the distances $x_1, x_2, \ldots, x_n$ of the point from n mutually perpendicular point spaces of $n-1$ dimensions. These coordinate spaces, taken $n-1$ at a time, determine n coordinate axes. A linear equation $\xi_1 x_1 + \xi_2 x_2 + \ldots + \xi_n x_n + 1 = 0$ defines or represents an $\overline{n-1}$-dimensional space of order *one*, the analogue of the plane in ordinary space. The ξ's are the negative reciprocals of the axal intercepts of the $\overline{n-1}$-space. Holding the x's fixed and letting the ξ's vary, the foregoing equation will represent a point as envelope of its generating $\overline{n-1}$-spaces. Two such equations together define an $\overline{n-2}$-space as their intersection or a straight line as their envelope. Similarly, three such equations serve to represent an $\overline{n-3}$-space as locus of points or a plane as envelope of $\overline{n-1}$-spaces, and so on. A space that is n-fold in points is also n-fold in spaces of $\overline{n-1}$-dimensions. Its dimensionality is $2(n-1)$ alike in lines and in spaces of $n-2$ dimensions. In general, its dimensionality is $p(n-p+1)$ if the point space either of $p-1$ or of $n-p$ dimensions be taken as generating element. Not only, however, do the two last mentioned elements furnish the same dimensionality, but they are indeed reciprocal elements of n-fold point space, for the same system of equations which on proper interpretation defines one of the elements admits of a second (dual) interpretation defining the other. It thus appears that by taking as elements the various simple spaces of less than n dimensions for generating elements of n-fold point space, there arise n geometries of this space; or, if we regard two reciprocal theories as but two aspects of one geometry, the elements in question yield $n:2$ or $1+(n-1):2$ geometries according as n is even or odd, the element having $(n-1):2$ dimensions being, in case of n odd, its own reciprocal, or *self-reciprocal*, like the line in ordinary space (see Line Geometry and Allied Theories).

Remarks on Four-space.—Thus point space of 4 dimensions is also 4-dimensional in ordinary spaces (say *lineoids*), the point and the lineoid being reciprocal elements. It is 6-dimensional in *lines* and also in *planes*, which are also reciprocal elements of this space. It appears that this space, unlike ordinary space, does not admit of self-reciprocal construction. An equation of degree n in point (lineoid) coordinates x_1, x_2, x_3, x_4 ($\xi_1, \xi_2, \xi_3, \xi_4$) represents a locus (envelope) of *order* (*class*) n. If $n=1$, the locus (envelope) is a lineoid (point). Two linear equations define a plane as locus or a line as envelope; three, if independent, represent a line as locus or a plane as envelope; and four give a point or a lineoid. In general, two planes have, not a line, but only a point in common; reciprocally, two planes are not in general in a same lineoid. A lineoid being determined by four independent points, it appears that two arbitrary lines determine a lineoid. In 4-space a point can pass from the inside to the outside of a (two-dimensional) closed surface, such as an ordinary sphere, without going *through* the surface, just as in ordinary space a point can pass from the inside to the outside of a circle without *crossing* the circumference. Accordingly, in 4-space a 3-fold solid like the human body could be literally seen through, and no ordinary prison-house could confine.

Do hyperspaces exist? Undoubtedly they have *logical* existence, the *concept* of hyperspace being interiorly consistent and available for thought. More mathematics does not demand. The hypothesis of their 'physical' existence, 'natural' science may yet be compelled to employ. Indeed it has been conjectured that certain chemical phenomena (as of the carbon compounds) may be due to greater freedom of motion than ordinary space affords.

Bibliography.—The literature of the geometry (both pure and analytical) of hyperspaces is very extensive. It is, however, chiefly contained in the mathematical journals. All scientific nations have contributed to the subject, the Italians probably more than any other. The best work for the beginner is P. H. Schoute's 'Mehrdimensionale Geometrie' (1902). An excellent explanation, addressed to the non-mathematician, of the concept of 4-space is found in Hermann Schubert's 'Mathematical Essays and Recreations.'

Cassius J. Keyser,
Adrain Professor of Mathematics, Columbia University.

Hyphomyceteæ, hī-fō-mī-sē'tē-ē. See Fungi.

Hypnotics are agents that induce sleep. They may be mental, physical, or medicinal. Thus certain kinds of music, the human voice, and suggestion may have power to induce sleep, which may also follow from eating, or from a warm bath before retiring. All such simple measures should be used before drugs are resorted to in the treatment of insomnia (q.v.). Hypnotics *per se* may be divided into two broad groups—those that induce sleep by alleviating pain and those that have no pain-relieving character. The latter are pure hypnotics. Combinations of the two are frequently employed in medicine. The pain-relieving drugs all come under the head of analgesics (q.v.). The pure hypnotics may be divided into a number of groups based on their chemical relationship, for in this class of drugs the relation between chem-

ical composition and physiological action is peculiarly close. Alcohol is one of the most prominent of the hypnotics, but while it is extensively used to induce sleep, the practice of taking a "nightcap" cannot be regarded as a safe one. Substituted alcohols, however, yield some of the most widely employed of all hypnotics. Chloral, paraldehyde, amylene hydrate belong to this series, while from chloral as a basis a number of allied hypnotics have been made. These are chloralamide, chloralose, chloretone, urethane, etc. The fundamental action of these is to cause a peaceful sleep without leaving ill after-effects. They all dilate blood-vessels, relieve spasm, and induce sleep. In large doses they depress the heart-action. Another group of hypnotics includes substituted sulphur compounds. The most important of these are sulphonal, trional, and tetronal. They are all closely allied in chemical structure. Sulphonal is the weakest, tetronal the strongest, trional occupies a middle position. In poisonous doses, and even in small doses if long continued, hypnotics of this group cause a form of chronic poisoning in which the red blood-cells are disintegrated. This is shown by the appearance of a cherry-red, or purple-red discoloration in the urine. A third group of hypnotics depends on some form of bromine, as bromides. Sodium bromide, potassium bromide, bromal, bromoform, etc., are representatives. They depress the activity of the brain, and are useful hypnotics. If used very long the bromine compounds cause skin-eruptions, foul breath, and heart-depression. See ALCOHOL; CHLORAL; INSANITY; INSOMNIA; MELANCHOLIA; NEURASTHENIA; SULPHONAL.

Hypnotism, hĭp'nō-tĭsm (Greek *hypnos,* "sleep"), an artificial sleep. The nervous phenomena exhibited in hypnotism resemble those induced by animal magnetism, though they arise solely from the condition of the patient, and not from any influence proceeding from others. Mr. Braid, of Manchester, England, brought this subject prominently before the public in the 17th volume of 'The Monthly Journal of Medical Science' (1853), but it has been long known in India. The actual foundation of modern hypnotic suggestion was discovered by Liébault, of Nancy, France, the famous "father of the therapeutic application of suggestion." After several years of practical experience, in 1866 he wrote his first book on the subject. It was shelved and he was pronounced erratic. Hypnotism remained a curiosity and Liébault's book was not reproduced till six years after Charcot, in 1878, began his studies in hypnotism. In 1884 Bernheim wrote his charming book on suggestion, and this created a demand for Liébault's book which then gave him lasting reputation. He was Bernheim's teacher. Formerly a profound skeptic, Bernheim became unavoidably converted by seeing the results of Liébault's application of suggestion to invalids. Bernheim was a clever clinical professor in the great hospital of Nancy and in his wards he convinced himself of the great value of hypnotic suggestion.

The word hypnotism is generally and largely misunderstood and misused. For example, if a person seems to be wholly influenced by another, it is commonly said that he has been hypnotized. This is a great error. The word hypnotism means putting a person to sleep and means nothing else. If an individual seems to be subjected to another in the waking state it should be said that he is unduly influenced. He is not hypnotized. That would mean that he was asleep. The means by which hypnotism is used is "suggestion." A person may be influenced by suggestion in the waking state, for suggestion is a great force in daily life. As connected with hypnotism, however, suggestion is the expression of an idea or combination of ideas which becomes impressed upon the mind of the somnolent subject to whom it is addressed. Conscious or unconscious results are sure to follow. This explanation sums up the meaning, use, and results of suggestion as applied to hypnotism and the hypnotic state. If a subject be awake he can, according to the strength of his will and desire, control to a greater or lesser degree the effect of a suggestion which he has received.

In the hypnotic state this self-control is decreased in a degree corresponding to that of the increase of the degree of sleep. Nevertheless, if merely the first degree of hypnosis has been attained, the subject, conscious of all he hears, may be influenced by the suggestion of the operator. In this way a vast amount of relief has been given to individuals who may claim that they have not been affected at all. In the hypnotic state there are nine sharply marked degrees of somnolence. In the first six degrees, notwithstanding he has been perfectly quiet and apparently asleep, the patient remembers all that has been said. In the last three degrees the patient, on waking, remembers nothing. Strange as it may seem, however, a person may be more influenced by suggestion in the lighter degrees of sleep than in the more profound degrees, and *vice versâ.* This is due to the patient's suggestibility. For example, the writer treated by hypnotic suggestion a very severe and prolonged case of intemperance. The patient claimed that not for an instant had he been sleepy, but he so responded to suggestion that from that day to this, a period of eleven years, he has not once touched alcohol. He had been intemperate from boyhood. On the other hand, a person may fall into profound sleep and yet not respond markedly to suggestion. Generally, however, if the subject be made to reach any degree of somnolency he can be relieved by suggestion. In the majority of cases the relief endures. In the popular mind exists the belief that this form of treatment is attended by danger, that the patient once hypnotized is thereafter under control of the operator, even at a distance, that the will is weakened, etc. This is all a mistake. No person can be hypnotized unless he be willing. No person can be hypnotized at a distance, unless by telephone, or if he be a good and willing subject, by letter; and the patient must first have been hypnotized by the operator at some previous time. Otherwise the operator cannot influence him at a distance in the slightest degree. The will is not only not weakened, but there is no other existing treatment which can so strengthen the will as can hypnotic suggestion. If any physician object to the treatment we know that this physician, however intelligent he may be in other professional matters, is ignorant of this method of relief. This treatment is not peculiarly useful in hysteria, as is commonly supposed, but has accomplished greatest benefit

in all cases attended by bodily distress, neuralgia, dyspepsia, headache, disturbance of menstruation, pains of rheumatism, mental unrest, sleeplessness in particular, intemperance, opium habit, and all drug habits, vicious propensities, lack of mental vigor, fear, illusions, stammering, and wherever calmness has disappeared. In short, it will give relief in many cases which it cannot cure. It can relieve, but cannot create. It can assuage pain, for instance, in heart ailments, while it cannot dispose of damages which the heart may have received.

It is an absolutely safe and beneficent form of aid. It may not always bring relief, but never in the hands of a competent operator has it done harm. The patient will always choose the operator as he would choose a surgeon. The object of all reliable operators in the use of hypnotic suggestion is the relief of the patient, and to the operator the treatment is a sacred thing.

The method of the operators of the school of Nancy is wholly verbal. The patient is talked to sleep, and on waking he is delighted by the changes in himself which are apparent, and he has become convinced of the agreeable effects of the treatment.

Formerly a bright object was held between and above the patient's eyes, and he was directed to fix his eyes upon it. This created sleep. But it was found that nervous distress was apt to follow this method, and it has been abandoned by followers of the school of Nancy. The rationale of the treatment is that a person whose mind is in a sleepy or sleeping condition offers no resistance to the suggestions of the operator and, just as in thirst, in the waking state, "the mouth waters," just as a woman blushes, because of a personal remark, or turns pale if a pistol be pointed at her, so the suggestions of the operator made to a sleeping person will follow a nerve path which is in accordance with the quality or nature of the mental impression created by the suggestion. In other words, the suggestion is followed by changes in sensation, act, or idea on the part of the patient, which correspond with the nature of the suggestion. Thus, if a sleeping person be assured by the operator that he will lose his craving for alcohol, or opium, or cocaine, or, that his pain will cease, that he will sleep at night, that his nervous unrest will disappear, that his power of will or a mental concentration will increase, and so forth, in nine out of ten cases the desired result will follow. Lack of space forbids further mention of this phase of the subject.

Brief reference should be made to an influence, wholly unappreciated by the popular mind, which is exerted by what is nothing but suggestion. For example: The sick people who were aided by the "magnetized" tree of Marquis Puysegur thoroughly believed in the therapeutic power of the tree, and therefore were cured or relieved. This was suggestion. The benefit of the electro-magnetic belts and rings formerly so largely in vogue was derived from suggestion. The influence of the waters of Lourdes is due to suggestion. The benefits which occur from many, if not the majority, of the medicines given by regular physicians are due to suggestion and temporary unusual care of the health. Therefore, in the absence of better means they are wisely given.

The people who resort to these things thoroughly believe in their efficacy, and this belief, acting through the mind, so influences the nerve and blood supply of the part or organ for which relief is sought, that the ailment passes away.

There are indeed scores of popular forms of relief which act wholly through the patient's mind and in themselves literally have no value. The effect of the mind cure and Christian Science is due to a weak form of suggestion, behind which an intelligent knowledge of anatomy, physiology, and disease is wholly lacking. The results are owing to influences produced upon the minds of those who seek these forms of relief, which thus have accomplished a degree of benefit but are dangerous aids where serious disease exists. These forms of suggestion, exactly speaking, are auto- or self-suggestion, that is, a belief which creates a mental power over bodily ailments, and which, in a certain percentage of people, is capable of large development.

The wise choice of a source of needed suggestion would be to seek it at the hands of a cultivated physician who is familiar with the application of suggestion to a somnolent patient.

With reference to causation of crime by means of hypnotic suggestion: few or no scientific men believe it possible. Habit is as strong as death. If a man's habit of mind be honest, no suggestion, sleeping or waking, can cause him to commit crime of any sort. If he be dishonest, naturally or by inclination, the suggestion would be unnecessary. In so far as physicians are concerned they are not interested in this phase of the subject because they use the treatment wholly as a means of relief, and, as a class, physicians are reliable men who would not even attempt to misuse hypnotism any more than they would use ether for evil purposes. The so-called "laboratory crimes," that is, imitation of crime in the presence of the operator who suggests it, would not occur unless he were present. The subject simply feels safe under the direction of the operator and, as has been proved many times, would not attempt suggested wrongs if he were alone.

The hypnotic sleep is a natural sleep. Those who claim that it is not natural are not intelligent in the matter, and their opinions are based upon pure and uninformed theory.

As has been shown by scores of thousands of cases, treated by brilliant and educated physicians, the treatment is absolutely innocuous. It either relieves or produces a neutral effect, and is useful in a multitude of ailments which baffle ordinary means of relief.

But the operator must be educated in the use of this valuable method of treatment. Hypnotism should be used only by physicians, and amateurs should by no means experiment with it as a means of amusement.

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HAMILTON OSGOOD, M.D.,
Boston, Mass.

Hypochlorites. See HYPOCHLOROUS ACID.

Hypochlo'rous Acid, an acid having the chemical formula HClO, which is formed when chlorine monoxid, Cl_2O, is dissolved in water.

The most convenient method of preparing it, however, is by distilling a mixture of dilute nitric acid and a salt of hypochlorous acid. The sodium salt of hypochlorous acid, known as sodium hypochlorite, NaClO, may be prepared by passing a stream of chlorine gas through a cold dilute solution of caustic soda, NaOH; the reaction being $2NaOH + 2Cl = NaClO + NaCl + H_2O$. Potassium hypochlorite may be prepared in a similar manner. Crude calcium hypochlorite, $Ca(ClO)_2$, known in the trade as "bleaching powder" (q.v.), is prepared by acting upon slaked lime with chlorine gas. Hypochlorous acid and the hypochlorites possess powerful bleaching properties, owing to the readiness with which they part with a portion of their chlorine or of their oxygen. (See BLEACHING.) Hypochlorous acid is only known in its aqueous solution, which is a colorless liquid, with a peculiar smell. It decomposes readily with the liberation of chlorine, and the formation of chloric acid, $HClO_3$, the decomposition proceeding rapidly in the sunlight. Hydrochloric and sulphuric acids also decompose it with liberation of chlorine, the reaction in the case of hydrochloric acid being $HClO + HCl = H_2O + 2Cl$. Heat decomposes the hypochlorites, with formation of the corresponding chlorates and chlorides.

Hypochondriasis, hī″pō- or hĭp″-ō-kŏn-drī′a-sĭs, a morbid condition of the mind in which an individual fears himself afflicted with various diseases. The name comes from the ancient belief that the symptoms of this disorder came from perversions of the vital force in the liver and pylorus of the stomach. The tendency to this condition is frequently inherited; it is more common in males, and is sometimes brought on by excesses. Patients afflicted with hypochondriasis are apt to watch for any expression of abnormality in their bodies, to connect various symptoms, and to reach the conclusion that they are sufferers from some disease. In conditions of perfect health any individual may have slight, temporary twinges of pain, or may show passing changes in the functions of the organs; but by the hypochondriac these abnormalities are seriously regarded, and efforts to disabuse him are usually futile. Such constant fear and worry divert the nervous energy from its proper course, and may cause actual disturbance of the bodily functions that are serious. The condition known as neurasthenia may follow; also, more rarely, true melancholia. The milder cases continue in actual good health, but become an unhappy burden to themselves and others. In the treatment it is to be remembered that mental occupation outside of the thoughts of self is essential to a cure.

Hypoder'mic Injection (Greek, *hypo,* under; *derma,* skin), a method of introducing medicines through the skin into the subcutaneous cellular tissue, sometimes deep into the fibres of a muscle by an instrument specially made for the purpose. This instrument is the hypodermic syringe, which is made of glass, with a graduated scale engraved on it, and fitted with a long, hollow needle-shaped point of steel. It must be filled before using, to prevent the possibility of introducing air into the veins. Hypodermic injection should never be resorted to excepting under the specific directions of a physician, and no patient should ever employ this method upon himself.

Hypodermic Medication, as opposed to endermic medication, means the administration of medicine by piercing the skin so as to throw the drug directly into the circulation, and bring it immediately in contact with the seat of pain, if pain is to be treated. There are some drugs which act on the system in a manner which differs in accordance with the method of their administration; thus podophyllin is a powerful cholagogue when administered through the mouth; when administered hypodermically it promotes the secretion of the kidneys. There are, however, distinct advantages of a general character in this method of administering drugs. The action of the drug is more rapid, sometimes instantaneous; the effect is concentrated and intensified; it takes a smaller dose to produce the desired effect; it is sometimes easier and pleasanter than administration by the mouth, and often obviates unpleasant or even dangerous complications. The process of hypodermic injection (q.v.) was invented and brought into vogue by Dr. Alexander Wood (q.v.) of Edinburgh.

Hypophosphites, salts of hypophosphorous acid (q.v.).

Hypophosphorous Acid, an oxyacid of phosphorus, having the formula H_3PO_2. The free acid is of no importance in the arts, but its salts, which are called "hypophosphites," are used in medicine. The acid is monobasic, only one of its hydrogen atoms being replaceable by a metallic atom. Sodium hypophosphite, $NaH_2PO_2 + H_2O$, may be prepared by acting upon caustic soda with phosphorus, phosphoretted hydrogen being given off, while sodium hypophosphite remains in solution. It crystallizes in small, rectangular tablets, which are easily soluble in water and in absolute alcohol. The evaporation of solutions of this substance is often attended by explosions. Barium hypophosphite, $Ba(H_2PO_2)_2 + H_2O$, may be prepared by heating baryta, BaO, with phosphorus and water until the elimination of phosphoretted hydrogen has ceased, the excess of BaO being then removed by a current of carbon dioxid, after which the solution is filtered and crystallized. Barium hypophosphite crystallizes in monoclinic needles, which are soluble in water, but insoluble in alcohol. Calcium hypophosphite may be prepared in the same manner as the barium salt. It has the formula $Ca(H_2PO_2)_2$, and crystallizes in thin, monoclinic tablets, which are soluble in six parts of water, but insoluble in strong alcohol. Free hypophosphorous acid may be prepared by decomposing the barium salt with sulphuric acid, and evaporating the solution at a temperature not exceeding 230° F. It crystallizes in large white tablets, which melt at 63° F., and are decomposed by heat, with the formation of phosphoretted hydrogen and ordinary tribasic phosphoric acid.

Hy'poscope (from Greek words meaning "to see under"), is the name given to an instrument adapted to be secured to the stock of a rifle near the breech, and intended to enable a marksman to fire with accurate aim without exposing his head to the fire of the enemy. The successful American contestants for the Palma trophy at Brisley, England, in 1903, brought

back with them this device, which seems likely to play an important part in the warfare of the future. It was invented by William Youlton of Brighton, England, who conceived the idea of it after the battle of Colenso in the Boer war, during which it is stated that not a single Boer was to be seen. Later in the war it was employed with good results, its use at Mafeking receiving particular mention.

The hyposcope consists of a series of mirrors mounted in a tube of inverted L shape; the shorter arm lies across the barrel of the rifle, while the longer arm hangs down at one side. The first mirror reflects the light coming in along the barrel of the rifle to a second mirror at the elbow of the instrument, which directs the rays downward to a mirror at the lower end of the tube, and thence it passes out at right angles to the eye. Thus on looking in at the eyepiece one can see the sights of his rifle, and take accurate aim while holding the gun above his head. The vertical arm of the instrument comprises two telescoping sections so that, by means of a thumbscrew at the side, this arm may be extended to elevate the device for long-range shooting. The amount of elevation may be accurately determined by means of a fine scale on the upper section. In order to allow for windage, a thumbscrew at the end of the horizontal arm may be rotated to move the mirror contained therein slightly to one side or the other. A scale on this arm shows just how far the mirror must be moved for different velocities and directions of the wind. The entire instrument is very compact and light, weighing about a pound. It is provided with a holster, in which it may be encased to prevent it from sustaining any injury when not in use.

The advantages of this instrument in actual warfare will be apparent to all. Only the muzzles of the rifles are exposed to the enemy, and the soldiers are entirely concealed in the trenches. But aside from its advantages as a means of protection, the device will be found greatly to increase the effectiveness of the firing. The fear of being shot while taking aim makes the soldier fire hurriedly and at random; with the hyposcope attached to his rifle no fears will be entertained, and the soldier may fire deliberately and with perfect aim. By applying it to the end of a field-glass, an observer can watch the movements of the enemy without danger of discovery. It has also been designed for use on Maxim guns.

Hypostatic Union, the union of the divine and human nature in the one person of Jesus Christ.

Hypoth'esis, in mathematics the term denotes what is assumed in order that the conclusion may follow from it as a consequence. It has sometimes been applied in a disparaging sense to suppositions that have been made for the purpose of drawing foregone conclusions, and not with the view, as has been generally the case in physics, to supply probable antecedents to conclusions which have already been experimentally established. In some cases the hypothesis may only acquire a certain degree of probability; in others it may account for all the known circumstances, and it then acquires the name of a theory; and if subsequent observation reveals no exceptions to its application, it gradually amounts to certainty. The conjecture of Newton that the force of gravity, as exemplified on the earth, might extend to the moon was at first a hypothesis; but when it was found that it accounted for all the facts it became a theory. There has an attempt been made to institute a distinction between a hypothetical cause and a true cause, but it is practically of no value.

Hypsom'etry (Greek, "height-measurement"), the art of determining differences of elevation on the earth's surface. Three distinct modes of procedure may be adopted for measuring a given difference in level. The first and most accurate of these consists in running a "line of levels" between the two stations whose difference in height is to be determined. This operation is conducted as follows: Let A, B, and C be any three points on the earth's surface, such that the difference in level between any two of them is not more than a few feet; and let us suppose that B lies between A and C, and that it is not more than a few hundred feet distant from either of them. A precise spirit level is set up at B, so that its telescope is higher than either A or C. A graduated staff is then held in a vertical position upon the point A, and the observer at the level determines, by looking through the telescope, which division of the staff is of precisely the same height as the cross-hairs of his instrument. If the height of A is known, we have merely to add to it the known length of the graduated staff, from the ground up to the division that has been observed, in order to ascertain the exact height of the cross-hairs of the level. The staff is next carried forward to the point C, and a second observation of the same kind is made upon it at this point. The height above the ground of the division that is here found to be on a level with the instrument is then subtracted from the known height of the cross-hairs in the telescope, and the result is the height of the point C. The instrument is then carried forward to a point, D, situated beyond C, and the altitude of a still more remote point, E, is determined in the same manner, by observing the graduated staff at C and at E, and then calculating the height of E from the known height of C, as determined by the preceding operation. A chain of observations of this sort is called a "line of levels," and it is obvious that the difference of elevation of any two points whatever may be determined with great precision by running such a line from one of them to the other.

The labor and expense of joining two distant points by a line of precise levels are often prohibitively great; and hence when a high order of accuracy is not essential, trigonometric or barometric methods are used instead. In determining the height of a mountain (for example) by the trigonometric method, a conveniently situated station is selected, from which the summit of the mountain can be well seen, and the horizontal distance from this station to the vertical line passing through the summit of the mountain is first determined by any of the methods used by surveyors for determining the distance of an inaccessible object. The apparent angular elevation of the mountain is next observed; that is, the angle included between the horizontal plane through the station and the line joining the station to the top of the mountain is measured.

If the earth were flat and devoid of any atmosphere, these data would enable us to compute the height of the mountain with considerable precision. For the vertical height of the mountain above the station, and its horizontal distance from the station, and the line joining the station to its summit, would constitute the three sides of a right-angled triangle; and the base of this triangle being known, as well as one of the adjacent angles, its vertical height (that is, the height of the mountain above the observing station,) could be easily calculated by the ordinary rules of trigonometry. In the actual case, however, the problem is complicated by the curvature of the earth's surface, and by the refraction effects due to the presence of the atmosphere. Corrections can be easily applied for the curvature, since that is constant in any given spot, and its value is well known. The refraction effects, however, are variable from time to time, according to atmospheric conditions; and it is impossible to determine them, at any given moment, with a precision sufficient to enable the trigonometric method to compete, in accuracy, with the method of leveling already described.

The third general method of determining elevations on the earth's surface depends upon the fact that the atmosphere possesses weight, so that its pressure diminishes as we pass upward. The difference in depth of two given points below the surface of the sea can be determined with a good deal of precision by noting the hydrostatic pressures at the two points. If these pressures are expressed in pounds per square foot, and their difference is divided by the weight, in pounds, of a cubic foot of the water, the quotient will be the difference in depth of the two points, expressed in feet. The same general principle applies to the determination of the differences of elevation in the atmosphere, only in this case the problem is far less simple in its actual application, because the air, instead of having a practically constant density as water has, is very elastic and compressible, and very sensitive to changes of temperature. The observations, therefore, have to be combined by means of a formula which will take these facts into account, so far as possible. In determining differences of height by this method (which is called "barometric hypsometry"), the difference in atmospheric pressure at the two points that are to be compared is usually determined by means of barometric readings, though the boiling-point method, to which reference will presently be made, is also used. The mercurial barometer gives the most accurate results, but the aneroid form is so much more convenient to manipulate and transport that it is commonly preferred for ordinary work. (See BAROMETER.) When the difference of elevation between two given stations is to be determined, it is preferable to make the barometric observations at both places simultaneously, simultaneous observations of the atmospheric temperature being also taken. This implies the co-operation of two observers, and the possession of two sets of instruments; and hence it is not always feasible. When the work is carried out by a single observer, or with a single set of instruments, the observations should be made first at Station A, then at Station B, and finally at Station A again; the average readings at Station A, both of barometric pressure and of temperature, being adopted as the definite observations at that station. In this way the effects of variations of temperature and pressure are eliminated as far as possible. If h is the average reading of the barometer at the lower station, in inches, and H is the reading of the barometer at the upper station, also in inches, and if t and t^1 are the temperatures observed at the two stations, on the Fahrenheit scale, then the difference in height between the two stations, as expressed in feet, is approximately

$$(\log h - \log H) \times 60384 \times (1 + \frac{t + t' - 64^\circ}{900}).$$

In place of the barometer, an instrument called a "hypsometer" is sometimes used for determining the difference in barometric pressure between the two stations. The hypsometer is essentially an instrument for determining the boiling point of water with a considerable degree of precision. Water, which at the normal atmospheric pressure boils at 212° F., boils at a lower temperature on the tops of mountains, where the atmospheric pressure is less. The change in the boiling point is approximately 1° F. for every 555 feet of ascent; though this relation is not exact. In the practical application of the method, the boiling point is observed, on the mountain top, by an accurate thermometer which should be graduated as fine as fiftieths of a degree on the Fahrenheit scale. The difference between the temperature so obtained and 212° F. is then multiplied by the constant factor 555, and the product is the desired estimate of the height of the mountain above the sea. This procedure, it will be seen, assumes that at the time the observation is made, the atmospheric pressure at the sea-level has its normal (or average) value, so that water would boil there at 212° F. precisely. This condition will seldom be more than approximately fulfilled, and hence the method by boiling points, as usually carried out, is more uncertain than the barometric method as described above. The thermometric method is very convenient, however, and for this reason it is in strong favor among travelers and explorers, who usually are content with a more or less rough approximation to the height to be measured. The method is capable of being refined further than has here been indicated; but when more accurate results are desired than are obtainable by the process as described above, it is better to make use of simultaneous readings of the barometer and thermometer, at the two stations to be compared.

Hyrax, hī'raks, the type-genus of a group of small rabbit-like animals forming the group *Hyracoidea*. There are two species, not very sharply defined, the daman (*H. Syriacus*), which spreads from the African shores of the Red Sea to Syria, and the Klipdas, or dassy (*H. Capensis*), which ranges from Abyssinia to the Cape of Good Hope. The former is the animal meant by the Scripture reference to "conies," as a "feeble folk." They are gregarious, plant-feeding, and make their homes among loose rocks, where they are little seen during the day. Hence English settlers call them rock-rabbits. The zoological position of these animals is astonishing in view of their size, appearance and rodent-like habits, for they are most nearly related to the elephant and rhinoceros. In west-central Africa live two

or three small arboreal species (*Dendrohyrax*). The latest monographer of these singular animals is O. Thomas (Proc. Zool. Soc. of London 1882), who says that the rules of priority require that the family and genus should be called *Procaviidæ* and *Procavia*. They are believed to be little modified descendants of the *Condylarthra*.

Hyrcanus (hẽr-kā'nŭs) **I.,** JOHN HYRCANUS, a Jewish high-priest and prince of the Asmonean family, who ruled in 135-105 B.C. He was the son and successor of Simon Maccabæus. At first dependent on the Syrians, he succeeded in throwing off their yoke, and also in subjugating the Samaritans. He next overcame the Idumæans, and obliged them to submit to Judaism. He afterward confirmed his power by an alliance with the Romans and made Judæa more powerful than it had been since Solomon's time. He was originally a Pharisee, but ultimately favored the Sadducees.

Hyrcanus II., high-priest of the Jews and prince of the Asmonean family, who ruled intermittently from 69 B.C. to 38 B.C. He was the grandson of Hyrcanus I. His younger brother, Aristobulus, seized the government, and finally Pompey removed Hyrcanus from the kingship, and made Antipater of Idumæa governor of the colony. In 47 B.C. Cæsar proclaimed Hyrcanus tetrarch and high-priest. Antigonus, son of Aristobulus, deposed Hyrcanus and removed him to Seleucia whence later, at the request of Herod, he returned to Jerusalem, where he was finally put to death (30 B.C.).

Hyslop, hĭs'lŏp, **James Hervey,** American scholar and educator: b. Xenia, Ohio, 18 Aug. 1854. He was graduated from Wooster University (Ohio), studied also at Leipsic and the Johns Hopkins University, taught successively in Lake Forest University, Smith College, and Bucknell University, and was appointed professor of logic and ethics in Columbia University. He became well known for his connection with the investigations of the Society for Psychical Research, and contributed extensively to its proceedings. His further work includes articles in prominent periodicals; an edition of Hume's 'Ethics' (1893) with introduction; a text-book on 'The Elements of Logic' (1892); one on 'The Elements of Ethics' (1895); 'Democracy: A Study of Government' (1899); 'Logic and Argument' (1899); and 'A Syllabus of Psychology' (1899).

Hyssop, hĭs'ŭp (*Hyssopus*), a genus of plants of the natural order *Labiatæ*, with four straight diverging stamens, and a 15-ribbed calyx. The common hyssop (*H. officinalis*) is a perennial shrubby plant about two feet in height. The leaves stand in pairs without footstalks. The flowers are blue, growing chiefly on one side, in short verticillated spikes. It is a native of the south of Europe and the East, and is naturalized in the United States. The leaves have an agreeable aromatic color, and an extract from them is produced by water and spirits. The hyssop of Scripture (that is, the plant whose Hebrew name *ezob* has been translated "hyssop") has not been ascertained. As it "grew out of the wall," it must have been a diminutive plant, and may have been one of the mosses. The most probable and most widely accepted view is that it was the caper-plant (*Capparis spinosa*), but it is not unlikely that the name was applied to several plants of somewhat similar properties. The name of hedge-hyssop is applied to species of plants of the genus *Gratiola*, belonging to the natural order *Scrophulariaceæ*.

Hysteria, a morbid state of the nervous system in which the clinical manifestations present a wonderful variety of symptoms closely simulating some forms of organic disase. There is often increased physical irritability; the condition is frequently manifested by neuralgic pains, hyperæsthesias, hallucinations, and convulsive and paralytic phenomena. It may be regarded as a brain affection — a mild insanity.

Among the causes of hysteria heredity plays a most important part. There may be direct transmission of the hysterical temperament from parent to child, or other nervous manifestations in the family and its branches, such as epilepsy, chorea, neuralgia, insanity, etc. It occurs more frequently in women, but it is much more common in men than is ordinarily believed; it occurs in boys and girls at a tender age or about the time of puberty. Briquet found that one eighth of his cases were in children under ten years of age. Anything which lowers the general tone of the nervous system may give rise to it in predisposed persons. Hæmorrhages, severe illness, poor food, anæmia, overwork in uncongenial occupations, anxiety, fright, jealousy, disappointments make a profound impression; so does an education which fosters and stimulates inherited instability. The enforced social restrictions of women, which they often inflict upon their young children, with lack of proper exercise for physical development and an artificial and premature education and habits heighten this predisposition. Accidents are a frequent cause of the first appearance of hysteria, as has been clearly pointed out by Charcot. The disease may, at times, occur in young girls who have witnessed attacks in others.

To understand the symptoms of hysteria, it must be borne in mind that there are two classes of phenomena. These have been termed the *mental stigmata* and the *mental accidents*. The stigmata are anæsthesias (loss of sensation), amnesias (forgetfulness), abulias (loss of will power), motor disturbances, and modifications of character. These are the cardinal symptom-groups that characterize the mental state of the hysteric. Any or all of the mental accidents may likewise be noted — suggestibility and sub-conscious acting, fixed ideas, ecstasy, automatism, convulsive movements, sleep-walking, deliriums, etc. The occurrence of these constitutes important corroborative evidences of hysteria and while not found in all hysterics, they may be very common symptoms.

Hysterical persons often complain of some of the symptoms found in neurasthenia — neuralgic pains in various parts and hyperæsthetic areas about the abdomen, chest, or back, frequently in the neighborhood of the ovary, mammary gland, etc. There may be anæsthetic patches in various parts of the body, or there may be complete loss of sensation on one side associated with anæsthesia of the mucous membranes. The special senses on that side are involved — sight, taste, and hearing.

There may be irritations of the bladder and

urethra; pain in the joints, which may be mistaken for joint disease.

In some cases the senses are exceedingly acute. Persons notice odors imperceptible to others; are often made sick by odors which do not affect normal individuals; may have a liking for odors and substances disagreeable to others. Perverted sense is shown in an abnormal taste, in eating soap, slate-pencils, etc. Hysterical manifestations in some are simply emotional exaggerations; they laugh and cry without cause. In serious attacks there are likely to be various hysterical manifestations. Occasionally tactile sensibility is disturbed, and the muscular sense may be abolished. The anæsthesia may affect the mucous membranes of mouth, pharynx and nose, abolishing the reflexes of the parts. The secretions may be diminished or arrested.

Spasmodic convulsions and paralytic phenomena may occur. The spasmodic attack may be rhythmic; may simulate the trembling of organic disease; may be confined to one member or involve the entire half of the body; may be coarse, as in disseminated sclerosis, or a fine tremor, as in paralysis agitans, or the tremor may simulate the trembling of organic brain disease. It may occur in any muscle or group of muscles; may manifest itself as contracture, which may be intermittent or may last continuously for months or years. Contracture may be confined to the strong muscle of the jaw and other muscles in their neighborhood, causing trismus. Spasms of the glottis may take place, giving rise to severe difficulty in breathing; or of the pharynx, causing difficulty in swallowing. Globus hystericus is a constant symptom, but is not as frequent as it is often thought to be. Persistent and severe vomiting often occurs, but the nutrition rarely suffers materially from these attacks. Retention of urine is frequent, owing to spasm of the sphincter, and the catheter may have to be used for months.

Paralysis occurs in these cases; it is variable in distribution, and may come on suddenly after a convulsive attack or without it; it may be flaccid or associated with contracture; it may come on slowly; it may be confined to one limb or be hemiplegic in type.

Hysterics are easily affected by pleasurable or painful impressions, and there is often a morbid craving for sympathy and attention. They may show moral perversion; may lie, steal, quarrel with and intrigue against their own family; may form and change attachments and dislikes without obvious reason; may manifest aversions, as to frogs, spiders, mice, cats, etc.; may deceive for deception's sake or to excite wonder. Some are painfully depressed; they have forebodings, or are compelled to do certain acts. Here the hysterical insanities are approached on the one hand, and the imperative conceptions and neurasthenias, on the other.

Hystero-epileptic attacks in their greatest severity are often preceded by general discomfort, or by hallucinations of vision and hearing. Usually sudden, they may be preceded by an "aura," globus hystericus, singing in the ear, etc. Breathing is spasmodic; consciousness is obscured; the convulsion may be similar to those of mild epilepsy. In some cases the body is thrown into all sorts of contortions. An extreme opisthotonos may be present, the body being bent backward, resting on the head and heels. Gestures and noises are made. Sometimes religious ideas have an influence over the attitudes assumed; at other times, ideas of demoniacal possession.

From milder forms, recovery is the rule. In graver cases, and when there is a strong neuropathic tendency, the persons will probably pass from one hysterical manifestation to another.

Treatment.— In cases where there is deterioration of the physical health, tonics and nutritious diet should be given. Hydrotherapy improves nutrition and also the mental state. Many drugs have been recommended, but they are all uncertain in their action, at one time giving a result, and failing at another. Convulsive attacks may at times be stopped by the cold douche to the spine. Isolation from the family circle is of the utmost importance in the treatment of these cases. Every effort should be made to discover the psychic shock which has produced the attack. Only the patient may have knowledge of this, and he will not often reveal it. There is no disease the treatment of which it is more difficult to describe. Suggestion-therapy gives by far the best results, but the great difficulty is that good results are rarely permanent.

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SMITH ELY JELLIFFE,
Managing Editor Journal of Nervous and Mental Disease.

Hysterophytes, hĭs'tē-rō-fīts. See FUNGI.

Hyvernat, hē'vĕr-nat, **Eugene Xavier Louis Henry,** American scholar: b. St. Julien-en-Jarrêt, Loire, France, 30 June 1858. He was graduated from the University of France at Lyons in 1876, studied divinity at the St. Sulpice Seminary, Issy, in 1877–9, at Paris in 1879–82, was Oriental interpreter to the Propaganda at Rome in 1885–9, and taught in the Roman Seminary in 1885–8. In 1889 he was appointed professor of Oriental languages and archæology in the Catholic University of America at Washington, D. C. His writings include: 'Les Actes des Martyrs de l'Egypte' (Vol. I. 1886); 'Album de Paléographie Copte' (1888); and 'Du Caucase au Golfe Persique' (with Muller-Simonis 1892).

I

I the ninth letter and third vowel of all the alphabets of western Europe, came into the Latin alphabet from the Greek. It is named in Greek iota, which is the yod of the Hebrew and the corresponding letter of the Phœnician alphabet from which the Greeks derived it. Iota and yod (whence jot) being the smallest letter in the Hebrew and Greek, gave occasion for the New Testament phrase "one jot or one tittle." In ancient Latin the i appears to have stood for a semi-vowel like y as well as for the vowel i: thus the Latins would write Ianus, Iulia, pronouncing them Yanus, Yulia. And till a comparatively recent date words beginning with I and J were in English dictionaries classed together.

The dot over the i appears first in MSS. of the 13th century. The sound value of i in all languages except English is constant and is equal to e in he and to i in him. What is called the long sound of English i as in hide is a diphthong made up of the two vowels a and i: this value of i in English is believed to have been given to the letter not earlier than the 16th century: till then the letter had the same sound in English as in other languages.

In the standard alphabet of philologists the values of the vowels are about as in the languages of continental Europe, in which i is sounded as English e.

It is the general rule in English pronunciation that i followed by two consonants in the same syllable is short; yet when the two consonants are ld or nd the i is nearly always long and diphthongal, for example, mild, rind; in wind (noun) it is short, but in wind (verb) it is long. Combined with o it forms a true diphthong oi as in oil; or mere digraphs representing sounds in which often the i has no part; examples: bail, rein, seize, pier, friend. Usually a final e indicates that the i in a word is to be pronounced as the diphthong; for example, fine, fin; yet genuine is genuin; or the i is pronounced as e long, — marine, quinine, Augustine.

In Pope's time and long after oblige was pronounced obleege and rhymed with besiege: the i in oblique is pronounced either e or i.

Ian Maclaren. See WATSON, JOHN.

Iba, ē'bä, Philippines, pueblo and capital of the province of Zambales, Luzon, situated on a river two miles from its mouth, 85 miles northwest of Manila. It has a good anchorage and is on the south coast road. It is a well built town, and has several fine public buildings. In 1901 a United States meteorological station was established there. Pop. 3,500.

Ibach, Lawrence J., American astronomer: b. Allentown, Pa., 17 Jan. 1816; d. Newmanstown, Pa., 9 Oct. 1888. He learned the blacksmith's trade and followed it throughout his life, chiefly at Sheridan, Lebanon County, Pa. He studied with the astronomer, Charles F. Engleman, who, on his death in 1860, bequeathed all his charts, books, and instruments to Ibach. His benefactor having promised to make several series of astronomical calculations for almanacs Ibach filled the first order (1863), and thereafter till his death made annual calculations for almanacs in the United States, Canada, South America, and Cuba. He was commonly known as the "blacksmith-astronomer."

Ibajay, ē-bä-hī', Philippines, pueblo of the province of Capiz, island of Panay, situated on the Ibajay River, 42 miles northwest of Capiz, the capital of the province. Pop. 11,350.

Iberia, ī-bē'rĭa. (1) The ancient name of a district of Asia, between the Euxine and Caspian seas. It now forms part of Russian Georgia, and consists of an extensive fertile plain, surrounded by mountains traversed by four passes. It probably belonged to Persia, until subjected by Pompey and Trajan to the Roman empire, under which it remained till after the time of Julian. (2) The ancient name of Spain, the Ebro, the principal river, being called Iberus. The Iberian language still lives in the Basque. See BASQUES and CELTIBERI.

Iberville, Pierre le Moyne, pē-ār lė mwän ē-bĕr-vēl, SIEUR D', French-Canadian naval and military commander: b. Montreal 16 July 1661; d. Havana, Cuba, 9 July 1706. He entered the French navy, in 1686 took part in the expedition for the capture of the English forts on James' Bay, in 1690 in that for the destruction of Schenectady, N. Y. He took Fort Nelson, on Hudson Bay; captured and demolished Fort Pemaquid, built for the protection of the New England settlements; laid waste all the British posts on the island of Newfoundland; and, having defeated three English vessels with his one, reduced Fort Bourbon, the last station of the Hudson's Bay Company. In 1699 he ascended the Mississippi for some distance, and built Fort Biloxi at the head of Biloxi Bay. This post he removed to Mobile in 1701. In 1706 he captured the island of Nevis. He was considered the ablest officer in the French naval service of his time, and is generally called the founder of Louisiana.

I'bex, any of several species of wild goat (q.v.), sometimes placed apart in a sub-genus *Ibex*, distinguished by the form of the horns of the ram, which are large (30 to 50 inches long),

backward curving, compressed, and marked on the front with bold cross-ridges or knot-like protuberances. The ibexes are larger than other goats, that of the Himalayas standing 40 inches high at the withers. Their coats are harsh, uniformly brown, becoming much grayer in winter, whitish on the under surface and buttocks, and with darker tints on the face and fore-legs. These animals inhabit the most precipitous and inaccessible heights of lofty mountains, where they assemble in flocks, sometimes consisting of 10 or 15 individuals. During the night they feed in the highest woods, but at sunrise they again ascend the mountains, till they have reached the most perilous heights. They are remarkably swift, and display amazing agility and dexterity in leaping. They are objects of the chase, and the hunter must have great skill and hardihood to succeed. Several species are distinguished by locality and minor differences. The typical ibex, bouquetin or steinbock (*capra ibex*), once numerous throughout the European Alps, now exists only as a semi-domesticated animal in certain valleys on the Italian border.

Three other species are recognized: The Arabian ibex (*C. sinaitica*) of Palestine, Arabian and northern Egypt (see BEDEN); the Abyssinian ibex or walie (*C. walie*); and the great Himalayan ibex (*C. sibirica*); which ranges over the high mountains and plateaus of all central Asia, keeping as near the snow-line as possible, and affording the best sport known to that region of game.

Ibicuhy, ē-bē-kwē', or **Ibicui, Brazil,** an affluent of the Uruguay River, which rises in the Serra de Santa Anna, province of Rio Grande do Sul, and after a westward course of about 400 miles joins the Uruguay at Yapeyu opposite St. Martin in Argentina.

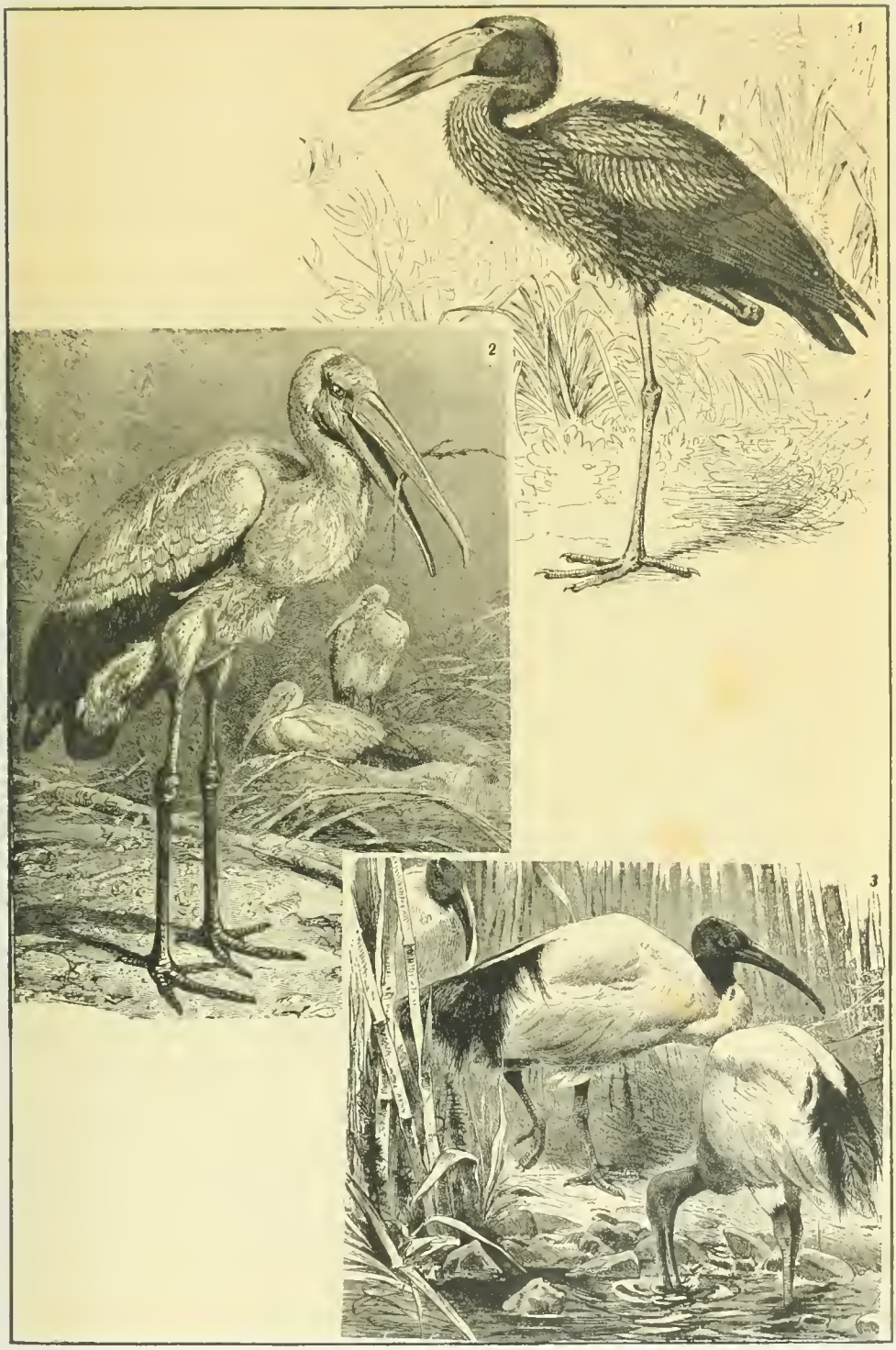
Ibilao, ē-bē-lā'ō, a head hunting Philippine tribe inhabiting the border lands of the provinces of Nueva Ecija and Nueva Vizcaya in the central part of the island of Luzon. They are heathens, of the Malay race, with an infusion of Negrito blood. See PHILIPPINE ISLANDS.

I'bis, a family of wading-birds (*Ibididæ*) inhabiting warm regions. They are related to the storks on the one hand and to the spoonbills and flamingoes on the other. Their bills are long, weak, curved, and the nasal grooves are very long. The legs are long, the tibia partly naked, and the toes long with small webs. In size they are like herons, rather less than storks; and in color present a great and beautiful variety of tints, often with a metallic sheen; the sexes are similar. Ibises are shy birds, which inhabit not only watery and wooded country, but dry plains and rocky gorges. They perform a powerful and elevated flight, extending their neck and legs, and uttering a hoarse croak. They ordinarily wade for their food, poking in the mud with the long bill for aquatic insects, worms and small shellfish; they also catch fish, and on land eat insects, especially locusts, frogs, newts and crustaceans. Some species breed in communities, like herons, others apart, but the nest is always a rude cradle of sticks on a tree or ledge of rocks and occasionally on marshy ground, and the eggs are usually green, with or without markings. There are 12 or 15 genera and a large number of species scattered throughout the whole tropical zone. The typical genus, *Ibis,* contains the sacred ibis (*I. æthiopica*), called by the natives of upper Egypt *abu Hannes,* or "Father John," which arrives in Egypt about the time that the inundation of the Nile commences, its numbers increasing or diminishing with the increase or diminution of the waters; and it migrates southward about the end of June. This species is about the size of a fowl; the head and neck are bare; the body white; the wing tipped with shining, ashy black, among which the white forms oblique notches; the secondaries and scapulars, which in summer curve gracefully over the hinder parts, are bright black. This was one of the birds adored by the ancient Egyptians, and of which numerous mummies are found. The Greek and Roman writers give many fabulous stories relating to ibis, which Savigny has gathered in 'Histoire Naturelle et Mythologique de l'Ibis.' He concludes that the reverence for this ibis was not due to its alleged destruction of snakes, which, in fact, does not occur, but arose from the birds' return at the time the Nile began to rise, the commencement of the season of abundance. Modern writers on Egyptian customs and antiquities may be consulted further on this point. Many other interesting species occur in Africa, Asia and the Australian region; and many species reside in the American tropics,—two, the white ibis (*Eudocimus albus*) and the scarlet ibis (*E. ruber*), flocking in summer in the southern United States. Both are birds of extreme beauty of plumage, and both have been so ruthlessly persecuted by plume-hunters, seeking feathers of millinery purposes, that the scarlet ibises are nearly exterminated.

Wood-ibises and shell-ibises are names for birds of other groups, elsewhere described.

Ibn Sina, ĭb'n sē'nä. See AVICENNA.

Ibsen, Henrik, hĕn'rĭk ĭb'sĕn, Norwegian novelist and dramatist: b. Skien, Norway, 20 March 1828, of mixed Scottish and German descent. At 16 he became apprentice to an apothecary at Grimstad, a small village on the southeast coast of Norway, and here were composed his first works, 'Hösten,' a poem, and 'Catilina,' a play published in 1850 over the signature Brynjolf Bjanne. After a few months at the University of Christiania in 1850, where he wrote 'The Warrior's Mound,' played at the Christiania Theatre that year, he became manager of the new National Theatre at Bergen and turned his attention directly to dramatic composition. In 1856 his 'Banquet at Solhaug,' a Norwegian historical drama, was produced here, and from 1857 to 1862 he was manager of the Norwegian Theatre at Christiania. To this period belong his historical plays, 'Lady Inger of Östraat' (1857); and 'The Vikings at Helgeland' (1858); 'The Comedy of Love' (1852), and several poems. His greatest historical drama, 'The Pretenders,' appeared in 1864, and indignant at the political position of Norway at the time, Ibsen then left Norway to be absent (save for short visits) for, as it is proved, 27 years, living for a time in Germany and then in Trieste and Rome. His noble dramatic poem, 'Brand,' was first published in 1866, and the Storthing thereupon voted him the "poet's salary." In 1867 appeared the famous dramatic poem, 'Peer Gynt,' followed by a political com-



REPRESENTATIVE IBISES.

1. Open-bill (Anastomus lamelligerus) 2. Wood Ibis (Tantalus ibis). 3. Sacred Ibis (Ibis religiosa)

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HENRIK IBSEN.

edy, 'The League of Youth' (1869); and the play, 'Emperor and Galilean,' his longest work (1873). In 1864 he returned to Norway for a short visit and was everywhere enthusiastically welcomed. His subsequent works include the social dramas which are the basis of his fame: 'The Pillars of Society' (1877); 'A Doll's House' (1879); 'Ghosts' (1881); 'An Enemy of the People' (1882); 'The Wild Duck' (1884); 'Rosmersholm' (1866); 'The Lady from the Sea' (1888); 'Hedda Gabler' (1890); 'Master Builder Solness' (1892); 'Little Eyolf' (1894); 'John Gabriel Borkman' (1896); 'When we Dead Awaken' (1900); 'Digte' (poems) appeared in 1871. By Ibsen's countrymen the poems 'Brand' and 'Peer Gynt' are considered his greatest works, both being intensely national, but nevertheless of universal application. Brand, the hero of the first, represents a protest against compromise, while 'Peer Gynt,' sometimes styled "the Scandinavian Faust," is an analysis of the human soul. The modern life dramas are the works by which Ibsen is best known to the world at large. The setting only is Norwegian, the lesson they convey is of world-wide extension. 'The Pillars of Society' is an attack upon hypocrisy as exemplified in the principal personages in a small town, while 'A Doll's House,' which has had a wide popularity in America, is concerned with the failure of marriage. 'Ghosts' is perhaps the most impressive and awesome of all of Ibsen's works, its theme being the consequences of hereditary vices. 'The Wild Duck' and 'Rosmersholm' are gloomy, despairing dramas; 'Hedda Gabler' presents in the character of Hedda a woman of the undomestic, selfish type, while the fearful price of success forms the motive of 'Master Builder Solness.' The theme of 'A Doll's House' is in effect that of 'Little Eyolf,' but in the latter Ibsen, who has hitherto seemed pessimistically to foretell the dissolution of modern society, now admits a hope of its regeneration. Over Ibsen's works a vast amount of controversy has arisen, and he has been fiercely assailed as cynical and even immoral, and as zealously defended. The truth of the matter appears to be that he is *par excellence* the poet of protest against social sophistry, and that he unerringly indicates the danger spots in modern life. There is nothing conventional in the construction or motive of his plays. More than once the climax of the play is represented as occurring prior to the opening of the drama which is concerned only with the consequences. Ibsen has made a deep impression upon the literature of his century and his fame is not likely to decrease. Consult: Brandes, 'Henrik Ibsen,' in 'Eminent Authors of the 19th Century' (1886); Jaeger, 'Henrik Ibsen: a Critical Biography' (1890); Wicksteed, 'Four Lectures on Henrik Ibsen' (1892); Shaw, 'The Quintessence of Ibsenism' (1893); Boyesen, 'A Commentary on the Writings of Henrik Ibsen' (1894).

Ica, ē-sä', Peru. (1) A littoral department bounded north by the department of Huancavelica, east by Ayacucho, south by Arequipa, and west by the Pacific Ocean. Area, 8,718 square miles; pop. (1896) 90,962. (2) A town, capital of the above department on a river of the same name, 46 miles southeast of Pisco on Pisco Bay, with which it is connected by rail. It was founded in 1563. It is in a grapevine and sugar-cane producing region and has manufactures of wine and brandy. Pop. 9,000.

Ice, water in the solid state. When sufficiently cooled, water loses its fluidity, and becomes filled with multitudes of needle-like crystals belonging to the hexagonal system (see CRYSTAL), which increase and interlace until the whole mass becomes solidified. In nature, this change begins at the surface of the water and spreads gradually downward, so that the exact course of the freezing is not so easy to trace as it is in the laboratory, where the water can be uniformly cooled throughout its entire mass. When the freezing process is complete, the crystalline nature of the solid that results from it is not at all obvious. It is clearly visible, however, in snow-flakes, where the hexagonal form is also evident. In a solid block of ice the crystalline structure can also be demonstrated by a method that was used with much success by Tyndall, as a beautiful and instructive lecture experiment. The image of a slab of pure ice is thrown upon a screen by means of a projection lantern provided with a powerful electric light. At first nothing is seen, but very shortly the heat-rays passing through the ice cause it to melt internally, and the melting takes place according to the internal crystalline structure, which is gradually brought out upon the screen in great beauty. Six-sided stars, suggestive of the snow-crystals, appear, and these enlarge and become serrated at the edges as the electric beam gradually destroys the molecular architecture, the process continuing until the ice has been again reduced to the liquid form.

Pure water normally freezes at a temperature which is denoted by 32° on the Fahrenheit scale, and by 0° on the centigrade and Réaumur scales. It is possible, however, to cool pure water to a temperature considerably lower than this, if proper precautions are taken. As long ago as 1836, for example, Gay-Lussac observed that water, when placed in a vessel and covered with a layer of oil, may be cooled to 10° F. without freezing. If the vessel be slightly shaken or jarred, however, solidification ensues at once.

Pressure has a slight effect upon the temperature at which water freezes. This effect was predicted, from theoretical considerations, by James Thomson, in 1849. Dewar has since measured its amount with much care, finding that the freezing temperature is lowered by 0.014° F. for each atmosphere of pressure. Small as this quantity is, it is of importance in some branches of physics. In 1858 Mousson, by the application of an enormous pressure, succeeded in reducing the freezing point to 4° below zero, Fahrenheit. The presence of dissolved substances in the water also depresses the freezing point. Sea-water, for example, freezes at about 27° F. (the ice that is formed being nearly free from salt), and strong brine is used in the circulating pipes and cooling coils of refrigerating plants, since it can be cooled much below this temperature without freezing.

The effect of pressure in lowering the freezing point is illustrated in the familiar process of making a snow-ball from damp snow, — that is, from snow whose temperature is precisely 32° F. Under the pressure of the hand, the freezing point of the snow mass is lowered slightly, with

the result that a partial melting of the crystals takes place. When the pressure is removed, the freezing point rises to its normal position, and the water that was formed by the pressure alone freezes again, and cements the mass together. (The superficial moisture, due to the warmth of the hand, is not here contemplated. The melting from this cause is a separate phenomenon.) The slight but real plasticity of large masses of ice, such as are met with in glaciers, is probably related to this phenomenon of the variation of the freezing point by pressure, but there is some difference of opinion among the authorities as to the precise way in which the slow downward flow of these ice masses is accomplished. The melting of ice by pressure, and its subsequent solidification upon the removal of the pressure, is known to physicists as "regelation".

Experiments that have been conducted in connection with precise thermometry, by Pernet and Marek, show that the temperature of melting ice is slightly different, according to the source of the ice, and the way in which it is treated; this variation being independent of the pressure, and existing even when the ice is sensibly pure. A variation in the melting point of as much as 0.164° F. has been observed; and in order to eliminate the effects of error from this cause, it is necessary, for the purposes of precise thermometry, to adopt a uniform mode of procedure in the treatment of the ice that is to be used for the establishment of the freezing point upon accurate thermometers. (Consult: Guillaume, 'Thermométrie de Précision,' ch.ii.).

When water that contains solid matter in solution or in suspension is frozen, the solid matter is mostly eliminated, so that the ice is much purer than the water from which it is produced. Some of the solids are almost invariably entangled among the interlacing crystals of the ice, however, so that numerous little particles of foreign matter often remain in the ice, imprisoned in tiny cavities. Bacteria and other germs that may have been present in the original water appear to be largely excluded from natural ice by the freezing process, though some of them are undoubtedly caught among the crystals and retained. In artificial ice, where a mass of water is frozen simultaneously on all sides, so that the solidification proceeds from the outside toward the centre of the cake in all directions, purification from this cause is hardly possible, and the middle part of the ice-cake is likely to be rich in whatever germs the original water may have contained. Fortunately the recent experiments of Sedgewick and others indicate that freezing and protracted storage of the ice is much more fatal to typhoid bacilli than was formerly supposed. Artificial ice, if prepared from distilled water, or from water that is certainly known to be free from disease germs, is undoubtedly safer than natural ice that is taken from streams or ponds of unknown purity; but in choosing between natural and artificial ice from the same identical water, the preference should be given to the natural product.

Water expands upon freezing, one volume of water at 32° F. becoming transformed, by freezing, into 1.0908 volumes of ice at the same temperature; which is equivalent to saying that water expands by one-eleventh of its own bulk upon freezing. The quantity of heat required to melt one pound of ice, from the state of ice at 32° F. to that of water at 32° F., is 142 times as great as the quantity of heat required to raise the temperature of a pound of water from 32° F. to 33° F. The specific heat of ice, near the temperature 32° F., is approximately 0.50.

Ice Age. See Glacial Period.

Ice, Artificial. See Ice Industry.

Ice Boat. See Ice Yachts and Ice Yachting.

Ice-breaker, a vessel, especially a strong, heavy steamer, with powerful engines, for opening up navigable channels in frozen waters. On the Great Lakes of the United States, where such vessels are extensively used, they are generally fitted for carrrying cargoes or transporting railroad cars. Such vessels are usually so built as to run their bows up on the ice and break it by means of their great weight. An ice-breaker called the Yermak, built in England in 1899, for use in Russian waters, is 305 feet long, with 71 feet beam and draft of 25 feet. She did good harbor work in polar ice in 1900, but proved unequal to the heavy pack of the sea. Admiral Marakoff of the Russian navy, who superintended her trials, believes that the best way to reach the north pole is by means of a powerful ice-breaker, using liquid fuel instead of coal.

Ice Industry. Though the use of natural and artificial ice as an article of commercial value practically began only in the first part of the 19th century, yet the artificial production of cold began long before it was generally supposed to have been thought of.

In Greece and Rome during the early ages snow was more commonly used, being placed in cone-shaped pits 45 feet in diameter, 50 feet deep and lined with straw and prunings of trees. The snow was packed down and covered with more straw and prunings, over all of which a thatched roof was placed; after the ice was formed it was cut and carried out through a door left in the side of the pit for the purpose. During the 16th century snow and ice was stored in cellars for the purpose of cooling drinks.. This custom spread from Greece and Italy to Western Europe and to France during the reign of Henry III. in the 16th century and by the end of the 17th century the sale of snow and ice had become a profitable trade. From that time until the beginning of the 19th century the ice trade was practically at a standstill, no material advance was made in the direction of improving the methods of harvesting the ice supplied by nature, nor was any attempt of any importance made to produce artificial ice. For purposes of description and comparison, ice may be divided into two classes, the natural and the artificial.

Natural Ice.— Probably the first ice cut and shipped as an article of commercial value was sent, in 1799, from New York to Charleston, S. C. This cargo was cut from a pond near Canal street. While this shipment was the first recorded it was of little importance; the real beginning of the industry came in the year 1805 when Frederic Tudor, of Boston, shipped a cargo of 130 tons to the West Indies. This resulted in a loss of $4,500, and Tudor's second shipment, two years later to Havana, likewise

was made at a loss enormous for those days. He stuck to the business, however, and finally, in 1812, was granted by Great Britain a monopoly of the trade with her colonies in the West Indies, and later, in 1815–16, Spain granted him the same concession to export to Havana. In 1817–18 the trade was extended to Charleston and Savannah; to New Orleans in 1820; to Calcutta in 1833; and to Rio Janeiro in 1834. Thus a large and lucrative trade with southern countries and southern cities of the United States was built up; competitors began to come into the field, the first of these to enter the export field being the firm of Gage, Hittinger & Co. of Boston who introduced American ice to the people of London. They were in turn followed by a Salem merchant named Lander, and others. The Treasury Department gives the following figures for the export trade from 1850 to 1900:

Year.	Tons.	Value.
1850	.....	$107,018
1855	41,117	190,793
1860	49,153	183,134
1865	59,927	225,825
1870	65,802	267,702
1875	53,724	208,249
1880	45,666	136,686
1885	38,901	89,420
1890	44,849	111,762
1895	17,295	41,915
1900	13,720	29,501

The harvest of natural ice is gathered on an enormous scale in the United States, the demand for the article being due in a large measure to the growth of other industries to which ice was a necessity. Before Croton water was introduced into New York and as far back as 1825, ice was cut on Sunfish pond, on the outskirts of the city, by some butchers who desired to preserve their stock of meat. In 1826 ice was cut on Rockland Lake, and at first all the ice cut was stored in the ground but later storehouses at Hubert street and Christopher street were built, and as the demand for ice gradually developed in all the larger eastern cities, large storehouses were erected nearby the places where the ice was cut. The capacity of these houses ranges from 10,000 to 90,000 tons and in size run from 100 to 150 feet in length by 30 to 50 feet in width. For gathering the ice there is an elaborate system of apparatus, but the usual methods employed are as follows: After the snow is cleared from the ice by means of scrapers or snow-plows, an ice-plow, either propelled by steam or drawn by horses — the latter means more commonly used — cuts deep grooves in the ice in one direction and then repeats the operation at right angles with the first, thus forming a perfect square, measuring a little more than 3 feet. As these grooves extend nearly through the ice it is a simple matter to saw through the remaining thickness, pry the cakes loose with crowbars, and float them to the icehouses through channels provided for the purpose. Upon reaching the icehouse the cakes are lifted on an elevator, run into the house, and packed in sawdust or other suitable material, to be held there in storage till needed.

The cost of harvesting a ton of natural ice varies greatly; it depending to a great extent upon the weather conditions, both during the process of the formation of the ice and during the process of cutting and housing. Under average conditions the cost of harvesting amounts to about 80 cents, though under very favorable conditions it has been known to have cost only from 25 to 30 cents per ton, but this has not been often. This, of course, does not include the cost of transportation, delivery, etc., and as the majority of the icehouses are a considerable distance from the centers of consumption, the cost of transportation is a large factor. The following figures, taken from 'The Ice Journal' give the quantities of ice harvested in Maine and on the Hudson River, the two most important fields of operation in the whole country:

Year.	Maine Tons.	Hudson River Tons.
1878	.....	2,225,000
1879	.....	2,371,000
1880	1,426,800	800,000
1881	994,800	2,558,000
1882	1,227,200	1,954,700
1883	1,364,500	3,017,600
1884	1,118,000	3,026,000
1885	1,499,400	3,019,500
1886	1,368,400	2,355,500
1887	1,311,100	3,266,000
1888	1,037,000	3,330,500
1889	1,529,600	2,742,000
1890	3,092,400	.....
1891	1,285,000	2,624,000
1892	1,435,900	2,500,000
1893	1,444,000	3,407,839
1894	1,600,800	2,638,500
1895	1,413,500	3,409,000
1896	1,466,000	2,735,500
1897	1,526,500	2,675,033
1898	1,242,500	2,172,400
1899	1,326,430	4,300,293
1900	723,780	1,430,670

The moving of this enormous quantity of ice necessitates the maintainance of a large fleet of barges and other boats for the domestic trade, and of sailing vessels for the export trade, and to the cost of maintaining these vessels, when figuring the cost of harvesting, must be added the cost of towing, loading, discharging, dock and stable rent, repairs of boats, icehouses, and wagons, etc., all this before the ice is placed in the hands of the retailer.

The tools used in harvesting this crop are many and varied, and the manufacture of them has become a large and valuable source of income to several concerns in this country who have made this a specialty. Many of the ice tools now in use were invented by Nathaniel Wyeth and John Barker, of Boston. The ice plow was invented in 1839 and the patent clearing-tooth in 1872. Some of the most common tools now in use are: the snow-scraper or plane, the masher and the plow; augers and axes for tapping the ice in order to drain off surface waters; saws; forked bars for prying the cakes loose; trimming bars for squaring the cakes after loose; adzes, edging tongs, and chisels used in packing the ice when in the storehouse; saws and bars for prying loose previous to shipment; and tongs, scales, axes, etc., used on the retail delivery wagon.

Artificial Ice.— The manufacture of ice as an industry was begun as early as 1866, but only reached a degree of commercial importance

about 20 years ago. The beginning was naturally made in the Southern States, but as it became more generally used, factories sprang up over the entire country. The growth of the "infant industries" throughout the United States gave this industry an added stimulus, because the supply of natural ice was by far too small to meet the requirements of slaughtering and meat packing-houses, refrigerator cars, cold-storage warehouses, etc.

The growth of the industry from its inception may be seen in the following statistics:

	1900.	1870.
Number of establishments	787	4
Capital	$38,204,054	$434,000
Salaried clerks, officials, etc.	1,545	.....
Salaries	$1,234,803	.....
Wage-earners	6,933	97
Wages	$3,424,305	$40,600
Miscellaneous expenses	1,779,890	.....
Cost of materials used	3,339,724	82,165
Value of product	13,874,513	258,250

The first experiments for making artificial ice for mercantile uses started with the Italians in the 16th century. The first machine used for the actual manufacture was invented by Dr. William Cullen, this being based on the vacuum principle, the atmospheric pressure being reduced by means of an air pump. Later, in 1795, several experiments were made by a Mr. Walker of Oxford, England, in the line of freezing mixtures. Prof. Leslie, of England, produced a considerable degree of refrigeration by including in the exhausted receiver of an air-pump, sulphuric acid, a substance rapidly absorbing vapor. In 1834 Jacob Perkins, an American engineer residing in London, obtained a patent for a machine generally credited with being the forerunner of the modern compressor machine. The refrigerant used in this machine was ether and brine was circulated at a temperature of 5° Fahrenheit through pipes which encircled the evaporator containing the ether. After running through the pipes the brine flowed into a receptacle containing boxes filled with water and thus the water was frozen. Later experiments were made by French and German inventors, boxes were supplanted by cans and this developed into the manufacture of can ice. Many of the improvements made in the ice-making apparatus are due to the efforts of Prof. A. C. Twining, of New Haven, Conn. He patented an ice machine in England in 1850 and in the United States in 1853; in 1855 he invented a machine, and put into active operation in Cleveland, Ohio, which produced 1,600 pounds of ice in 24 hours; and later discovered that ice would be transparent, with the exception of a small porous core, if frozen at a temperature slightly below the freezing point. In 1857 Dr. John Gorrie of Appalachicola, Fla., patented his ice-making machine; this was later followed by the compressed-air machine of Dr. Alexander Kirk; in 1858–60 the machine, upon which the modern ammonia absorption system was founded, was brought forth by Ferdinand P. E. Carre; and later the plate-ice system was introduced by Capt. David Smith, of Chatham, Mass., who erected the first machine of this character in the United States at Oakland, Cal. There have been nearly 4,500 patents taken out in the United States alone for refrigeration processes.

Two systems of making ice are now used, the compressor, and the absorption systems, the former the more generally used. The first step is the compression of the anhydrous ammonia (that is, ammonia which contains no water) into the gaseous form by means of a steam pump, a pressure of from 125 to 175 pounds per square inch being exerted. The next step is to reduce the gas to a liquid state by passing the ammonia through pipes which are in contact with the cold water or some other cold substance. The gas as the beginning contained a certain degree of heat, but by the condensation process this heat is eliminated, and, after being reduced to a liquid state, the ammonia reaches the third and last process, that of expansion. As the ammonia in the liquid state reaches the pipes which are in contact with the water to be frozen, it becomes gaseous because of the expansion, its temperature is thus reduced below the freezing point of water and so draws from the water the heat which was taken away by the condensation process. This results in the freezing of the water.

In the absorption process aqua ammonia is first converted into gas by the application of heat which raises the pressure to from 120 to 160 pounds per square inch. The ammonia is then reduced to liquid form by being passed through pipes in contact with cold water. The ammonia is then changed from a liquid to a gaseous form by the expansion process, the methods being the same as in the compressor system. The expansion draws out any heat in the gas, which, as it passes through the pipes in contact with the water to be frozen, absorbs the heat from them till they are of a like temperature.

A large portion of the ice manufactured in the United States is produced by the can system or the plate system. In making ice by the can system the water is first boiled and allowed to settle, in order to free the ice from any foreign substances and to reduce it to the greatest possible degree of purity. The water is then distilled, boiled again, and run through three kinds of filters. A series of tanks, containing a strong solution of brine, is placed under the freezing room, and through this brine run the pipes containing the liquefied ammonia gas. Into the tanks containing the brine are submerged the cans holding the water to be frozen. As in the compressor system, the ammonia in the pipes is expanded into gas as it passes into the brine, and absorbs enough heat from the brine and water to form the water in the can into ice. The whole process requires from 20 to 66 hours, according to the size and weight of the blocks of ice and to the temperature of the brine. The can is then raised from the tanks by means of a hoist and dipped into a well of warm water to loosen the contents.

The production of ice by the plate system is much slower and more cumbersome. In this process the tank contains the water to be frozen and into it is placed a hollow iron plate holding the coils of pipe filled with the freezing medium. Thus the ice is formed on the outside of the iron plate, is taken out and removed, and is then ready for use.

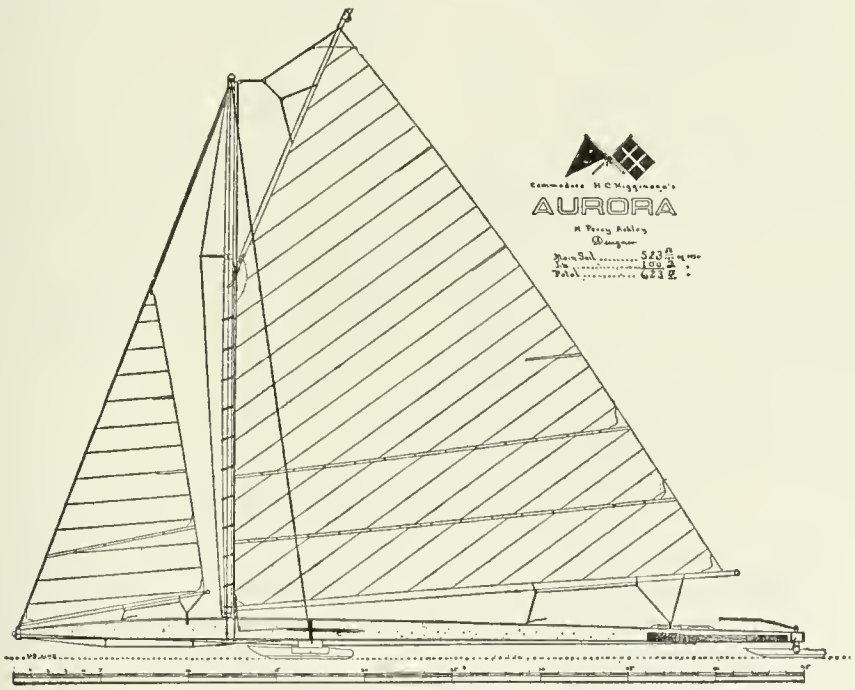
The cost of producing a ton of ice averages throughout the country for all seasons of the year, between $1.10 and $1.50; the average price to the wholesaler ranges from $2 to $2.25; and the retail prices range from 15 to 40 cents per hundred weight according to the season. The changes and improvements in the methods of producing artificial ice have so reduced the cost of manufacture that it can now compete with the natural product. See REFRIGERATION AND REFRIGERATING MACHINERY.

Ice Machines. See GAS, LIQUEFIED.

Ice in Medicine. See COLD.

Ice Yachts and Ice Yachting. The amusement or sport of sailing yachts over the ice has reached its highest development in the United States. The sport abroad is confined to Russia, Sweden and Norway. Boats of the Russian River Club are sailed over a portion of the Gulf of Finland. In 1901 the Stockholm Ice Yacht Club of Sweden built a fleet of fast-racing ice yachts from American designs by Ashley.

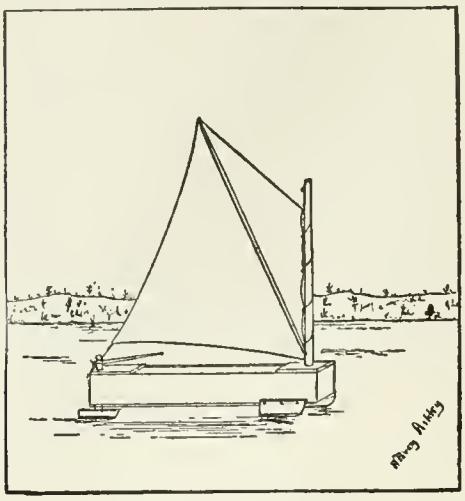
The first authentic ice boat in the United States was built by Oliver Booth, at Poughkeepsie, N. Y., in 1790. It was a square box mounted on three runners, shod with rough iron; with a rudder post and tiller of wood. In 1850 on the Shrewsbury River, in New Jersey, George D. Allaire, constructed an ice yacht of the box order, equipped with rough square iron bars for runners, sharpened with cutting edges. In 1855, on the same river, Nathan B. Clark built a three-cornered platform boat, having sharpened runners, and added a jib to the sprit sails previously carried. The type of side-rail boat came into use about 1871. Jacob Buckhout of Poughkeepsie was the pioneer designer of this type, and at the Centennial Exhibition (1876) exhibited the side-rail yacht Whiff, built for Commodore Irving Grinnell of the New Hamburgh, N. Y., Ice Yacht club. She carried 347 square feet of canvas and measured 40 feet from the top of the bowsprit to the end of the main-boom. The sloop-rigged Icicle built on these lines carried 1,070 square feet of sail, but this excess of canvas was found impracticable and the building of large boats was abandoned. The revolution in ice yachting began in 1879, when H. Relyea of Poughkeepsie built the Robert Scott, having a single backbone and an elliptical steering box. This boat carried 499 square feet of canvas and easily outsailed boats of twice her size. In 1883 the Jack Frost was built by Commodore Archibald Rogers of Hyde Park-on-the-Hudson and the famous racing yacht Haze was built the same year. The Jack Frost won the world's pennant in 1883 and the Haze in 1884. About this time the Shrewsbury Ice Yacht club of Red Bank, N. J., built a large lateen rigged boat, the Scud, carrying over 600 square feet of duck in a single sail. The Orange Lake, N. Y., club built at the same time the catboat Shadow, carrying 800 square feet of sail, and said to be the strongest ice yacht ever constructed. Both of these vessels proved unsuccessful as prize or pennant winners. In 1903 the "sloop" remained the fastest rig in the world, but in reality it is merely a catboat rig with a small jib. The 1903 model of the first class, carrying about 650 square feet of canvas, is capable of sailing a mile a minute, and costs to construct anywhere from $1,200 to $1,600.



The Most Modern and Expensive Ice Yacht (1902).

Racing Rules.— For class racing, ice yachts are divided into four classes: (1) Yachts carrying 600 square feet of sail area and over. (2)

Yachts carrying 450 square feet and under 600. (3) Yachts carrying 300 square feet and under 450. (4) Yachts carrying less than 300 square



Ice Boat of 1790.

feet. Handicap or time allowance for mixed classes is made as follows: One second per square foot for every foot of canvas carried over the smaller boat, providing the race is sailed in one hour. If the race is sailed in 30 minutes ½ second per square foot is allowed, and proportionately in accordance with the time of the race.

The course is usually a triangle sailed over as required to make the number of stated miles; or a straight course to windward and return or to leeward and return. The standard distances for ice-yacht races are 20 miles, 15 miles or 5 miles. The larger the yacht the longer the course. Time limit: 20 miles, 1 hour 15 minutes; 15 miles, 35 minutes; 5 miles, 20 minutes.

In the United States and Canada there are 45 ice-yacht clubs. The challenge pennant of America is open to any American or foreign built yacht. It was held in 1903 by Jack Frost the Second, owned by Commodore Archibald Rogers of the Hudson River Ice Yacht club.

The record of leading American ice yachts are given in the following table.

It will be noted that the fastest time recorded in this table was made by the Jack Frost, 9 Feb. 1893, for 20 miles; time 49 minutes 30 seconds. In 1902 these records were excelled by the Joker, owned by Commodore D. C. Olin of the Kalamazoo, Mich., club, which sailed 20 miles on Gull Lake in 36 minutes 59 seconds. Ice yachts have actually sailed short distances at the rate of 85 miles an hour.

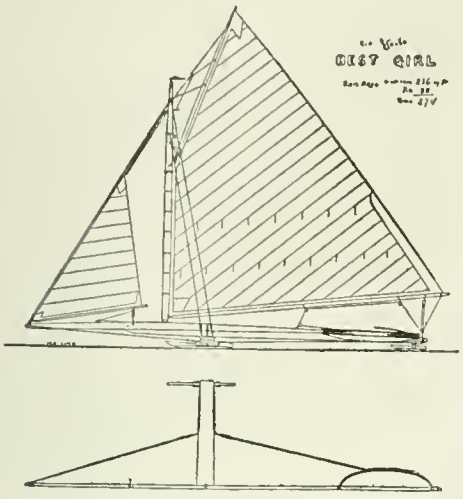
Ice Yacht Construction.—In the modern ice yacht the centre timber or backbone may be made of two pieces, one solid stick or a hollow truss

RACES FOR THE ICE-YACHT CHALLENGE PENNANT OF AMERICA.

NAME OF WINNING YACHT	Club	Date	Distance between buoys in miles	Number of times sailed over	Total Length of course in miles	Calc'lated distance sailed in miles	Time H. M. S.
Phantom	New Hamburg vs. Poughkeepsie	March 5, 1881	.....	.....	.....	.....	.....
Aralam or Robert Scott.....	Poughkeepsie vs. New Hamburg	Feb. 6, 1883	10	Once	20	31.38	57
Jack Frost.....	Poughkeepsie vs. North Shrewsbury	Feb. 23, 1883	2½	Five	25	39.20	1 14 35
Haze	Poughkeepsie vs. North Shrewsbury	Feb. 9, 1884	6.66	Three	21	31.38	1 05 30
Haze	Poughkeepsie vs. New Hamburg	Feb. 14, 1885	2	Five	20	31.38	1 01 15
Northern Light....	Poughkeepsie vs. North Shrewsbury	Feb. 18, 1885	2½	Four	18	31.38	1 08 42
Jack Frost.....	Hudson River vs. Poughkeepsie	Feb. 14, 1887	2	Four	16	25.10	0 43 40
Icicle	Hudson River vs. North Shrewsbury	March 8, 1888	2	Three	12	18.83	0 36 59
Icicle	Hudson River vs. North Shrewsbury	Feb. 25, 1889	2	Four	16	25.10	0 54 01
Icicle	Hudson River vs. North Shrewsbury	Feb. 5, 1892	1.46	Five	20	22.92	0 46 19
Jack Frost.....	Hudson River vs. Orange Lake	Feb. 9, 1893	2	Five	20	31.38	0 49 30
Icicle	New Hamburg vs. Hudson River	Jan. 21, 1899	2½	Four	20	38.	1 09 37
Jack Frost.....	*Hudson River vs. North Shrewsbury	Feb. 7, 1902 Feb. 13, 1902	2½ 2½	Four Four	20 20	36. 38.	1 02 21½ 53 24

* Best two out of three races — all other races single races. All races sailed off Hyde Park, on the Hudson River, New York.

backbone. To this is joined at right angles the running plank, and a steering box or cockpit is attached at the aft extremity of the backbone. The best material is seasoned basswood, which



Side-guyed Ice Yacht, 1901.

is very light and stiff. The central objects in construction are lightness and strength and adaptability for perfect handling. The centre of sail balance should agree with the centre of balance of the hull.

	Lbs.
Hollow backbone (45 feet long)	489
Solid runner plank (26 feet long)	417
Hollow mast (32½ feet long)	118
Hollow boom	55
Hollow gaff	28
Runners and steel steering gear	225
Sails	71
Rigging	151
Total weight	1,554

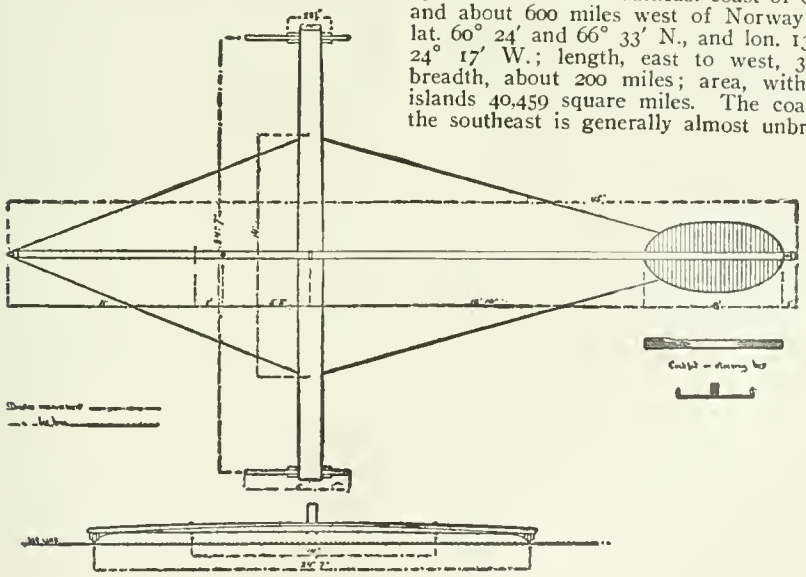
The cost to build an ice yacht of the first class, carrying about 650 square feet, is $1,200, and of the fourth class, carrying 300 square feet, about $350.

Sailing.— Racing on a lake is preferred to river racing, as there are neither tides nor ice cracks to interfere. In sailing a yacht the sheets are trimmed flat. The closest a boat will go to the wind is 30° or 2⅔ points. The best course, or the one that will take the yacht farthest to windward, is 60° or 5⅓ points from the wind, when the advance to windward should be at the rate of half the velocity of the wind, while the actual velocity is equal to that of the wind. The yacht encounters the greatest velocity of the wind when her course is 90°, or 8 points from the wind, when the apparent wind is twice the actual velocity. The greatest speed of the boat is attained at 120°, or 10⅔ points from the wind, when her speed is twice that of the wind. The most rapid progress to leeward is made at 150°, or 13⅓ points from the wind, when the apparent velocity of the wind will equal its true velocity.

H. Percy Ashley,
Ice Yacht Architect.

Icebergs. See Ice.

Iceland, an island dependency of Denmark, 250 miles from the southeast coast of Greenland, and about 600 miles west of Norway; between lat. 60° 24′ and 66° 33′ N., and lon. 13° 31′ and 24° 17′ W.; length, east to west, 301 miles; breadth, about 200 miles; area, with adjacent islands 40,459 square miles. The coast-line on the southeast is generally almost unbroken, but



Plan of The Aurora.

The fastest ice yachts are of the sloop pattern with about one-fifth of their sail area in the jib.

Commodore H. C. Higginson's ice yacht Aurora, of Orange Lake I. Y. C., carrying 623¾ square feet of sail, and equipped with hollow spars and backbone, weighs a total of 1,554 pounds, divided as follows:

on all other sides presents a succession of bays or fiords and promontories. The best harbors are those of Reykjavik and Eyrarbakki on the southwest, and of Eyja on the north. The interior of the island has for the most part a desolate appearance. Lofty mountains of volcanic origin rise crowned with snow and ice, which

stream into the intervening valleys and form immense glaciers. Glaciers cover a surface of upward of 4,000 square miles, and appear in all the mountains above 4,000 feet in elevation. These icy mountains, which take the common name of Jökul, have their culminating point near the southeast coast in Oræfa Jökul of 6,409 feet in height. Next to it in height are the Snæfell, near the east coast, 5,965 feet; and Eyjafjalls Jökul, in the south, 5,579 feet. The structure of these mountains is volcanic; in several of them the volcanic agency is still active, and eruptions have occurred within the last four centuries. Lava covers a large portion of the island. Of volcanic origin and agency are the numerous hot springs or geysers scattered throughout the island, but found more especially in the southwest, to the northeast of Reykjavik, where, from one of the principal geysers, jets of water are thrown to heights varying from 100 to 200 feet. (See GEYSERS.) The general effects of the volcanic agency and the geological formations exhibited on a magnificent scale in Mount Hecla, 5,095 feet high; lat. 63° 59′ N.; lon. 19° 44′ 15″ W. The hot springs are sometimes used for economical purposes; food is dressed over them, and in some places huts are built over small fountains, to form steam baths.

The immense reservoirs of snow and ice furnish supplies to numerous lakes and rivers. Of the former the most important are the Thingvalla Vatn, Hvitar Vatn, and Arnar Vatn in the southwest, and the My Vatn in the northeast.

The most valuable mineral product is sulphur, of which the supply appears to be inexhaustible, and surturbrand or lignite is also worked to some extent. The other minerals are chalcedonies, rock-crystals, and the double-refracting spar, for which the island is famous. On many parts of the coast, particularly the west, basaltic caves occur; that of Stappen is not unworthy to be compared with Fingal's Cave in Staffa.

The climate is mild for the latitude. At Reykjavik, on the southwest coast, the mean temperature of the year is 40°, that of summer 56°, and that of winter about 29° 30′. The air is damp and misty, the weather is extremely variable, and storms and hurricanes frequent. The prevailing winds are north and northeast. In the southern part of the island the longest day is 20 hours, and the shortest 4 hours, but in the northernmost extremity the sun at midsummer continues above the horizon a whole week, and of course during a corresponding period in winter never rises.

Vegetation is sparse and confined within narrow limits. Almost the only tree is the birch, which is stunted, hardly exceeding 10 feet in height. Heath and whortleberry cover the surface. Among flowering plants are saxifrages, sedums, etc. The want of fuel is sometimes supplied by sheep's dung or by drift-wood brought by the Gulf Stream and the polar currents; and the island furnishes a fine turf. Grain appears to have been at one time cultivated, but is not now grown; cole, potatoes, turnips, radishes thrive tolerably well. But the most valuable crop is grass, on which numbers of livestock are fed. Flocks and herds have been estimated at 750,000 sheep, 20,000 cattle, and 40,000 horses. The last, though small, are strong and active and numbers of them are exported. Some of the sheep are four-horned. Reindeer were introduced about 1770, but all that now remain are a few living in a wild state. Wild fowl, including the eider-duck, are abundant; the streams teem with salmon, and on the coast fisheries of cod, haddock, herrings, etc., are carried on.

Manufactures are entirely domestic, almost every family possessing within itself the means of supplying its wants, and occasionally furnishing a surplus, of coarse woolens, mittens, stockings, etc., to be disposed of at the markets. The exports are wool, oil, fish, horses, feathers, worsted stockings and mittens, sulphur, and Iceland-moss. The inhabitants are Scandinavians, and speak a Scandinavian dialect, the original Norse. They are of a tall manly form, open countenance, florid complexion, and flaxen hair. They are simple in manners and customs, having no distinctions of rank, pure in morals, and hospitable. Their houses are chiefly composed of drift-wood and lava; fresh meat and bread seldom appear at their tables, but fish, butter, milk, and preparations of milk constitute their staple food. Their intellectual capacity is superior, education is diffused, and it is rare to meet with an Icelander who cannot read and write.

In religious profession they are Lutherans, the whole island forming a single bishopric. The civil division is into three bailiwicks — Süderamt, Westeramt, and Norderamt with Osteramt — subdivided into 20 smaller districts called Sysler. The governor takes the name of Stiftsamtmann, and presides over the althing or parliament (from "thing," a public assembly), which meets twice a year at Reykjavik, the capital and only town in the island, and consists of 36 members, of whom 30 are chosen by popular suffrage, and 6 (2 spiritual and 4 temporal) are nominated by the king. In response to petitions and complaints Iceland was granted home rule in 1874, and now has the entire management of all matters concerning the island particularly. A minister for Iceland, nominated by the king, is at the head of the administration, but the highest local authority is vested in the governor.

Christianity was introduced in 981, and legalized in 1000; when schools and two bishoprics, those of Holar and Skalholt, were established. The Latin language and the literature and learning of the West, introduced by Christianity, were warmly received in Iceland where poetry and history had been cultivated more than elsewhere in the north. Previously to this the Icelanders had discovered Greenland (983) and part of America (about 1000), and they were now led to make voyages and travels to Europe and the East. The most flourishing period of Icelandic history as regards church and state, — the period too when its intercourse with the outside world abroad was most active — was from the middle of the 12th to the beginning of the 13th century.

Early History.— In 1264 Magnus VI. of Norway united Iceland with his own kingdom, with which it passed to Denmark in 1380, remaining with the latter in 1814, when Norway was joined to Sweden. Toward the end of the 14th century science and art, which had begun to decay with the introduction of the Norwegian rule, sank to the lowest ebb, but they gradually re-

covered their position during the following century. In the 17th century the island was ravaged by Algerian pirates, who in 1627 murdered or carried off a large number of the inhabitants. In the 18th century the island suffered from 43 years' failure of crops and 18 famines. In 1707 about 18,000 persons died of smallpox. Between 1783 and 1785 volcanic eruptions, failure of crops, and famine reduced the population from 48,668 to 38,142. Famine raged again in 1824–5, principally through violent volcanic outbreaks; and a deadly epidemic scourged the country in 1827. In the beginning of the last century the althing, which had existed for about 900 years, was abolished, but it was reorganized in 1843. As already mentioned, a new constitution was granted in 1874, and in August of the same year the 1000th aniversary of the colonization of the island was celebrated, the king of Denmark being present.

Language and Literature.— The Icelandic language is the most northerly of all cultivated tongues. It is rich in roots and grammatical forms, soft and sonorous to the ear, being free from gutturals and excess of hissing sounds. There are 28 letters, namely, all the English except *w*; also *æ*, *ö* (the German *ä* and *ö*), and a character for English *th*. Icelandic literature may be divided into an ancient period, extending to the fall of the republic, and a modern, extending from that date to the present time. Poetry was early cultivated, and among the most important works in Icelandic literature is the collection of ancient heathen songs called the elder or poetic Edda, compiled soon after the introduction of Christianity. (See Edda.) Many other poems, especially songs of victory, elegies, and epigrams, belong to the ancient period of the literature. Histories and romantic works, known by the name of Sagas, were also numerous. Among these we may mention the Völsunga Saga, the most important of all, the Vilkina Saga, the Saga of Hrolf Kraka and his companions, the Saga of King Ragnar Lodbrok, Frithiofs Saga, and the younger or prose Edda. Some of these are partly historical, but there is a larger and more valuable class that are altogether historical in their character, consisting of local and family histories and biographies. Among these we may mention the Islendingabók; the Landnamabók, an account of the settlement of the island; the Kristni Saga, an account of the introduction of Christianity; Njáls Saga (translated into English by G. W. Dasent); Viga Glums Saga; Egils Saga, the biography of a well-known poet and chief; Eyrbyggja Saga, an abstract of which was published by Sir Walter Scott; the Sturlunga Saga, a history of the important Icelandic race of the Sturlungar; the Orkneyinga Saga, a history of the jarls of Orkney (an English translation of which was published in 1873); the Færeyinga Saga, on the Faroe Islands; the Knytlinga Saga, a history of the Danish kings from Harold Blaatand to Canute VI.; and lastly, the famous Heimskringla or Chronicle of the Norwegian Kings, by Snorro Sturleson. Many of these works are masterpieces of style, and are still read with delight by the people of Iceland. The early portion of the second period was barren of anything worth mention in the way of literature, nor can the modern period boast at all of works possessing the interest of those belonging to the ancient. In the 17th century there was a considerable revival of literary activity, the principal names being those of Arngrimur Jonsson (1568–1648), Gudmundur Andræ (died 1654), Runolfur Jonsson (died 1054), Arni Magnusson (died 1730), and Thormodur Torfason or Torfæus. The first complete edition of the Icelandic Bible was issued under the direction of Gudbrandur Thorlaksson (died 1627). The true revival of letters may be said to date from the middle of the 18th century, since which time there is scarcely a department of literature in which Icelandic writers have not done something, not to mention works on various branches of science. Many of the most valuable works of Europe have been translated into Icelandic, even the poems of Milton. Pop. (1895), 73,449; (1903), 78,470.

Consult: Von Toil, 'Letters on Iceland' (1772); Poestion, 'Island, das Land und seine Bewohner' (1889); Burton, 'Ultima Thule, a Summer in Iceland' (1875). For language and literature, Vigfusson, 'Sturlunga Saga' (1878).

Iceland Moss, a lichen (*Cetraria islandica*), found in all the northern parts of the world. It is valued for its nutritious and medicinal properties, and as an article of commerce is collected in Iceland and Norway. In the extreme north it grows even near the sea-level; farther south, only on the mountains. In Iceland it often thickly covers great tracts, and the gathering of it is a summer industry. It grows about 1½ to 4 inches high, consists of an almost erect thallus, and is of a substance leathery and rather cartilaginous. It has a bitter principle which is reduced by steeping in water, and the moss is prepared as food either by pounding and making it into bread or by boiling, with water or milk, till it makes a jelly, in which form it is an agreeable and beneficial diet in some forms of disease, especially in pulmonary disorders. It is also utilized in dressing the warp in weaving, and for sizing paper, being mixed in the vat with pulp.

Icelandic Language and Literature. See Iceland.

Icer'ya, a genus of scale insects, containing the fluted scale. See Scale Insects.

Ichneumon-fly, ĭk-nū'mŏn, the name of a large family (*Ichneumonidæ*) of insects of the order *Hymenoptera*. As the species of this family are very numerous (more than 1,100 genera had been described before 1903) so their manners are extremely diversified; but, in the general outlines of their character, they all agree, particularly in their depredations among the insect tribes. In some the female has the ovipositor in the form of a boring instrument, with which she is capable of perforating the hardest substances. The larvæ of wasps are the devoted prey of these insects, who no sooner discover one of their nests than they perforate the material of which it is constructed, and deposit their eggs within it. Others glue their ova to the skin of a caterpillar, while others again penetrate through it, and lay their eggs in its body. In all these cases the young, as soon as they are hatched, prey on the caterpillar or larva, without, however, destroying it at once, as upon the life of its victim that of the spoiler appears to depend. The caterpillar, in fact, seems healthy until the larvæ of the ichneumon have spun their cocoons, and entered the chrysalis state.

These carnivorous insects are of various sizes; some are so small that the aphis, or plant-louse, serves as a cradle for their young; others again, from their size and strength, are formidable even to spiders, destroying them with their stings. They are, as a whole, highly beneficial to humanity, as a large part of their prey consists of insects which are injurious to crops and valuable vegetation.

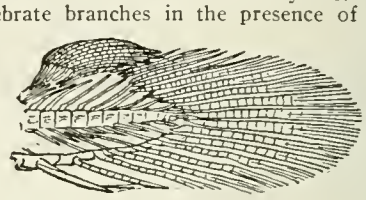
Ichneumons, small carnivorous animals of the civet family (*Viverridæ*) and sub-family *Herpestinæ,* which are distinguished from the true civets by the straight non-retractile claws, and various skeletal characters. While there are a number of genera the typical and most important is *Herpestes,* many species of which inhabit Africa, southern Asia, and the neighboring islands. The teeth are numerous, usually 40; the head is elongated, with short rounded ears; the limbs are short; and the body and stout tail are covered with long hairs. They vary in size from that of a squirrel to a cat. Their food consists of all kinds of small animals; rats and mice, birds and their eggs, snakes, lizards, etc., which they pursue chiefly on the ground but also in trees. The Egyptian ichneumon (*H. ichneumon*) or Pharoah's rat, is famous as one of the many animals venerated by the ancient people of that country, and because of its reputation as a destroyer of crocodile's eggs. While the eggs of this reptile may be occasionally devoured, the importance of the ichneumon in this respect is purely mythical. The Indian ichneumon or mungoose (*H. mungo*) is still better known. It lives in a semi-domesticated state, and performs an invaluable service as a destroyer of venomous serpents, whose fangs it generally manages to escape by its wonderful agility. This species has been introduced into Jamaica for the purpose of destroying rats, and has multiplied exceedingly and become a serious pest, though of late years it has been held in check by a great increase in the number of ticks.

Ichnology, ĭk-nol'ō-jĭ, that department of palæontology which treats of the foot-prints petrified in sedimentary rocks and made by extinct animals; the science of fossil foot-prints. Such foot-prints frequently occur in all formations, and have sometimes been the first and most instructive intimation of the existence of the animals that made them. This was particularly true of the foot-prints of dinosaurs (q.v.) so numerous and sharply marked in the brown sandstones of the Connecticut Valley; and they have greatly assisted in arriving at a true realization of those reptiles, which were at first regarded as birds. The tracks, trails, burrows, outlines of bodies, feathers and appendages of a vast variety of animals occur in the rocks and interest the ichnologist.

Ichthyol'ogy (Gr. *ἰχθύς,* fish; *λογός,* a discourse), is the science of fishes. It is that branch of human knowledge which treats of the aquatic gill-bearing vertebrates, popularly known as fishes to English-speaking people.

Classification of Fishes.— In different treatises on fishes there appear very great differences in the classification proposed or adopted. Often in two works of parallel scope scarcely a group will appear in both with the same boundaries or under the same name. For this condition there are several causes. First, the tendency in some minds toward the extreme of subdivision, and in others toward the extreme of aggregation; second, the various values assigned by different authors to different sorts of characters, the actual value of each only to be determined by the final judgment of palæontology; third, the tendency of many writers to give new names to old groups. On this account a single class order may have half a dozen virtually synonymous names. Thus the terms *Chondropterygii, Elasmobranchii, Plagiostomi, Selachii, Placodii, Antacea,* and other less known names have been applied to the group of sharks and skates. Again various authors, recognizing the validity of a given group, may find it necesssary at times to change its boundaries. In such case a new name may be proposed, or a new definition be given to an old one. Either arrangement may lead to confusion. Thus with some writers, the groups of sharks, under various names, may include the order of *Chimæroids,* or, under the same names, the *Chimæroids* may be excluded from it.

The Chordata.— The great branch of chordate animals finds its origin probably in worm-like forms. It differs essentially from the invertebrate branches in the presence of a more



A Diphy-cercal Tail.

or less developed notochord (which in the higher forms gives place to a backbone), and in the presence of gill-slits, connected with respiration. These gill-slits and accompanying gill-structures are persistent in fishes, while in the higher vertebrates they are mostly relegated to the embryonic stages.

The *Chordata* include several classes of marine animals leading up to the true fishes, as follows:

Enteropneusta.— Balanoglossus (q.v.).

Tunicata.— Ascidians (q.v.).

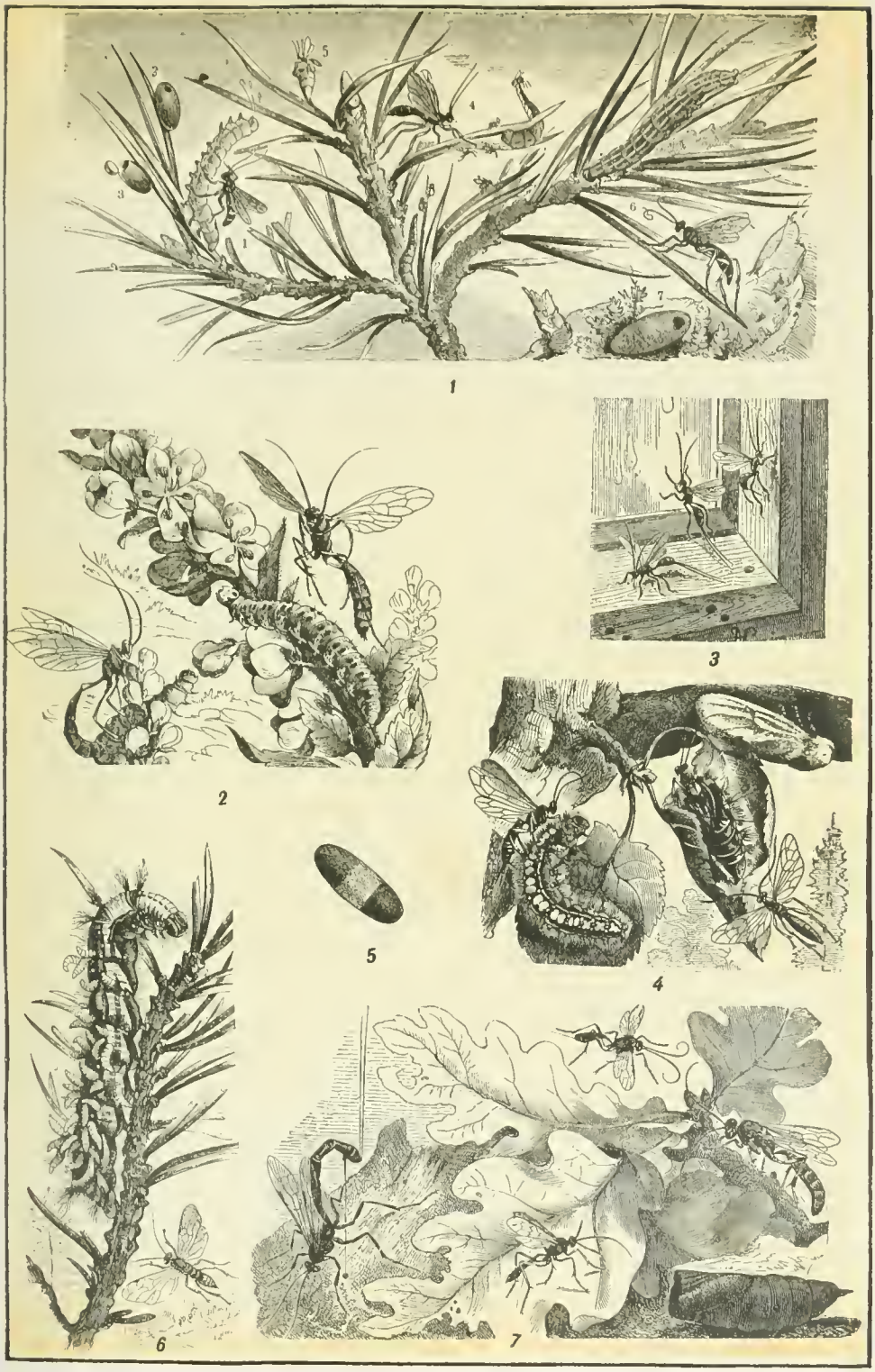
Leptocardii.—Lancelots (q.v).

Cyclostomi.—Hag-fishes and Lampreys (qq. v.).

Cyclic.— Extinct (palæozoic) fish-like forms.

Pisces.— Fishes, properly so called; the various primary divisions of which are usually called sub-classes.

But in view of the uncertainty attached to the mutual relations and origin of these groups, we may follow recent American custom in regarding the elasmobranchs, ostracophores, arthrodires, and teleostomes as distinct classes, the last named group containing the typical or true fishes. On anatomical grounds we must regard the *Elasmobranchii* (sharks) as the most primitive of these classes. As to this, palæontology gives no certain answer. There is no doubt that fishes existed and that some of the classes were well differentiated at a period long antecedent to the deposition of the oldest known remains. The earliest remains of fossil fishes now known occur in the Ordovician or Lower Silurian deposits at Cañon City, Colorado. Among the broken fragments are apparently parts of shields of ostracophores, scales of cros-



1. (1) Exenterus marginatorus attacking the larva of the pine-tree moth; (2) the cocoon of the latter as left by an ichneumon-fly; (3) as left by its rightful occupant; (4) Bassus albosignatus attacking the larva of the syrphus-fly; (5) male of the same; (6) Banchus falcator stealing upon a caterpillar; (7) larva of the ichneumon-fly.

2. Anomalon circumflexum attacking a caterpillar; and Ophion undulatus thrusting its ovipositor into the body of a caterpillar

3. Spathius clavatus, in a window

4. Pimpla instigator, preying upon a willow-moth.

5. Pupa-case of an Ophion.

6. Larva of Microgaster nemorum emerging from an infested caterpillar of the pine-tree moth.

7. Ichneumon pisorius, the left-hand figure being that of a female depositing eggs in a boring in the trunk of an oak.

sopterygians and vertebræ of a possible chimæroid. It is probable that primitive sharks existed still earlier than this, but no definable remains precede the Devonian.

The class or sub-class of *Elasmobranchii* (also called *Chondropterygii, Antacea,* etc.) agrees with the higher fishes in the presence of lower jaw, shoulder-girdle, pelvic girdle, paired fins, well developed skull, brain, and viscera. The gills are well developed, and the general structure and anatomy may be described as fish-like.

In distinction from the true fishes, the gills are differently formed, adnate by their outer margin, there are no membrane bones about the head, the ova are very large, the ventral fins are provided with claspers, there is no trace of air-bladder, the arterial bulb has three series of valves, there is a spiral valve in the rectum, the upper jaw is formed of palatal elements, the typical jawbones of the fish being undeveloped. The lower jaw is also different in structure from that of the true fishes.

The existing elasmobranchs are known as sharks, rays and chimæras. The vast majority of the known species are extinct. There are two strongly marked sub-classes among the elasmobranchs, the *Selachii* or sharks and rays, and the *Holocephali* or chimæras. In the *Selachii* there are five to seven gill-openings, the jaws are distinct from the skull, and the teeth are distinct. In the *Holocephali* there is but one external gill-opening, the jaws are coalescent with the skull, and the teeth are united to form bony plates or lamellæ. Both groups are very old in geologic times, having been separated at least since the Devonian. For this and other reasons some writers prefer to regard the sharks and chimæras as separate and coordinate groups.

We may without serious violence divide the sharks and rays into six orders; namely, *Pleuropterygii, Acanthodii, Ichthyotomi, Notidani, Asterospondyli,* and *Tectospondyli,* the first three of these being confined to Palæozoic time. We may regard the *Pleuropterygii* or the allies of *Cladoselache* as the most primitive, and therefore as standing first in an ascending series.

In this group the pectoral and ventral fins are broad and fold-like, the notochord is apparently not segmented, the tail is short and keeled, well specialized, its tip abruptly turned upward. There are no spines, the teeth are small, with many cusps. There is probably but one family, the *Cladoselachidæ* (extinct), *Cladoselache fyleri,* a large elongate shark from the Devonian of Ohio, is the best known species.

The *Acanthodii* are small sharks with a spine at the front of each fin except the caudal. The teeth are minute or wanting, and the skin is covered with small checker-like plates. There are three families, *Acanthœssidæ* (extinct), with one dorsal fin, *Diplacanthidæ* (extinct), with two, and the *Ischnacanthidæ* (extinct), small sharks found from the Devonian to the Permian.

The *Ichthyotomi* have the pectoral fin developed as an archipterygium or jointed limb with a fringe of rays on one or both sides. The dorsal fin extends along the back, and on the head is a first dorsal preceded by a long spine. There are two well-marked families, *Pleuracanthidii* and *Cladodontidæ,* abundant in the Carboniferous and Permian, but now extinct.

The *Notidani* or *Diplospondyli* have the notochord imperfectly segmented by vertical partitions, and the gill-clefts are six or seven in number instead of five, as in other sharks. Most of the species are extinct, the teeth being found in the rocks from the Jurassic to the present time. Two families are represented, the *Hexanchidæ* and the *Chlamydoselachidæ,* the latter eel-shaped sharks of the open sea, chiefly about Japan.

In the large order of *Asterospondyli* the vertebræ are strengthened by secondary plates of calcified tissue, which radiate outward from the small primitive cylinder. In these typical sharks there are five gill-slits, two dorsal fins, and one anal fin.

In the most primitive group, the sub-order *Cestraciontes,* the dorsal fins are each armed with a spine, the numerous teeth are small and mostly blunt, differing in form in different parts of the jaw, and the vertebræ are imperfectly formed. A curious fact in geological distribution is that a multitude of early types of shark disappear in the Permian or toward the end of Palæozoic time. Only cestraciont sharks are known to have any representatives in the Trias-

A Lancelet (*Amphioxus*).

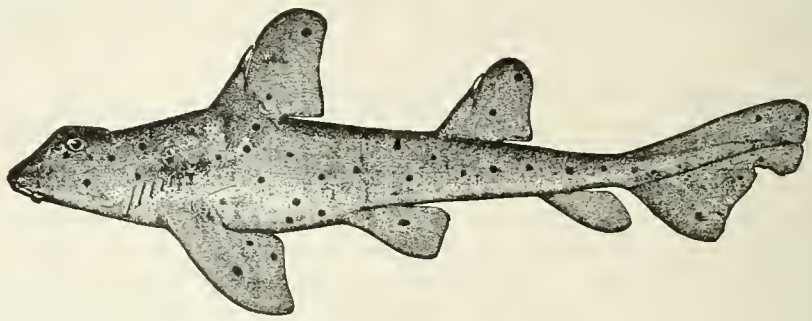
sic, and this group may be ancestral to all modern sharks.

Of the *Cestraciontes* the Palæozic families of *Cochliodontidæ* (extinct) and *Orodontidæ* (extinct), known mainly by the teeth, occur in the Lower Carboniferous. In some and probably all of these forms the dorsal fins were each armed with a spine. The *Edestidæ* (extinct), known only from coiled whorls of fused teeth, are doubtless closely related to these forms. These are found in the coal measures. The principal family of *Cestraciontes,* the *Heterodontidæ,* begins in the Permian, and is represented by five living species all in the Pacific Ocean, the longest known being the Port Jackson shark of Australia (*Heterodontus philippi*). We may here mention two families of sharks of uncertain relationship, the species confined to the Carboniferous Age. These are the *Petalodontidæ* (extinct), with blunt teeth, and some of them with broad fins like rays, and the *Psammodontidæ* (extinct), known from the blunt teeth only. Still more uncertain is the group of *Tamiobatidæ* (extinct) from the Devonian of Kentucky, resembling a ray, but probably a primitive offshoot from the sharks.

The remaining asterospondylous sharks from a sub-order, *Galei,* without dorsal spines, and with the vertebræ more perfectly calcified. The principal family is the *Carchariidæ.* Others are the *Sphyrnidæ* or hammer-heads, *Scyliorhinidæ* or cat-sharks, *Ginglymostomidæ, Hemiscylliidæ, Orectolobidæ, Lamnidæ* or man-eater sharks,

Odontaspididæ, or sand-sharks, *Alopiidæ,* or thresher-sharks, *Mitsukurinidæ* or spoon-bill sharks, *Cetorhinidæ* or basking-sharks, *Pseudotriakidæ* and *Rhincodontidæ*. Of the *Lamnidæ* and related families fossil teeth are very numerous from the Jurassic to modern times.

The *Tectospondyli* have the vertebræ each provided with secondary plates of calcified tissue concentrically arranged in one or more series. In these sharks there is no anal fin. To these belong the *Squalidæ* or dog-fishes, *Dalatiidæ, Oxynotidæ,* and *Echinorhinidæ* or bramble-sharks, these families forming together the sub-order *Cyclospondyli,* having the vertebral centrum a simple constricted cylinder pierced by the notochord. To the *Tectospondyli* proper we may refer a few families of sharks, the *Squatinidæ* or monk-fishes, and *Pristiophoridæ* or saw-sharks. A third sub-order, *Batoidei,* includes all the skates or rays. These agree with the true *Tectospondyli* in having a number of series of concentric plates within the vertebræ. The body is, however, more or less depressed, the broad pectoral fins outlining a body disk, and the gill-openings lie underneath instead of being lateral, as in all the sharks. The rays are first certainly known from the Jurassic, although several of the Carboniferous sharks have ray-like teeth, and have been referred to the group of rays.



Bullhead Shark of California (*Gyropleurodus francisci*).

The recognized families of rays are the *Pristididæ* or saw-fishes, the *Rhinobatidæ* or guitar-fishes, the *Narcobatidæ* or torpedos, the *Rajidæ* or skates, the *Dasyatidæ* or sting-rays, the *Myliobatidæ* or eagle-rays, the *Mobulidæ* or devil-fishes, and the *Ptychodontidæ* (extinct) of the Cretaceous. The earliest of these groups, the *Rhinobatidæ,* date from the Jurassic.

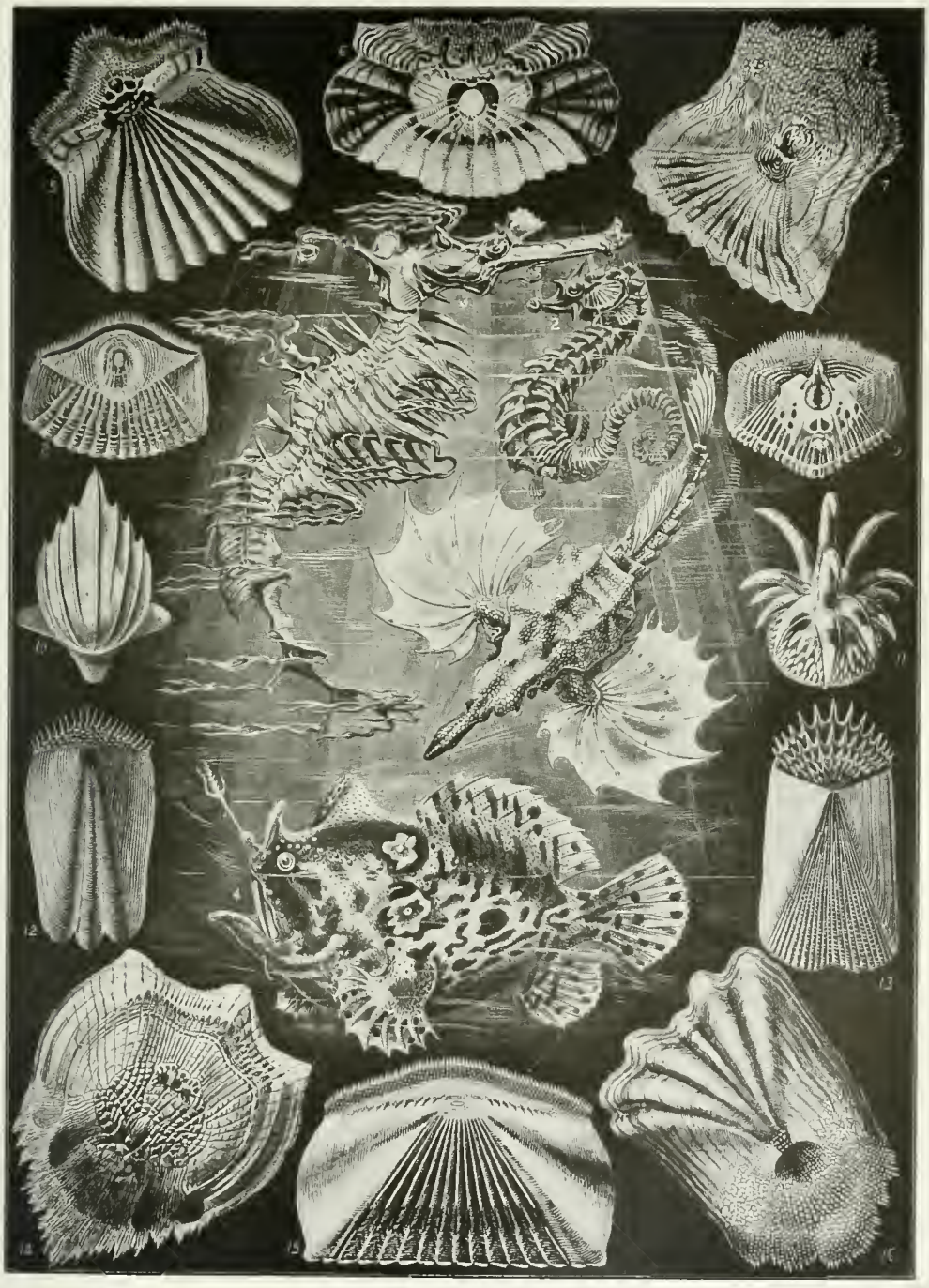
In the sub-class of *Holocephali* or *Chimæroids* the upper jaw or pterygoquadrate arcade is immovably joined to the skull. The teeth are coalesced into broad plates, and a fold of skin covers the gill-clefts so that there is but one external opening. The vertebral axis is imperfectly segmented, and the notochord is surrounded by partially calcified rings. In all recent genera, and in most others, there is a strong spine in the first dorsal, and in the male the forehead has a singular cartilaginous hook with a brush of spines at the end.

There are fragments referred to the skeleton of a chimæroid found in the Lower Silurian at Cañon City, Col. Numerous forms appear in the Devonian. Four genera, representing three families, are now extant, the *Rhinochimæridæ* (*Rhinochimæra* and *Harriotta*) in the deep seas, *Chimæridæ* or elephant-fishes (*Chimæra*) in the north and south temperate seas, and *Callorhynchidæ* (*Callorhynchus*) in the seas of the southern hemisphere only. Extinct families are the *Ptychodontidæ* (extinct), the *Squaloriidæ* (extinct), and the *Myriacanthidæ* (extinct). Numerous extinct genera are referred to the *Chimæridæ*. Fossil fin-spines of many species of sharks and chimæroids, fishes otherwise unknown, occur in the rocks. These are called ichthyodoroulites, and their proper classification is often a matter of much uncertainty. The earliest of these are known as *Onchus,* occurring in the Upper Silurian.

Class Ostracophori.— The earliest vertebrates actually recognized as fossils are known as ostracophores (ὄστρακον, a box; φορέω, to bear). These are most extraordinary creatures, which may be described as jawless, limbless, enveloped in a coat of mail. While they have been called mailed lampreys, the likeness to lampreys is almost wholly negative, resting in the total absence of jaws, limbs, and limb-girdles. What the mouth was like can only be guessed, but no trace of jaws has yet been found in connection with it. The most remarkable distinctive character is found in the presence of a hard shell, made of bony plates covering the anterior part of the body, while the backbone is developed as a persistent notochord, imperfectly segmented. The entire absence of jaw structures, as well as the character of the armature, at once separates them widely from the mailed arthrodires of a later period.

This group was originally called *Ostracodermi,* a name preoccupied for the group of bony trunk-fishes (*Ostraciidæ*). The names *Protocephali* and *Aspidoganoidei* have also been used for them. The still earlier name *Placodermi* included the *Arthrodires* as well.

The ostracophores are found in the Ordovician, Silurian, and Devonian rocks, after which they disappear. The species are very numerous and varied. Their real affinities have been much disputed. Traquair regards them as much modified allies of ancient sharks, which view of the case is supported by features in the structure of the most shark-like of the orders, *Anaspida.* The absence of jaws and limbs separates them widely from true fishes, and there is no clear evidence in the structure of the fins and fin-supports that these structures are homologous with the fins and fin-supports of true fishes, or even of sharks. In this group are four well-marked orders, *Heterostraci, Anaspida, Aspidocephali,* and *Antiarcha.*



SCALES AND ARMOR OF TELEOST FISHES.

1. Flying Gurnard (Pegasus chiropterus). 2 Seahorse (Hippocampus antiquorum). 3. Seaweed fish (Phyllopteryx eques). 4. Tentacle fish (Antennarius tridens). 5–16. Characteristic forms of scales among teleost fishes: 5, 6, 7, Sparidæ (sea-breams); 8–9, Percidæ (perches); 10, Centriscidæ (snipefish); 11, Siluridæ (catfish); 12, Fistularidæ (flutemouths); 13, Pleuronectidæ (soles); 14, Labridæ (wrasses); 15, Pristipomidæ (fossil); 16, Sparidæ (Cantharus).

The *Heterostraci* (ἕτερος, different; ὄστρακον, box) have no bone-corpuscles in the coat of mail. This order includes the *Pteraspidæ* (extinct), *Thelodontidæ* (extinct), *Drepanaspidæ* (extinct), and *Psammosteidæ* (extinct).

The *Anaspida* are more fish-like in appearance, having the armature of the head not plate-like, but formed of tubercles. There are two families, all of recent discovery, *Birkeniidæ* (extinct) and *Euphaneropidæ* (extinct).

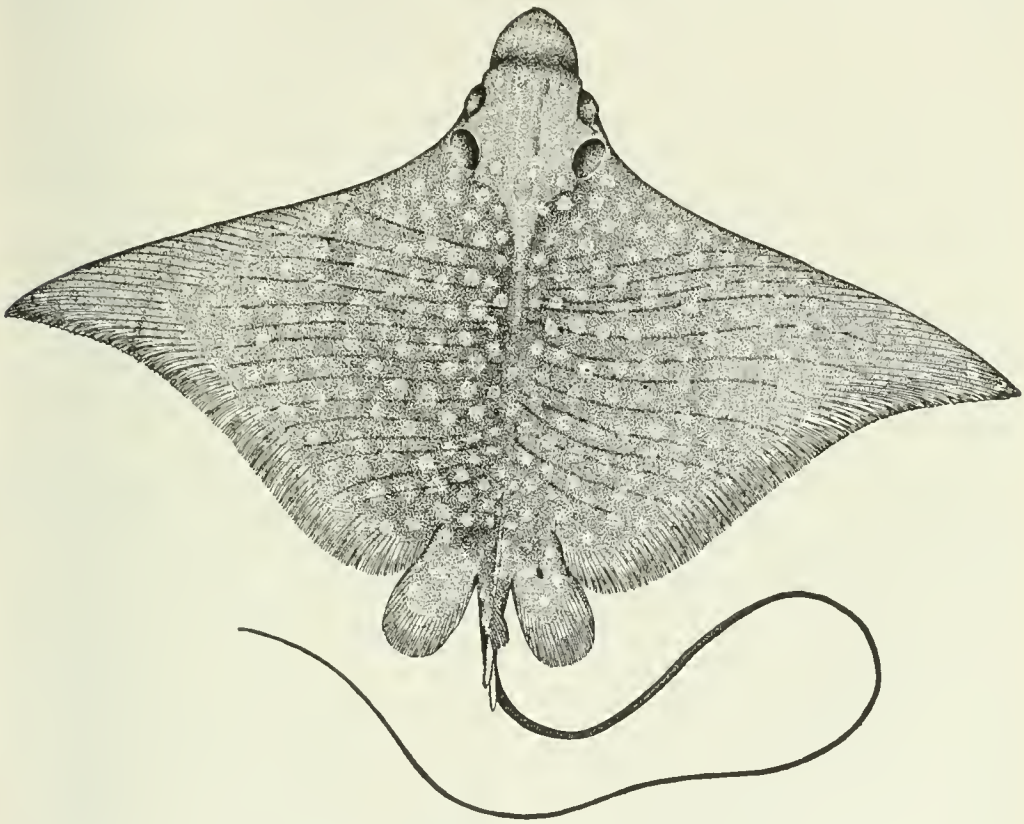
The *Aspidocephali* (also called Osteostraci) have bone-corpuscles in the shields, and the shield of the back is of one piece, without lateral line-channels or sense-organs. The order includes four families, *Ateleaspidæ* (extinct), *Cephalaspidæ* (extinct), *Thyestidæ* (extinct), and *Odontodontidæ* (*Tremataspidæ*) (extinct), with many genera and species.

The *Antiorcha* have also bone-corpuscles in the plates, which are also enameled. The sense-organs occupy open grooves, and the dorsal and ventral shields are of many pieces. The head is jointed on the trunk, and jointed to the head are paddle-like appendages covered with bony plates and resembling limbs. There is no evidence that these erectile plates are real limbs. They seem to be rather jointed appendages of the head-plate, erectile on a hinge like a pectoral spine.

There is but one family, *Asterolepidæ* (extinct). *Pterichthyodes milleri*, named by Agassiz for Hugh Miller, from the Lower Devonian, is the best-known species.

Class Arthrodires.— Another group of extinct mailed fishes is known as *Arthrodira* (ἄρθρον, joint; δειρή, neck). In this group jaws are developed, but of peculiar character, the mandibles being regarded as mere dermal elements, not forming part of the skeleton. The head in all the species is covered with a great bony helmet. Behind this on the nape is another large shield, and between the two is typically a hinge-joint, which has been compared to the hinge of a spring-beetle (elater). Some of these plates are traversed by sensory grooves. Nothing whatever is known of the internal structure, and as the skeleton is soft, the backbone notochordal, there is no trace of shoulder-girdle, nor any certain evidence of limbs, although peculiar structures have been interpreted as such. The presence of a peculiar type of jaws separates the group from the mailed ostracophores, from which the arthrodires differ also widely in the character of the armature.

Dr. Woodward and several other recent writers have regarded the arthrodires as armored, widely modified offshoots of the primitive *Dipneusto*. But the evidence does not seem to justify the union of the arthrodires with the latter group, and it would seem as reasonable to regard them as derived directly from the sharks or the ostracophores. The arthrodiran fishes occur in abundance from the Silurian times to the Mesozoic. In the Devonian their gigantic size and thick armor gave them the leading position among the hosts of the sea, ranging in



Spotted Sting-ray (*Aetobatus narinari*).

size "from that of the perch to that of the basking-shark."

The class, called by Dr. Dean *Arthrognathi,* is divided by him into two sub-classes, *Arthrodira,* with a hinge at the neck, and *Anarthrodira,* without hinge. In the first of typical sub-class are two orders, *Temnothoracici,* with the single family *Chelonichthyidæ* (extinct), *Arthrothoroci,* with the families *Coccosteidæ, Dinichthyidæ* (extinct), *Titanichthyidæ* (extinct), *Mylostomidæ,* and *Selenosteidæ* (extinct). To the *Chelonichthyidæ* belongs the noted species *Homosteus milleri,* celebrated by Hugh Miller under the name of "the Asterolepis of Stromness," in his 'Footprints of the Creator.'

The arthrodires without joint at the neck constitute the order *Stegothalami,* with the families of *Macropetalichthydiæ* (extinct), and *Asterosteidæ* (extinct).

The best known of the many genera of arthrodires is *Coccosteus,* found in the Scottish Devonian.

Class Teleostomi.— We may unite the remaining groups of fishes under a single class for which the name *Teleostomi* (τέλεος, true; στόμα, mouth), proposed by Bonaparte in 1838, may be retained. The fishes of this class are characterized by the presence of a suspensorium to the mandible, by the existence of membrane-bones (opercles, suborbital, etc.) on the head, by a single gill-opening, leading to gill-arches bearing bilamellate gills, and by the absence of claspers on the ventral fins. The skeleton is more or less ossified in all the *Teleostomi.* More important as a primary character distinguishing these fishes from the sharks is the presence typically and primitively of the air-bladder. This arises at first as a diverticulum from the ventral side of the œsophagus, and develops as a lung, but in later forms it becomes degraded to a swim-bladder, springing from the dorsal side of the alimentary canal, and in very many forms it is altogether lost with age. The group comprises the vast majority of recent fishes, as well as a large percentage of those known only as fossils. In these, the condition of the lung can be only guessed.

The *Teleostomi* are doubtless derived from sharks, their relationship being perhaps nearest to the *Ichthyotomi* or to the primitive chimæras. The lowest *Teleostomi* retain the shark-like condition of the upper jaw, made of palatal elements which, as in the *Chimæra,* may be fused with the cranium. In the lower forms also the primitive diphycercal or protocercal form of tail is retained, as also the archipterygium or jointed axis of the paired fins, fringed with rays on one or both sides.

We may divide the teleostomes or true fishes into three sub-classes, the *Crossopterygii* or fringe-fins, the *Dipneusti* or lung-fishes, and the *Actinopterygii* or ray-fins. Of these, recent writers are disposed to consider the *Crossopterygii* as most primitive, and to derive from this, by separate lines, each of the remaining sub-classes, as well as the higher vertebrates.

Sub-class Crossopterygii.—The earliest teleostomes constitute the class called after Huxley, *Crossopterygii* (κροσσός, fringe; πτερόν, fin). Its essential character is the retention of the jointed pectoral fin or archipterygium, its axis fringed by series of soft rays. This character it shares with the *Ichthyotomi* among sharks, and with the *Dipneusti.* From the latter it differs in the hyostylic cranium, the lower jaw being suspended from the hyomandibular — and by the presence of distinct premaxillary and maxillary elements in the upper jaw. In these characters it agrees with the ordinary fishes. The skeleton is more or less perfectly ossified. Outside the cartilaginous skull is a bony coat of mail. The skin is covered with firm scales or bony plates. The tail is diphycercal, straight, and ending in a point. The shoulder-girdle, attached to the cranium, is cartilaginous, but overlaid with long, bony plates, and the branchiostegals are represented by a pair of gular plates.

In the single family represented among living fishes the heart has a muscular arterial bulb with many series of valves on its inner edge, and the large air-bladder is divided into two lobes, having the functions of a lung, though not cellular as in the lung-fishes.

The fossil types are very closely allied to the lung-fishes, and the two groups have no doubt a common origin in Silurian times. It is now usually considered that the crossopterygian is more primitive than the lung-fish, though at the same time more nearly related to the ganoids, and through them to the ordinary fishes.

From the primitive *Crossopterygii* the step to the ancestral amphibia, which are likewise mailed and semi-aquatic, seems a very short one. It is true that most writers until recently have regarded such dipneustans as the *Ceratodontidæ,* as representing the parents of the amphibians. But the weight of recent authority, Gill, Boulenger, Dollo, and others, seems to place the point of separation of the higher vertebrates with the crossopterygians.

Cope and Woodward divide the *Crossopterygii* into four orders or sub-orders, *Haplistia, Rhipidistia, Actinistia,* and *Cladistia.* To the last belong the existing species (*Polypteridæ*) alone. In all these the pectorals are narrow with a single basal bone, and the nostrils, as in the dipneustans, are below the snout.

In the *Haplistia* the notochord is persistent, and the basal bones of dorsal and anal fins are in regular series, much fewer in number than the fin-rays. The single family *Tarrassiidæ,* regarded as lowest of the crossopterygians, are small fishes of Carboniferous Age.

In the *Rhipidistia* the basal bones of the median fins are found in a single piece, not separate as in the *Haplistia.* Four families are recognized, *Holoptychiidæ* (extinct), *Rhizodontidæ* (extinct), *Osteolepidæ* (extinct), *Onychodontidæ* (extinct), the first of these being considered as the nearest approach of the crossopterygians to the dipnoans.

In the *Actinistia* there is a single fin-ray to each basal bone, the axonosts of each ray fused in a single piece. The notochord is persistent, causing the backbone in fossils to appear hollow, the cartilaginous material leaving no trace in the rocks. The genera and species are numerous, ranging from the Subcarboniferous to the Upper Cretaceous, and belonging to the single family *Cœlocanthidæ* (extinct).

In the *Cladistia* the axis of the pectoral limb is fan-shaped, made of two diversified bones joined by cartilage. The notochord is restricted and replaced by ossified vertebræ. The axonosts of the dorsal and anal are in regular series, each bearing a fin-ray. The order contains the single family *Polypteridæ,* represented

by numerous species in the Nile, Senegal, and Kongo rivers. In this group the pectoral fin is formed differently from that of the other crossopterygians, being broad, its base of two diverging bones with cartilage between. This structure, more specialized than in any other of the crossopterygians or dipneustans, has been regarded by Gill and others, as above stated, as the origin of the fingered hand (chiropterygium) of the frogs and higher vertebrates. The base of the diverging bones has been identified as the antecedent of the humerus, the bones themselves as radius and ulna, while the intervening, non-ossified cartilage breaks up into carpal bones, from which metacarpals and digits ultimately diverge. This hypothesis is at least a reasonable one. The nostrils, as in true fishes, are superior. The body in these fishes is covered with rhombic enameled scales, as in the garpike, the head is similarly mailed, but in distinction from the garpike, the anterior rays of the dorsal are developed as isolated spines.

The young have a bushy external gill, with a broad scaly base. The air-bladder is double, not cellular, with a large air-duct joining the ventral surface of the œsophagus. The intestine has a spiral valve.

The cranium is remarkable for its generalized form, this forming a trait of union between the ganoids and the primitive *Amphibia* or *Stegocephali*. Without considering *Polypterus*, it is not possible to interpret the homologies of the cranium of the amphibians and the sharks.

Sub-class Dipneusti or Lung-Fishes.— The *Dipneusti* (δίς, twice; πνέω, to breathe) are a group characterized by the presence of paired fins consisting of a jointed axis with or without rays. The skull is autostylic, the upper jaw being made, as in the *Chimæra*, of palatal elements fused with the cranium and without premaxillary or maxillary. Dentary bones little developed. Air-bladder cellular, used as a lung, in all living species. Heart with many valves in the muscular arterial bulb. Intestine with a spiral valve. Teeth usually of large plates of dentine covered with enamel on the pterygopalatine and splenial bones. Nostrils concealed, when the mouth is closed, under a fold of the upper lip. Scales cycloid, mostly not enameled.

This group has been usually known as *Dipnoi*. But this term was first taken by Leuckart, in 1821, as a name for amphibians, before any of the living *Dipneusti* were known

The *Dipneusti* agree with the crossopterygians by the presence of lungs, a character which separates them from all the earlier orders of fishes. In its origin the lung or air-bladder arises as a diverticulum from the alimentary canal used by the earliest fishes as a breathing-sac, the respiratory functions lost in the progress of further divergence. Nothing of the nature of lung or air-bladder is found in lancelet, lamprey, or shark. In none of the remaining groups of fishes is it wholly wanting at all stages of development.

In the Dipneusti or dipnoans, as in the crossopterygians and higher vertabrates, the trachea or air-duct arises from the ventral side of the œsophagus. In the more specialized fishes, yet to be considered, it is transferred to the dorsal side, thus avoiding a turn in passing around the œsophagus itself. From the sharks these forms are further distinguished by the presence of membrane-bones about the head. From the *Actinopteri* (ganoids and teleosts) dipneustans and crossopterygians are again distinguished by the retention of the fringe-fin or archipterygium as the form of the paired limbs. From the crossopterygians the dipnoans are most readily distinguished by the absence of maxillary and premaxillary, the characteristic structures of the jaw of the true fish. The upper jaw in the dipnoan is formed of palatal elements attached directly to the skull, and the lower jaw contains no true dentary bones. The skull in the dipnoans is in the *Chimæra* is autostylic, the mandible articulating directly with the palatal apparatus, the front of which forms the upper jaw, and of which the pterygoid hyomandibular and quadrate elements form an immovable part. The shoulder-girdle, as in the shark, is a single cartilage, but it supports a pair of superficial membrane-bones.

In all the dipnoans the trunk is covered with imbricated cycloid scales and no bony plates, although sometimes the scales are firm and enameled. The head has a roof of well-developed bony plates made of ossified skin and not corresponding with the membrane-bones of higher fishes. The fish-like membrane-bones, opercles, branchiostegals, etc., are not yet differentiated. The teeth have the form of grinding-plates on the pterygoid areas of the palate, distinctly shark-like in structure. The paired fins are developed as archipterygia, often without rays, and the pelvic arch consists of a single cartilage, the two sides symmetrical and connected in front. There is but one external gill-opening, leading to the gill-arches, which, as in ordinary fishes, are fringe-like, attached at one end. In the young, as with the embryo shark, there is a bushy external gill, which looks not unlike the archipterygium pectoral fin itself, although its rays are of different texture. In early forms, as in the ganoids, these scales were long and enameled, but in some recent forms, deep sunken in the skin. The claspers have disappeared, the nostrils, as in the frog, open into the pharynx, the heart is three-chambered, the arterial bulb with many valves, and the cellular structure of the skin and of other tissues is essentially as in the *Amphibia*.

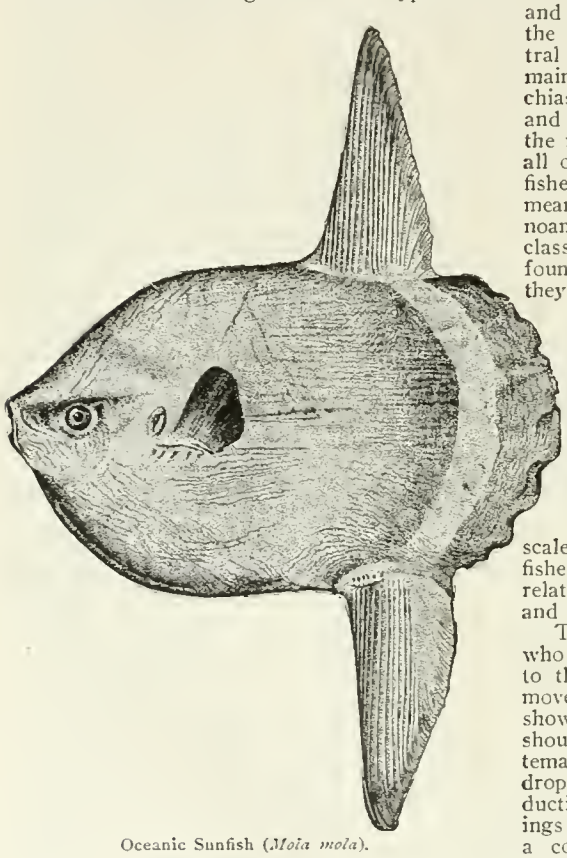
The developed lung, fitted for breathing air, which seems the most important of all these characters, can, of course, be traced only in the recent forms, although its existence in all others can be safely predicated. Besides the development of the lung we may notice the gradual forward movement of the shoulder-girdle, which, in the dipneustans, as in the crossopterygians, is attached to the head. In the fishes generally there is no distinct neck, as the post-temporal, the highest bone of the shoulder-girdle, is articulated directly with the skull.

We may divide the dipnoans into two orders, *Ctenodipterini*, with the families *Uronemidæ* (extinct), *Dipteridæ* (extinct), and *Ctenodontidæ* (extinct). These families occur from the Devonian to the Mesozoic. The more specialized order of *Sirenoidei* includes the families of *Ceratodontidæ* and *Lepidosirenidæ*, each of these represented by living forms. Most of the *Ceratodontidæ* are extinct, occurring in the Mesozoic; but two species, *Neoceratodus forsteri* and *N. miolepis*, live in rivers of Australia. No fossil *Lepidosirenidæ* are known. *Lepidosiren paradoxus* lives in the swamps of southern Brazil and *Protopterus annectens*, *P.*

dolloi, and *P. æthopicus,* in those of the Nile region.

Sub-class Actinopteri.—After setting off from the great group of fishes primitive or archaic types, one after another, we are left at last with only those having fish-jaws, fish-fins, and in general the structure of the typical fish. For all these in all their variety, as a class or subclass, we adopt the name of *Actinopteri,* suggested by Prof. Cope. The name (ἀκτίς, ray; πτερόν, fin) refers to the structure of the paired fins. In all these, the bones supporting the fin-rays are highly specialized, and at the same time concealed by the general integument of the body.

In general, two bones connect the pectoral fin with the shoulder-girdle. The hyperacoracoid is a flat square bone, usually perforated by a foramen lying above, and parallel with it the irregularly formed hypocoracoid. Attached to these is a row of bones, the actinosts or pterygials, short, often hourglass-shaped, which actually support the fin-rays. In the higher forms the actinosts are few (four to six) in number, but in the lower types they may remain numerous, a reminiscence of the condition seen in the crossopterygians and especially in *Polypterus.* Other variations may occur; the two coracoids are sometimes imperfect or specially modified, and the actinosts may be distorted in form or position. Among the lower *Actinopteri* many archaic traits still persist, and by its earlier representatives the group is joined very closely to the *Crossopterygii.* The great class may be divided into two series or sub-classes, the *Ganoidei,* which retain the ancient traits, and the *Teleostei* or bony fishes, in which most of these have disappeared.



Oceanic Sunfish (*Mola mola*).

Even among the *Ganoidei,* as the term is here restricted, there remains a great variety of form and structure. The group constitutes several distinct orders, and as a whole does not admit of perfect definition. All of the species known have the tail strongly heterocercal. Most of them have the skeleton still cartilaginous, and in some it remains in a very primitive condition. Most of them have an armature of bony plates, diamond-shaped with an enamel like the surface of teeth. All of them have the air-bladder highly developed, usually cellular and functional as a lung, but connecting with the dorsal side of the gullet, not with the ventral side, as in the dipnoans. In all these remain more or less perfectly developed the optic chiasma, the many valves of the arterial bulb, and the spiral valve of the intestines found in the more archaic types. But traces of some or all of these structures are found in some bony fishes, and their presence in the ganoids by no means justifies their separation with sharks, dipnoans, and crossopterygians as a great primary class, *Palæichthyes.* All forms of body may be found among the ganoids. In the earlier seas they were scarcely less varied and perhaps scarcely less abundant that the teleosts in the seas of to-day. So far as fossils show, the characteristic actinopterous fin, with its reduced and altered basal bones, appeared at once without intervening gradations.

The name *Ganoidei* (γάνος, brightness; εἶδος, resemblance), alluding to the enameled plates, was first given by Agassiz to those forms, mostly extinct, allied to the garpike, and covered with bony scales or hard plates. As originally defined, catfishes, sea-horses, *Agonidæ,* and other wholly unrelated types were included with the garpikes and sturgeons as ganoids.

These were eliminated by Johannes Müller, who recognized the archaic characters common to the existing forms. Still later Huxley removed the crossopterygians, and others have shown that the *Ostracophori* and *Arthrodira* should be placed far from the garpike in systematic classification. Cope and Woodward have dropped the name ganoid altogether as productive of confusion through the many meanings attached to it. Others have retained it as a convenient group name for the orders of archaic *Actinopteri.* For these varied and more or less divergent groups it seems convenient to retain it.

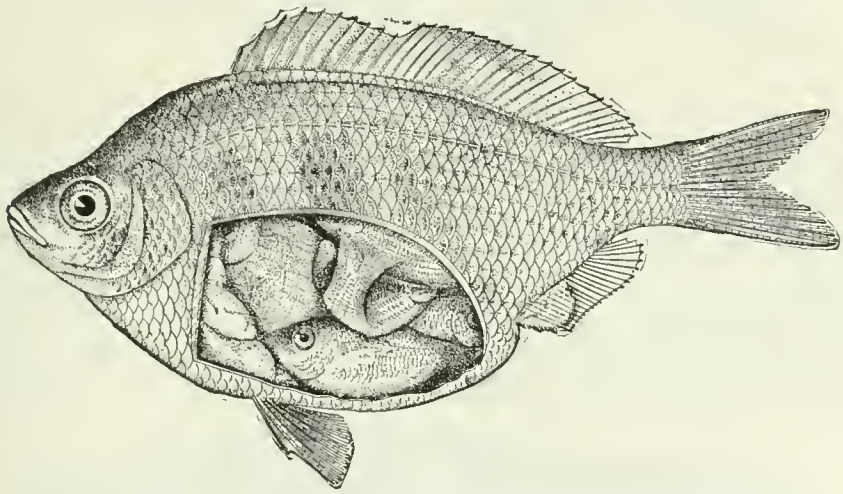
The order *Lysopteri* (λύσις, a loosing; πτερόν, fin) comprises the earliest ganoids, beginning in the Devonian, covered with enameled scales. The families are *Palæoniscidæ, Platysomidæ, Dictyopygidæ,* and *Dorypteridæ.* The order *Chondrostei* (χόνδρος, cartilage; ὀστέον, bone) includes a great variety of forms, characterized by the less cartilaginous skeleton, the distinctly heterocercal tail, and the presence of bony plates, rather than scales, on most parts of the body. These represent a degenerate offshoot from the *Lysopteri,* the form being less like that of the typical fishes. The earliest members of this group appear in the Tertiary.

the most primitive family being the *Chondrosteidæ* (extinct). Another family is that of *Belonorhynchidæ* (extinct). The *Acipenseridæ* (sturgeons) are well represented among living fishes. The order *Selachostomi* (σέλαχος, shark; στόμα, mouth) includes the paddle-fishes (*Polyodontidæ*), two living species, and one extinct, in the Eocene. The order *Pycnodonti* including the family of *Pycnodontidæ* (extinct), consists of a deep-bodied, compressed fishes with small mouths and a peculiar physiognomy. The order *Lepidostei* (λεπίς, scale; ὀστέον, bone) includes numerous families with rhombic enameled scales. The families are *Semionotidæ, Lepidotidæ, Isopholidæ, Macrosemiidæ, Pholidophoridæ, Aspidorhynchidæ,* and *Lepisosteidæ,* all extinct save the *Lepisosteidæ,* represented by four species known as garpike in the rivers of North America. The earliest fossil garpikes occur in the Eocene. The *Halecomorphi* (*halec,* herring; μορφή, form) comprise the *Pachycormidæ, Protosphyrænidæ, Liodesmidæ, Oligopleuridæ,* and *Amiidæ.* All these have perished, except the *Amiidæ,* which group is represented by a single species, the Bowfin, *Amia calva,* in the waters of the eastern United States. In these forms there is a gradual transition from diamond-shaped scales, covered with enamel, to the cycloid scales of the ordinary soft-rayed fishes. The line separating the *Lepidostei* and *Halecomorphi* from each other and from the *Isospondyli* is a very narrow one.

Sub-class Teleostei or Bony Fishes. — The fishes which still remain for discussion constitute the great sub-class or series of *Teleostei* or bony fishes. They lack wholly or partly the ganoid traits, or show them only in the embryo. The tail is slightly if at all heterocercal, the fulcra disappear, the actinosts of the pectoral fins are few and large, rarely if ever over five in number, the air-bladder is no longer cellular in most species, nor does it assist in respiration. The optic nerves are separate, one running to each eye without chiasma. The skeleton is almost entirely bony, the notochord usually disappearing entirely with age. The valves in the arterial bulb are reduced in number, and the spiral valve of the intestines disappears. Traces of each of the ganoid traits may persist somewhere in some group, but as a whole we see a distinct specialization and a distinct movement toward the fish type with the loss of characters distinctive of sharks, dipnoi, and ganoids. In a general way the skeleton of all teleosts corresponds with that of the striped bass, and the visceral anatomy is in all cases sufficiently like that of the sunfish.

The mesocoracoid or præcoracoid arch, found in all ganoids, persists in the less specialized types of bony fishes, although no trace of it is found in the perch-like forms. With all this, there is found among the bony fishes, an infinite variety in details of structure. For this reason the *Teleostei* must be broken into many orders, and these orders are very different in value and in degrees of distinctness, the various groups being joined by numerous and puzzling intergradations.

Order Isospondyli.— Of the various subordinate groups of bony fishes there can be no question as to which is most primitive in structure or as to which stands nearest the orders of ganoids. Earliest of the bony fishes in geological time is the order of *Isospondyli* (ἴσος, equal; σπόνδυλος, vertebra), containing the allies recent and fossil of the herring and the trout. This order contains those soft-rayed fishes which have the ventral fins abdominal, the mesocoracoid or præcoracoid arch developed (sometimes lost in degeneration), and the anterior vertebræ unmodified, essentially similar to the others.



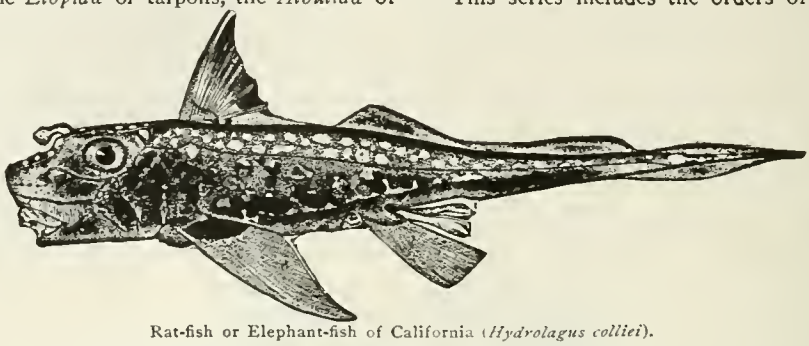
Sparada, or Viviparous Perch of California (*Cymatogaster aggregatus*).

The ganoids pass by degrees into the *Isospondyli,* and the soft-rayed fishes pass again by imperceptible gradations into those more specialized forms having spines in the fins, structures which are again lost in the most modified members of the same group.

Ganoid traits are present in certain families of *Isospondyli.* Among these are the gular plate (found in *Amia* and the *Elopidæ*), presumably derived from the similar plate in the earliest ganoids, additional valves in the arterial bulb in *Albulidæ,* the cellular air-bladder of *Notopterus* and *Osteoglossum,* the spiral intestinal valve in *Chirocentridæ,* and the ganoid

scales of the extinct *Leptolepidæ*. From these characters it is inferred that the soft-rayed fishes are descended from the *Lepidostei* or *Halecomorphi*. The more primitive *Isospondyli* approach more nearly to these ganoid forms than to their later descendants, the catfishes, the eels, or the pikes.

Most ancient of the *Isospondyli* is the extinct family of *Leptolepidæ* of the Triassic. Families mostly still extant, but nearly all of them more or less represented in fossils from the Jurassic on, are the *Elopidæ* or tarpons, the *Albulidæ* or



Rat-fish or Elephant-fish of California (*Hydrolagus colliei*).

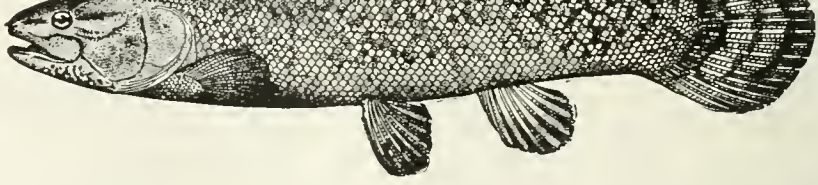
lady-fishes, the *Chanidæ* or milk-fishes, the *Hiodontidæ* or moon-eyes, the *Spaniodontidæ* (extinct), the *Pachyrhizodontidæ* (extinct), the *Thryptodontidæ* (extinct), the *Pterothrissidæ*, the *Chirocentridæ*, the *Notopteridæ*, the *Enchodontidæ* (extinct), the *Ichthyodectidæ* (extinct), the *Osteoglossidæ*, the *Phareodontidæ* (extinct), the *Clupeidæ* or herrings, the *Dussumieriidæ* or round herrings, the *Dorosomidæ* or gizzard-shad, the *Engraulididæ* or anchovies, the *Alepocephalidæ*, the *Pantodontidæ*, the *Salmonidæ* or salmon and trout, the *Thymallidæ* or graylings, the *Argentinidæ* or smelt, the *Microstomidæ*, the *Salangidæ* or ice-fish, the *Galaxiidæ* or New Zealand trout, the *Haplochitonidæ*, the *Gonorhynchidæ*, the *Notopteridæ*, and a host of other forms, mostly from the deep seas, constituting (sub-order *Inomiæ*) the families of *Aulopidæ*, *Ctenothrissidæ* (extinct), *Synodontidæ* or lizard-fishes, *Benthosauridæ*, *Bathypteroidæ*, *Ipnopidæ*, *Rondeletiidæ*, *Cetomimidæ*, *Myctophidæ* or lantern-fishes, *Rhinellidæ* (extinct), *Dercetidæ* (extinct), *Chirothicidæ* (extinct), *Exocoetoididæ* (extinct), *Mauroliciдæ*, *Chauliodontidæ* or viper fishes, *Gonostamidæ*, *Astronesthidæ*, *Stomiatidæ*, *Malacosteidæ*, *Plagyodontidæ* or lancet-fishes, *Evermannellidæ*, *Paralepididæ*, *Sternoptychidæ*, and *Idacanthidæ*.

The order of *Lyopomi* (λύω, loose, πόμα, opercle), contains a few deep-sea fishes, without mesocoracoid and with the opercular bones distorted. One family, the *Halosauridæ*, with fossil allies.

A series of soft-rayed fishes descended from the *Isospondyli* are grouped together to form the super-order or series called *Ostariophysæ*. These differ from the *Isospondyli* in having the four anterior vertebræ much modified, the air-bladder being connected, by a series of ossicles called the Weberian apparatus, with the auditory organ.

This series includes the orders of *Eventognathi*, *Heterognathi*, *Nematognathi*, and *Gymnonoti*, immense groups comprising the vast majority of the fresh-water fishes of the world.

The *Eventognathi* and *Heterognathi* have the mouth-parts normal, the maxillary not rudimentary, and the body usually covered with ordinary scales. In the order *Heterognathi* (ἕτερος, differing; γνάθος, jaw) the lower pharyngeals are not especially modified, and the jaws usually with teeth. This group comprises most of the river-fishes of South America and Africa. It includes the families of *Characidæ* and *Erythrinidæ*, the former with and the latter without the adipose fin characteristic of catfishes and salmon.

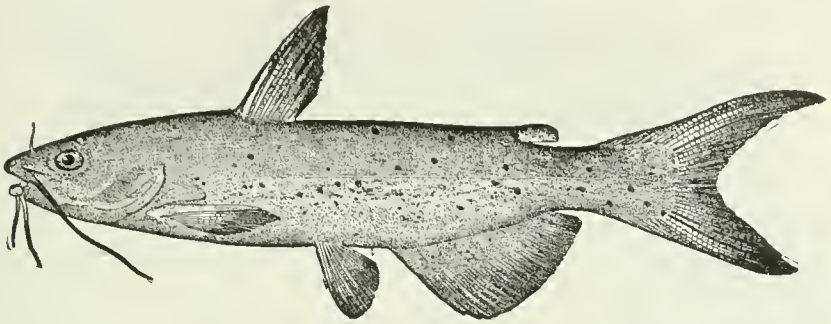


The Bowfin (*Amia calva*).

The order *Eventognathi* (εὖ, well; ἐν, within; γνάθος, jaw) is characterized by the absence of teeth in the jaws, and by the high degree of specialization of the lower pharyngeals, which are scythe-shaped, and in typical forms are armed with a relatively small number of highly specialized teeth of peculiar forms and arranged in one, two, or three rows. In all the species the gill-openings are restricted to the sides, there is no adipose fin, and the broad flat branchiostegals are but three in number. In all the species the scales, if present, are cycloid, and the ventral fins, of course, abdominal. The modification of the four anterior vertebræ and their connection with the air-bladder are

essentially as seen in the catfishes. The families of *Eventognathi* are the *Kneriidæ, Homalopteridæ, Cobitidæ* or loaches, *Catostomidæ* or suckers, and *Cyprinidæ* or carp, dace and minnows. The last is the largest family recognized in ichthyology, comprising over 2,000 species, almost all confined to the north temperate zone.

The order of *Nematognathi* or catfishes is characterized among the *Ostariophysæ* by the fact that the maxillary bone is rudimental, forming the base of a long barbel. There are no true scales, the body being naked or mailed, and about the mouth are always fleshy feelers. The multitude of species inhabit chiefly the rivers of



Channel Cat-fish (*Ictalurus punctatus*).

the tropics, only the typical catfishes of the principal family of *Siluridæ* occurring in waters of the United States and Europe. The families are *Diplomystidæ, Siluridæ, Bunocephalidæ, Plotosidæ, Chacidæ, Chlariidæ, Hypophthalmidæ, Argidæ, Sisoridæ, Pygidiidæ, Loricariidæ,* and *Calliichthyidæ,* the members of the last three groups armed with a bony coat of mail.

The order *Gymnonoti* contains elongate eel-like fishes without dorsal fin and with the tail excessively long. The vertebræ are modified, as in the preceding orders, but there is no mesocoracoid arch. The families are *Electrophoridæ* and *Gymnotidæ*, all river-fish of South America.

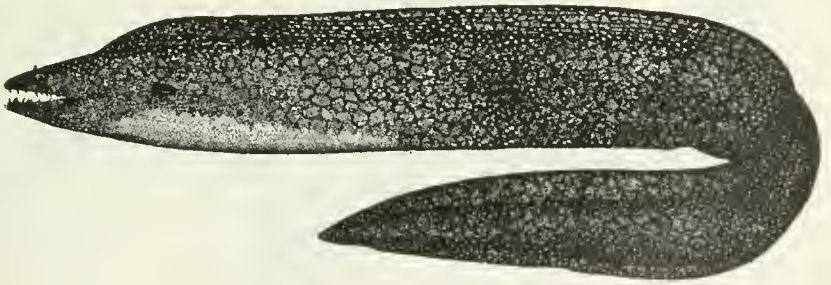
The order *Scyphophori* contains river-fishes of Africa in which the small mouth is at the end of a long snout. There are no pharyngeal teeth, and the opercular bones are considerably modified. In all there is a deep cavity on each side of the cranium, covered by a thin bony plate, the supertemporal bone. The families are *Mormyridæ* and *Gymnarchidæ.*

Next we may place a long series of more or less related families, known collectively as eels. In all these the upper jaw is more or less degenerate, the ventral fins are wanting, and the shoulder-girdle has typically lost its connection with the skull. The earliest fossil eels have traces of scales, the caudal fin separate, and, according to Dr. O. P. Hay, abdominal ventral fins. These characters are lost in all or most of the living forms.

The eels may be distributed among different orders. The *Symbranchia* (δύν, together; βράνχος, gill) — *Ichthyocephali,* and *Holostomi* — have normal fish-like jaws, and the shoulder-girdle is sometimes joined to the skull. The families are *Monopteridæ* or rice-field eels, *Symbranchidæ, Amphibnoidæ,* and *Chilobranchidæ.*

The true eels or apodes have the shoulder-girdle free from the skull, the premaxillaries more or less coalesced with the vomer, and the body elongate and of many vertebræ. The families are *Anguillavidæ* (extinct), with distinct caudal and sometimes with ventral fins, *Anguillidæ,* or true eels, *Leptocephalidæ* or conger-eels, *Simenchelidæ, Muræsocidæ, Nettostomidæ, Nemichthyidæ, Ophichthyidæ, Hyophidæ, Heterocongridæ, Dysommidæ, Eucheliidæ* (extinct), *Murænidæ* or morays, *Myrocongridæ,* and *Moringuidæ.*

The small order of *Carencheli* contains one family, *Dcrichthyidæ,* characterized by the



Muræna.

snake-like neck and the structure of the jaws.

The order *Lyomeri* includes deep-sea eels of enormous gape, with the parts of the head very loosely joined, and with the fifth gill-arch not modified to form a pharyngeal. There are two families, *Saccopharyngidæ* and *Eurypharyngidæ.*

Still more aberrant is the small order of *Heteromi* (ἕτερος, differing; ὦμος, shoulder), the spiny eels, elongate fishes, having the shoulder-girdle detached from the head and the coracoids united in an imperforate plate. This group includes eel-like fishes of the deep

sea, with spines in the dorsal fin — the families, *Protonotocanthidæ* (extinct), *Notacanthidæ*, and *Lipogenyidæ*.

Another order of uncertain relationship is that of *Opisthomi*, with normal coracoids, spines in the dorsal fin, and the shoulder-girdle remote from the skull. It contains one family, the *Mastacembelidæ*, small fishes from the streams of tropical Asia and Africa.

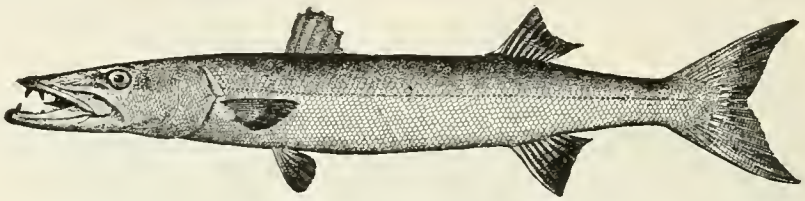
Another small order, the *Xenomi* (ξένος, strange; ὦμος, shoulder), has the coracoids rudimentary and cartilaginous, with no basal bones or actinosts to the pectoral fin. One family, *Dalliidæ*, characterized by the black-fish of the marshes of Alaska and Siberia.

In the order *Haplomi*, the mesocoracoid arch is wholly undeveloped, as is the case in all of the other groups remaining to be enumerated.

In common with the soft-rayed fishes in general, the air-bladder has a persistent air-duct, the fins are without spines, the ventral fins are abdominal, and the scales are cycloid.

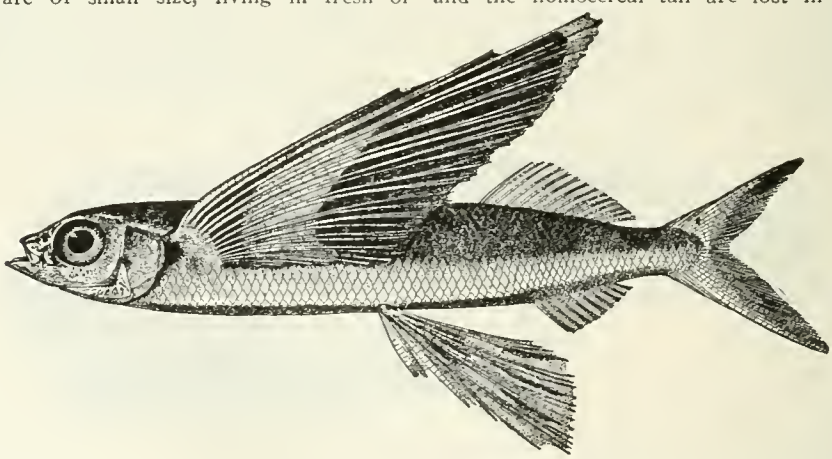
There is no adipose dorsal in the *Haplomi*, the dorsal is inserted far back, and the head is generally scaly. Most, but not all, of the species are of small size, living in fresh or brackish waters, and they are found in almost all warm regions, though scantily represented in California, Japan, and Polynesia. The families are *Esocidæ* or pikes, *Umbridæ* or mud-minnows, *Poeciliidæ* or killifishes, and *Amblyopsidæ* or blind-fishes of the caves. The *Gonorhynchidæ* and the extinct families of *Crossognathidæ* and *Cobitopsidæ* may be doubtfully added to this group.

Order Acanthopterygii.— The most of the remaining bony fishes constitute a natural group for which the name *Acanthopterygii* (ἄκανθα, spine; πτερόν, fin or wing), may be used. This name is often written *Acanthopteri*, a form equally correct and more euphonious and convenient. These are characterized, with numerous exceptions, by the presence of spines in the fins, by the connection of the ventral fins to the shoulder-girdle, by the presence, in general, of more than one spine in the anterior part of dorsal and anal fins, and as a rule of one spine and five rays in the ventral fins, and by the absence in the adult of a duct to the air-bladder. Minor characters are these: The pectoral fins are inserted high on the shoulder-girdle, the scales are often ctenoid, and the edge of the upper jaw is formed by the premaxillary alone, the maxillary being always toothless.



Barracuda (*Sphyræna barracuda*).

But it is impossible to define or limit the group by any single character or group of characters. It is connected with the *Isospondyli* through the *Haplomi*, on the one hand, by transitional groups of genera which may lack any one of their characters. On the other hand, in the extreme forms, each of these distinctive characters may be lost through degeneration. Thus fin-spines, ctenoid scales, and the homocercal tail are lost in the cod-fishes, the connection of ventrals with shoulder-girdle fails in certain peculiar forms, and the development of the air-duct is subject to all sorts of variations. In one family even the adipose fin reappears.



A Flying-fish (*Exocætus volitans*).

The *Acanthopterygii* or preferably *Acanthopteri*, the *Physoclysti* of Müller, the *Thoracices* of older authors, and the *Ctenoidei* of Agassiz, include substantially the same series of forms.

Among the many subordinate groups, suborders or super-families, a few stand out as susceptible of definition. Among these is the

group of *Salmopercæ*, composed of perch-like fishes, with spines in the fins and with ctenoid scales, yet retaining at the same time the abdominal ventrals and the adipose fin of the salmon. This constitutes the family of *Percopsidæ*, trout-perches or sand-rollers. The extinct *Erismatopteridæ* and *Asineopidæ* probably belong here.

The sub-order *Symentognathi* agree externally with the *Haplomi*, but have the lower pharyngeals solidly united, and the air-duct lost in the course of development. The families are *Belonidæ*, the gars, *Scombresocidæ*, the sauries, *Hemiramphidæ* or half-beaks, and *Exocætidæ* or flying-fishes. This order and the *Haplomi* are joined by Hay under the name of *Mesichthyes*, the groups forming a perfect transition from soft-rayed to spiny-rayed fishes.

The group of *Percesoces* has the general traits of the spiny-rayed fish, with the ventral fins abdominal. Here belong the *Sphyrænidæ* or barracudas, the *Atherinidæ* or silversides, and the *Mugilidæ* or mullets. Another sub-order, *Rhegnopteri*, includes the *Polynemidæ* or thread-fins. Other transitional forms, with the ventrals abdominal, and spines usually present in the fins, constitute the sub-orders of *Hemibranchii, Lophobronchii* and *Hypostomides*. In all of these the bones of the gill-arches are reduced in number, and the gill-structures are distinctly degenerate. For this reason Dr. Hay has proposed to unite them as a distinct order, *Phthinobranchii* (*φθίνων*, waning). The *Hemibranchii* include the families *Gasterosteidæ* (sticklebacks), *Protosyngnathidæ* (extinct), *Aulorhynchidæ*, *Fistulariidæ* (cornet-fishes), *Aulostomidæ* (trumpet-fishes), *Urosphenidæ* (extinct), *Rhamphosidæ* (extinct), *Marcorhamphosidæ* (snipe-fishes), and *Centriscidæ* (shrimp-fishes). The more degenerate sub-order of *Lophorbranchii* includes the *Solenostomidæ*, the *Syngnathidæ* (pipe-fishes), and the *Hippocampidæ* or sea-horses. The singular order of *Hypostomides* includes the *Pegasidæ* (sea-moths or sea-dragons).

In another sub-order we may place the *Berycoidei*, fishes perch-like in general structure and usually well armed, with the ventral fins thoracic, but their number of rays never I, 5, the typical number in all perch-like forms. The berycoids are especially characterized by the presence of the orbitosphenoid bone, a structure wanting in all perch-like families; are the earliest in time of the fishes of this pattern, appearing in the Cretaceous or earlier. The families are *Berycidæ, Trachichthyidæ, Holocentridæ* or soldier-fishes, *Polymixiidæ*, and *Monocentridæ* or pine-cone fish.

Another group or sub-order *Zeoidei*, agrees well with the beryces in the presence of more than five soft rays in the ventral fins and in the armature of the fins. It differs, however, in the character of the skeleton, the post-temporal, especially being adnate to the skull, as in the butterfly-fishes or *Chætodontidæ*.

One family, *Zeidæ*, the John-dories, belongs here. In the same group we may place provisionally an extinct family, *Amphistiidæ*. Dr. Boulenger has suggested that to fishes allied to the *Amphistiidæ* we may trace the origin of the John-dories, and of the great group of flounders as well. This is an interesting suggestion, but the actual line of descent is as yet not proved.

The sub-order *Selenichtyes* includes the family of *Lamprididæ* or opahs. In this group is a single species, a huge fish almost as deep as long, with the hypercoracoids greatly developed and the ventral fin with many soft rays, an archaic character unknown in other spiny-rayed fishes.

In this neighborhood belongs the sub-order of *Heterosomata*, or flounders, characterized by the twisting of the cranium, an arrangement which permits the fish to lie flat on one side on the sand, while both eyes are turned to the upper or colored side. In this group there are no fin-spines. The young flounder when first

A Sea-horse (*Hippocampus*).

hatched has the skull and eyes symmetrical, and the modification of the head proceeds by degrees.

There are two families, *Pleuronectidæ* or flounders, and *Solcidæ* or soles.

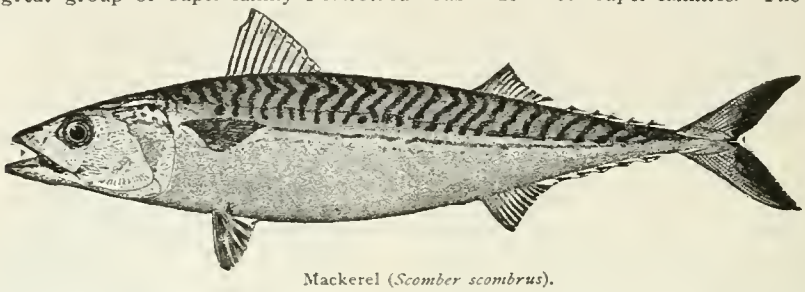
To the group or super-family *Scombroidea* belong a great variety of fishes, usually swift in motion and with thin soft scales, the ventral fins, if present, having a spine and five soft rays.

The families are *Rachicentridæ*, the sergeant-fishes, *Pomatomidæ* or bluefishes, *Carangidæ* or Cavallas, *Nematistiidæ* or papagallos, *Scombridæ* or mackerels, *Palæorhynchidæ* (extinct), *Lepidopidæ* or scabbard-fishes, *Trichiuridæ* or cutlass-fishes, *Istiophoridæ* or sail-fishes,

Xiphiidæ or sword-fishes, *Coryphænidæ* or dolphins, *Bramidæ* or pomfrets, *Pteraclididæ*, *Stromateidæ* or harvest-fishes, *Icosteidæ* or rag-fishes, *Acrotidæ*, *Zaproridæ*, *Luvaridæ* or Lowars, *Menidæ*, *Leiognathidæ*, *Steinegeriidæ*, and *Tetragonuridæ* or square-tails. The *Grammicolepidæ* perhaps belong in this neighborhood.

The imperfectly known families, *Bathyclupeidæ*, *Stephanoberycidæ*, and *Pempheridæ* have some resemblance to berycoids, but the ventral rays are I, 5.

The great group or super-family *Percoidea* agrees with the mackerel-like fishes in general structure, but the scales are usually coarser and rougher, and the structure less adapted to swift movement. Many members of this group are confined to the fresh waters. The families are *Centrarchidæ*, the sunfishes, *Kuhliidæ*, the silver-bass, *Elassomidæ*, the pigmy-perch, *Aphredoderidæ*, the pirate-perch, *Percidæ*, the river-perch and darters, *Apogonidæ*, the beardless mullets, *Scombropidæ*, *Acropomidæ*, *Serranidæ*, the bass, *Lobotidæ*, the flashers, *Rypticidæ*, the soap-fishes, *Kyphosidæ*, the chopas, *Scorpididæ*, *Theraponidæ*, the slave-fishes, *Hæmulidæ*, the grunts, *Lutianidæ*, the snappers, *Sparidæ*, the porgies, *Cæsionidæ*, *Gerridæ*, the majorras, *Mænidæ*, the picarels, *Sciænidæ*, the drums, *Centropomidæ* (or *Oxylabracidæ*), the robalos, *Polycentridæ*, *Nandidæ*, *Oplegnathidæ* or stone-wall perch, *Sillaginidæ*, *Pentacerotidæ*, *Priacanthidæ*, the catalufas, *Mullidæ*, the surmullets. Remotely allied to the percoid fishes are the *Pseudochromididæ*, the *Opisthognathidæ* or jaw-fishes, the *Malacanthidæ*, the *Latilidæ* or tile-fishes, and possibly the *Cepolidæ* or band-fishes.



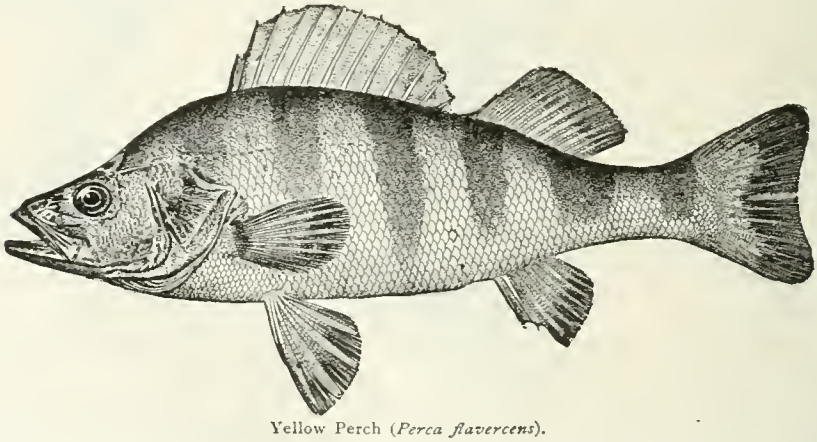
Mackerel (*Scomber scombrus*).

The group or sub-order of *Labyrinthici* comprises fresh-water fishes of the Indian region, with a peculiar apparatus for storing water connected with the gills. The families are *Osphromenidæ* or gouramies, *Anabantidæ* or climbing perch, *Helostomidæ*, *Luciophalidæ*, and *Ophiocephalidæ* or snakehead-fishes.

Another group, called *Pharyngognathi* by Müller, is characterized by the complete union of the lower pharyngeals, a character developed independently in the *Synentognathi* and in some *Sciænidæ*. It contains three sub-orders or super-families. The *Chromides* have a single nasal opening on either side. Of these there are two families, the *Pomacentridæ* or damsel-fishes, chiefly beautiful inhabitants of the coral reefs, and the *Cichlidæ*, river-fishes of the tropics of both continents.

The *Holconoti* comprise the viviparous perch or surf-fishes of California and Japan; one family, *Embiotocidæ*.

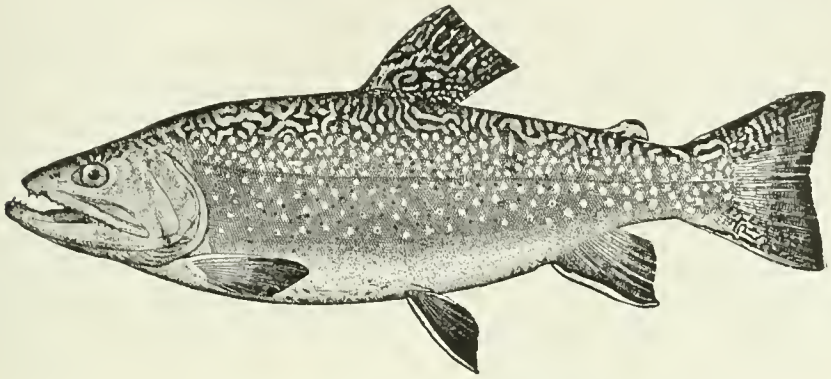
The *Pharyngognathi* proper, having two nostrils on either side, smooth scales and the gills three and one half, constitute four families, *Labridæ*, wrasse-fishes or doncellas, *Odacidæ* *Siphonognathidæ*, and *Scaridæ* or parrot-fishes, in which the teeth are united to form a bird-like beak.



Yellow Perch (*Perca flavescens*).

A large group of more or less related forms, perhaps derived from ancestors of the *Zeoidea* is known as *Squamipinnes* or *Chætodontoidea*. These are characterized in general by the union of the post-temporal or uppermost bone of the shoulder-girdle with the skull. The ventral fins in these fishes have one spine and five (rarely fewer) rays. The scales are small and often rough. The presence in the more primitive forms of 24 vertebræ and five soft rays in the

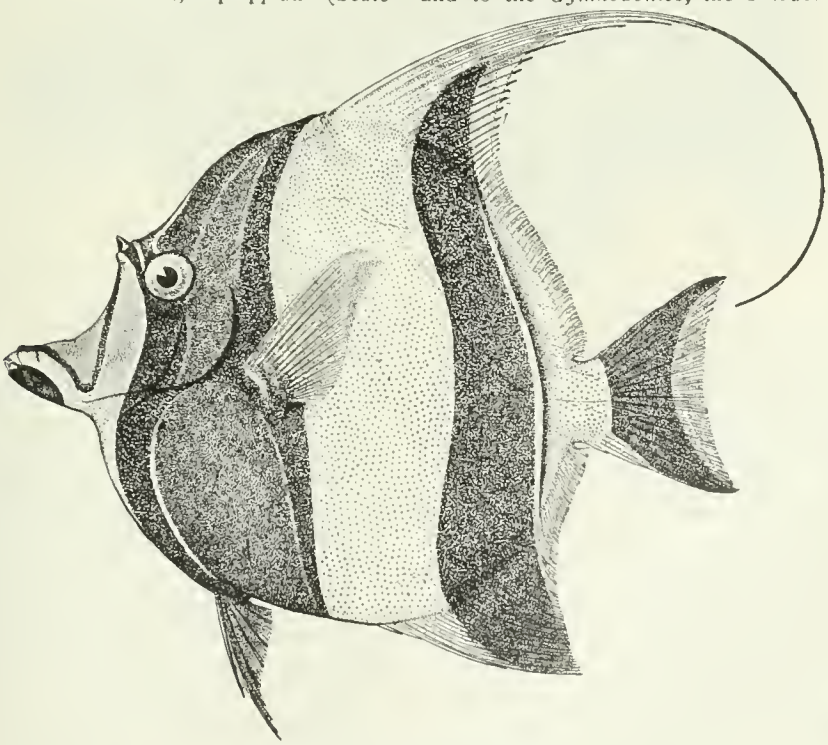
ventrals indicates the common origin of these fishes with the members of the scombroid, percoid, and labroid groups. While the more primitive of the chætodontoid series much resemble primitive members of the other series, the extremes of the former represent a wide divergence, specialization, and degeneration.



Brook or Speckled Trout (*Salvelinus fontinalis*).

The typical families are the *Ilarchidæ* or spade-fishes, the *Chætodontidæ* or butterfly fishes, characteristic of coral reefs and the *Zanclidæ* or Moorish idols. Aberrant types are the *Toxotidæ* or archers, *Ephippidæ* (*Scatophagidæ*), *Antigoniidæ* or boar-fishes, and *Drepanidæ*. Still more aberrant are the *Acanthuridæ*, tangs or surgeon-fishes, the *Siganidæ*, with the last ventral ray spinous like the first. From the tangs are descended the degenerate types known collectively as *Plectognathi*, the bones of the jaws being more or less consolidated. Three sub-orders exist among these forms, *Sclerodermi*, with separate rough scales and separate teeth, the *Ostracodermi*, with the body enclosed in a bony box, and the *Gymnodontes*, with the teeth coalescent into one or two plates in each jaw.

To the *Sclerodermi* belong the three families, *Triacanthidæ*, *Balistidæ* or trigger-fishes, and *Monacanthidæ* or file-fishes. To the *Ostracodermi* belong the *Ostraciidæ* or trunk-fishes, and to the *Gymnodontes*, the *Triodontidæ*, the *Tetraodontidæ* or globefishes, the *Tropidichthyidæ*, the *Chonerhinidæ*, the *Diodontidæ* or porcupine fishes, the *Heptadiodontidæ* (extinct), and the *Molidæ* or head-fishes.



Moorish Idol (*Zanclus cornutus*).

A small group known as the super-family

Cirrhitoidea is characterized by the thickened and unbranched character of the lower pectoral rays, the third suborbital being at the same time not enlarged. Here belong the *Cirrhitidæ*, the *Aplodactylidæ*, the *Latrididæ*, and possibly the *Trichodontidæ*. This group seems to mark a direct transition from the perch-like fishes to those with mailed cheeks.

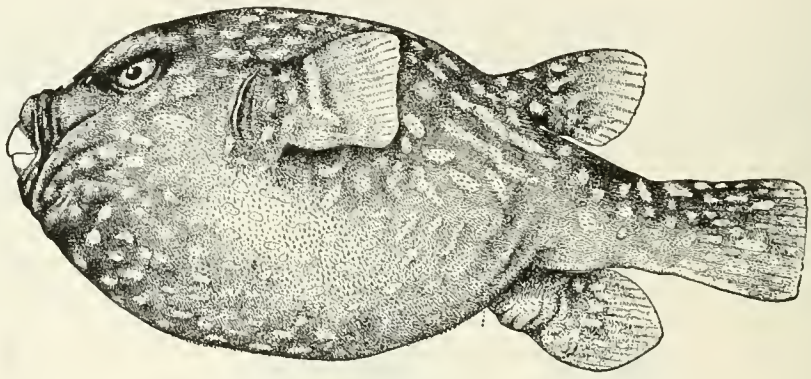
The sub-order of mailed-cheek fishes, *Parcioplitæ*, is characterized by the presence of the suborbital stay, a process extending backward from the third suborbital to or toward the upward limb of the preopercle. This stay is subject to great exaggeration in some forms, while in others it is much reduced. It is, however, always present in these fishes and in no others. In the more primitive types, the ventrals have one spine and five rays. There are 24 vertebræ, and the scales are normally developed. In the extremes there are remarkable cases of specialization on the one hand and of degeneration on the other.

The families of mailed-cheek fishes are the *Caracanthidæ*, the *Hexagrammidæ*, or greenfishes, the *Anoplopomidæ*, or skil-fishes, the superfamily *Trachinoidea* for the most part retain the normal number of ventral rays, the spine, and five soft rays. To this group belong the *Trachinidæ* or weavers, the *Uranoscopidæ* or stargazers, the *Percophidæ*, *Notothæniidæ*, *Pteropsaridæ*, *Harpagiferidæ*, *Chænichthyidæ*, *Champsodontidæ*, *Bovichthyidæ*, the *Draconettidæ*, *Callionymidæ* or dragonets, the *Platypteridæ*, and perhaps the *Chiasmodontidæ* and *Hemerocætidæ*.

Other divergent or aberrant families in this neighborhood are the *Comephoridæ*, or Baikal-fishes, the *Bathymasteridæ* or ronquils, and the *Gadopsidæ*. The *Batrachoididæ* or toad-fishes represent the group *Haplodoci*.

The group *Xenopterygii*, without spinous dorsal and with a large sucking disk between the ventral fins, contains the *Gobiesocidæ* or cling-fishes.

The super-family *Blennioidea* contains the blennies and their relatives, with the ventrals jugular and always few-rayed. Here belong the *Blenniidæ*, *Pholididæ*, *Stichæidæ*, *Xiphasiidæ*, *Cryptacanthodidæ* or wry-mouths, *Anarrhichadidæ* or wolf-fishes, *Ptilichthyidæ*, *Cer-*



A Californian Globefish (*Ovoides setosus*).

Scorpænidæ or rose-fishes and sea-scorpions, the *Platycephalidæ*, the *Bembridæ*, the *Hoplichthyidæ*, the *Cottidæ* or sculpins, the *Cyclopteridæ* or lump-fishes, the *Liparididæ* or sea-snails, the *Rhamphocottidæ*, the *Agonidæ*, sea-poachers or alligator-fishes, the *Triglidæ* or sea-robins, the *Peristediidæ*, and the *Cephalacanthidæ* or flying gurnards. The last three families differ considerably in osteology, and are segregated by Dr. Gill as the sub-order *Craniomi*.

In the sub-order *Discocephali* the spinous dorsal fin is modified to form a sucking disk. This is placed on the head, and is made of two series of flat plates. There is one family, the *Echineidæ* or remoras.

The large family of *Gobiidæ* forms a super-family called *Gobioidea*. The gobies are distinguished by numerous minor traits, the restricted gill-openings, the short spinous dorsal and usual connection of the ventral fins among others. With the gobies may be associated the small family of *Oxudercidæ*.

To the sub-order *Jugulares* we may refer many families which agree in having the ventral fins inserted before the pectorals. The *dalidæ*, *Pataecidæ*, *Gnathanacanthidæ*, and the extinct family of *Blochiidæ*.

Very closely allied to the blennoid series, and also belonging to the *Jugulares*, is the superfamily *Ophidioidea*, differing in the absence of fin-spines. Here belong the *Zoarcidæ* or eelpouts, the *Ammodytidæ* or sand-launces, the *Bleekeriidæ*, the *Brotulidæ*, the *Brotulophidæ*, the *Ophidiidæ* or cusks, the *Fierasferidæ* or pearl-fishes, the *Xenocephalidæ*, *Scytalinidæ*, *Congrogadidæ*, and *Bregmacerotidæ*.

A sub-order of uncertain relations, characterized by the absence of foramen in the hypercoracoid, by the peculiar form of the tail, by the jugular insertion of the ventrals and the absence of spines, is the *Anacanthini*. Here belong the *Gadidæ* or codfishes, the *Merlucciidæ* or hakes, the *Macrouridæ* or grenadiers, the *Ateleopodidæ* and *Bathyonidæ*.

Still more uncertain are the relationships of the sub-order *Tæniosomi*, ribbon-shaped fishes of the deep sea, soft in body and often reaching an immense size. The families are *Trachypteridæ* or deal-fishes, *Regalecidæ* or oar-fishes. The *Lophotidæ* or crest-fishes show some resemblance to these.

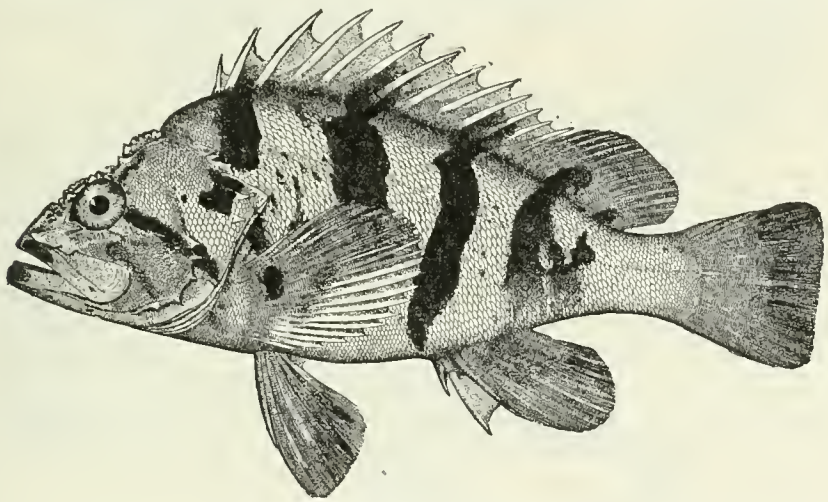
Finally we may close the long series with the order of *Pediculati*. These are jugular fishes, degenerate in structure, the small gill-opening *behind* the pectoral fins. The families are *Lophiidæ*, the anglers, *Antennariidæ* or walking-fishes, *Ceratiidæ* or sea-devils, and *Ogcocephalidæ* or sea-bats.

History of Systematic Ichthyology.— The title of "Father of Ichthyology" is justly given to Petrus Artedi, a Swede, associate and intimate friend of Linnæus. Artedi was the first to recognize the meaning of genus and species in ichthyology, and to supply the outlines of a classification. After Artedi's untimely death (by drowning in a canal in Holland), Linnæus edited his manuscripts, publishing them in 1738, in five parts, as follows: (1) Ichthyological biography; (2) Ichthyological philosophy; (3) Genera of fishes, involving a complete classification of the forms he knew, his genera corresponding to the groups now called families; (4) Synonymy of all species recorded by authors, and (5) Description of all the species actually examined by Artedi. Of true fishes (exclusive of whales) 228 species are recorded by Artedi — a small portion of the 12,000 species now actually known (1903).

But the work of Artedi is masterly in its method and shows a stronger touch than that of any of his successors in ichthyology until the time of Cuvier. In the 'Systema Naturæ' Linnæus did little more for fishes than to substitute binomial names for the descriptive phrases of Artedi.

With the 'Règne Animal' (1817–28) of Cuvier, a new era in zoology began. In this epoch-making work the "Animal kingdom," as the title indicates, was "arranged according to its organization." Comparative structure founds its reflection in the schemes of classification. The application of the principles of morphology was carried out in detail with the fishes in the great 'Histoire Naturelle des Poissons' (1828–49) of Georges Dagobert Cuvier and Achille Valenciennes, long the most valuable general work on fishes. The only general work on fishes since Cuvier and Valenciennes is the monumental 'Catalogue of the Fishes of the British Museum' (1859–70) by Dr. Albert C. L. G. Günther. In this work 6,843 species are described and 1,682 doubtful species are mentioned in foot-notes, the number of species known in 1870 being estimated at 9,000. Since that date about 3,000 have been described, the number of living species at present, according to an enumeration made by Dr. Boulenger, being about 12,000. The number of fossil species known may be estimated at 3,000 to 4,000.

The systematic arrangement of Cuvier was extended and modified by Louis Agassiz to include the multitude of fossil forms made known in his 'Poissons Fossiles.' Still more important corrections and changes in the general scheme of classification were suggested by Johannes Müller, the greatest comparative anatomist of the 19th century. Other valuable contributions to taxonomy have been made by Dr. Günther, Dr. Edward Drinker Cope, and especially by Dr. Theodore Gill, a critical writer who ranks with the first of taxonomists of the age, and whose views have been accepted in substance if not in name as representing our best present knowledge of the origin and relationship of forms among the vertebrate animals.



Black-banded Rock-fish (*Sebastodes nigricinctus*).

The contributions of Geoffroy Saint-Hilaire, Pieter van Bleeker, Carl Gegenbaur, Ramsay H. Traquair, George Albert Boulenger, Louis Dollo, Bashford Dean, Karl Zittel, Arthur Smith Woodward to the systematic arrangement of the higher groups of fishes have also been of great value.

In modern times the students of systematic ichthyology have been very numerous. The local faunal work in various nations has been very extensive. In Great Britain we may note Parnell's 'Natural History of the Fishes of the Firth of Forth' (1838); William Yarrell's 'History of British Fishes' (1859); the earlier histories of British Fishes by Edward Donovan and by William Turton, and the works of Jonathan Couch (1862), and Dr. Francis Day (1888), possessing similar titles. H. G. Seelye has also a useful 'Synopsis of the Fresh-water Fishes of Europe.' William Swainson studied the fishes of Sicily, W. Thompson those of Ireland, and Rev. Richard T. Lowe and J. Y. Johnson have done excellent work on the fishes of Madeira.

In Germany and Austria the chief local works have been those of Heckel and Kner on the fresh-water fishes of Austria (1858), and C. Th. von Siebold on the fresh-water fishes of Central Europe (1863). The two memoirs of Eduard Rüppell on the fishes of the Red Sea and neighboring parts of Africa, 'Atlas zu der Reise im nördlichen Afrika' (1828), and 'Neue Wirbelthiere' (1837), rank with the very best of descriptive work.

In Italy, Charles Lucien Bonaparte, Prince of Canino, has published an elaborate 'Fauna Italica' (1838), and numerous minor papers. O. G. Costa published (about 1850) a Fauna of Naples.

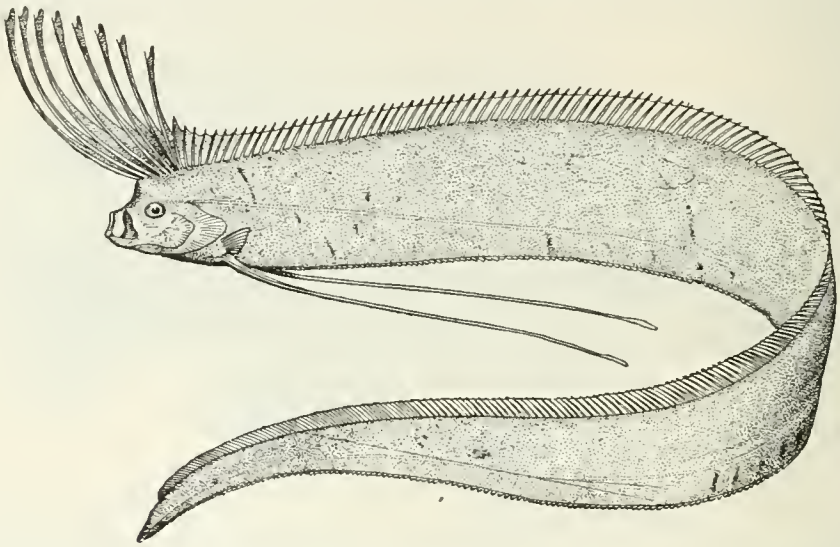
In France, the fresh-water fishes are the subject of works by Emile Blanchard (1866), and Emile Moreau. Léon Vaillant has written on various groups of fishes. The 'Mission Scientifique au Mexique,' by Vaillant and F. Bocourt, is a most valuable contribution to our knowledge of the fishes of Mexico.

In Holland the chief great works have been those of Schlegel and Pieter van Bleeker. Professor Schlegel, of the University of Leyden, described in 'The Fauna of Japonica' the fishes collected about Nagasaki in Japan by Ph. Fr. de Siebold and Bürger.

Pieter van Bleeker (1819–78), a surgeon in the Dutch East Indies, is the most voluminous writer in ichthyology. His chief work is the 'Atlas Ichthyologique des Indes Orientales Néerlandaises,' illustrated by colored plates. The writings of Dr. Bleeker constitute the chief source of our knowledge of the fauna of the East Indies. Dr. Van Lidth de Jeude, of the University of Leyden, is the author of a few descriptive papers on fishes.

The fish fauna of Cuba has been the lifelong study of Dr. Felipe Poey y Aloy (1799-1891), a pupil of Cuvier, for a half century or more the honored professor of zoology in the University of Havana. Of his many useful papers, the most extensive are his 'Memorias sobre la Historia Natural de la Isla de Cuba,' followed by a 'Repertorio' and an 'Enumeratio' on the same subject. Before Poey, Guichenot of Paris had written on the fishes collected in Cuba by Ramon de la Sagra. Philip H. Gosse (1810–88) wrote on the fishes of Jamaica. Much earlier, Robert Herrmann Schomburgk (1804–65) wrote on the fishes of British Guiana. Other papers on the Caribbean fishes were contributed by Johannes Müller and F. H. Troschel, and by Richard Hill and J. Hancock.

Besides the work in South America of Marcgrave, Agassiz, Reinhardt, Lütken, Steindachner, Jenyns, Boulenger, and others already named, we may note the local studies of Dr. Carlos Berg in Argentina, Dr. R. A. Philippi in Chile, and special records of Humboldt, Garman, J. F. Abbott, and others in recent times. Carl H. Eigenmann and also Jordan and Eigenmann have studied the great collections made in Brazil by Agassiz. Steindachner has described the collection of Johann Natterer and Gilbert those made by Dr. John C. Branner. The most recent extensive studies of the myriads of Brazilian river-fishes are those of Dr. Eigenmann.



A Ribbon-fish or Oarfish (*Regalecus*).

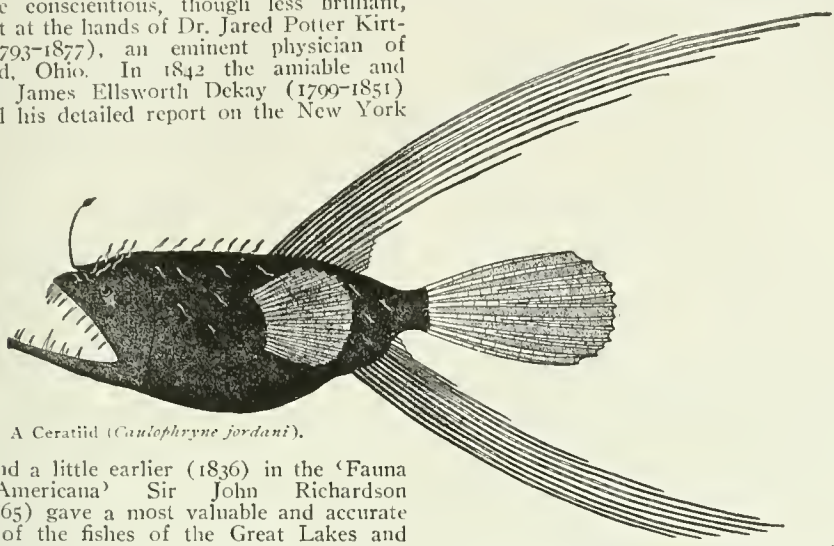
In New Zealand, F. W. Hutton and J. Hector have published a valuable work on the fishes of New Zealand. Later writers have given us a good knowledge of the fishes of Australia. Notable among them are W. Macleay, James Douglas Ogilby, and Edgar R. Waite. Clarke has also written on 'Fishes of New Zealand.'

The most valuable work on the fishes of Hindustan is the elaborate treatise on the 'Fishes of India,' by Francis Day.

The most recent as well as the most extensive studies of the fishes of Japan were made in 1900 by the present writer and his associate, John Otterbein Snyder.

The scanty pre-Cuvieran work on the fishes of North America has already been noticed. Contemporary with the early work of Cuvier is the worthy attempt of Professor Samuel Latham Mitchell (1764–1831) to record in systematic fashion the fishes of New York. Soon after followed the admirable work of Charles Alexandre Le Sueur (1780–1840), artist and nat-

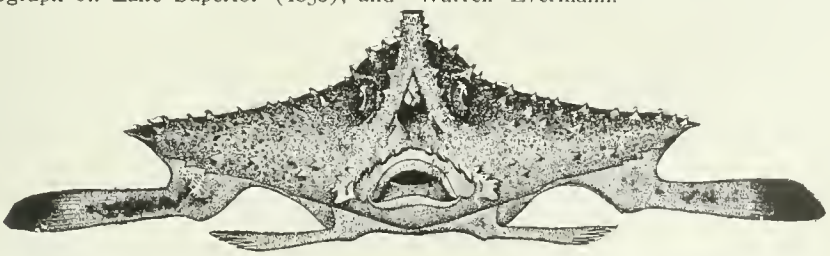
uralist, who was the first to study the fishes of the Great Lakes and the basin of Ohio. Constantine Samuel Rafinesque (1784–1842), the third of this remarkable but very dissimilar trio, published numerous papers descriptive of the species he had seen or heard of in his various botanical rambles. This culminated in his elaborate but untrustworthy 'Ichthyologia Ohiensis.' The fishes of Ohio received later a far more conscientious, though less brilliant, treatment at the hands of Dr. Jared Potter Kirtland (1793–1877), an eminent physician of Cleveland, Ohio. In 1842 the amiable and scholarly James Ellsworth Dekay (1799–1851) published his detailed report on the New York



A Ceratiid (*Caulophryne jordani*).

fauna, and a little earlier (1836) in the 'Fauna Boreali-Americana' Sir John Richardson (1787–1865) gave a most valuable and accurate account of the fishes of the Great Lakes and Canada. Almost simultaneously, Rev. Zadock Thompson (1796–1856) gave a catalogue of the fishes of Vermont, and David Humphreys Storer (1804–91) began his work on the fishes of Massachusetts, finally expanded into a 'Synopsis of the Fishes of North America' (1846) and a 'History of the Fishes of Massachusetts' (1867). Dr. John Edwards Holbrook (1794–1871), of Charleston, published (1860) his invaluable record of the fishes of South Carolina. The monograph on Lake Superior (1850), and was barely finished at the time of his death. The work of Theodore Nicholas Gill and Edward Drinker Cope has been already noticed.

The present writer began a systematic 'Catalogue of the Fishes of North America' in 1875, in association with his gifted friend, Herbert Edson Copeland (1849–76), whose sudden death, after a few excellent pieces of work, cut short the undertaking. Later, Charles Henry Gilbert (1860—), a student of Professor Copeland, took up the work, and in 1883 a 'Synopsis of the Fishes of North America' was completed by Jordan and Gilbert. Dr. Gilbert has since been engaged in studies of the fishes of Panama, Alaska, and other regions, and the second and enlarged edition of the 'Synopsis' was completed in 1898, as the 'Fishes of North and Middle America,' in collaboration with another of the writer's students, Dr. Barton Warren Evermann.



Atlantic Bat-fish (*Malthe vespertilio*).

other publications of Louis Agassiz (1807–73) are well known. One of the first of Agassiz's students was Charles Girard (1822–95), who came with him from Switzerland, and in association with Spencer Fullerton Baird (1823–87) described the fishes from the United States Pacific Railway Surveys (1858) and the United States and Mexican Boundary Surveys (1859).

Most eminent among the students and assistants of Professor Baird was his successor, George Brown Goode (1851–99), whose greatest work, 'Oceanic Ichthyology,' published in collaboration with Dr. Tarleton Hoffman Bean,

As students of the extinct fishes, following the epoch-making 'Poissons Fossiles' of Louis Agassiz, some of the notable names are those of Pander, Asmuss, Heckel, Hugh Miller, and Ramsay H. Traquair. An indispensable 'Handbuch der Palæontologie' is that of Karl A. Zittel, translated by Charles R. Eastman. The most valuable general work is the 'Catalogue of the Fossil Fishes in the British Museum' in four volumes, by Dr. Arthur Smith Woodward, a worthy companion of Günther's Catalogue of the living fishes.

In America Dr. John Strong Newberry, and Professor Edward W. Claypole have studied the

fossil fishes of Ohio. . Edward Drinker Cope and Dr. Joseph Leidy have written on the Eocene and Cretaceous fishes of the Rocky Mountains. Numerous recent papers of importance have been published by Dr. Bashford Dean, of Columbia University, Dr. Charles R. Eastman, of Harvard, and Dr. Oliver Perry Hay of New York. Other important records are due to Orestes St. John, A. H. Worthen, Charles D. Walcott, J. F. Whiteaves, S. W. Williston, and the Redfields, father and son.

Besides all this there has risen, especially in the United States, Great Britain, Norway, Canada, and Australia, a vast literature of commercial fisheries, fish culture, and angling, the chief workers in which fields we may not here enumerate even by name.

See FISHES, GEOGRAPHICAL DISTRIBUTION OF.

DAVID STARR JORDAN,
President Leland Stanford Jr. University.

Ichthyopsida, ik-thĭ-ŏp'sĭ-dạ. See HERPETOLOGY.

Ichthyopterygia. See ICHTHYOSAURIA.

Ichthyornis, ik-thĭ-ôr'nĭs, a genus of fossil carinate birds constituting an order *Ichthyornithes* and family *Ichthyornithidæ*. They were about the size of, and presumably had much the habits and appearance of, rather large gulls, but they had extremely large heads, and both mandibles of the long pointed beak were studded with sharp, backward pointing, snake-like teeth, each set in a distinct socket. These sea-birds fished in the great inland sea which during the Cretaceous Age covered so much of the present western half of the United States, and the remains of two species and of some allied forms, as *Aptornis,* are found in western Kansas, but they became extinct at the end of the period.

Ichthyosauria, Ichthyopterygia, or **Fish-lizards,** an order of reptiles, embracing primitive marine forms with a fish-like body, long head and tail, and no distinct neck, whose remains are found exclusively in the Mesozoic, and most plentifully in the Lias. They varied in length from 3 to about 30 feet, and, as shown by their numerous coprolites (q.v.), fed upon fishes and cephalopods (squids). "The members of this order," remarks Zittel, "differ conspicuously from all living reptiles and are distinguished chiefly by their fish-like form of body, paddle-shaped limbs with numerous oval or polygonal phalanges, large head with elongated rostrum, short amphicœlous vertebræ, and naked integument." They had no dermal armament like crocodiles, but the snout was prolonged, narrow like that of a gavial or a dolphin, the teeth were acutely conical, crocodile-like, and thickly set in a groove without separate sockets; as many as 400 have been counted in a single mouth. The eyes were surrounded by a circle of wedge-shaped sclerotic plates. That they breathed air is plain from the absence of branchial arches, the shape of the hyoid bones, and other evidences of pulmonary respiration; and their viviparous habit is demonstrated by several well-preserved skeletons embracing embryonic remains in the abdominal cavity,—as many as seven young in one case. As regards external form and adaptation to a marine existence, the ichthyosaurus "depart as widely from other reptiles as whales do from land mammals, and occupy as isolated a position." Their composite character is most puzzling to the phylogenist, and nothing is certainly known as to their origin or descent, except that they certainly were modified from terrestrial ancestors. The only family is *Ichthyosauridæ,* which existed from the Lias to the Cretaceous periods, and contains the small-sized and primitive genus *Mixosaurus,* the typical and exclusively Old World genus *Ichthyosaurus, Baptanodon* (q.v.), and *Shastasaurus,* the last two being American in their distribution. Consult: Zittel-Eastmann, 'Text-book of Palæontology,' Vol. II. (New York 1902); Gadow, 'Amphibia and Reptiles' (London 1901).

Ichthyosis, ĭk-thĭ-ō'sĭs, a congenital, chronic disease of the skin characterized by dryness, harshness, and a scaly appearance suggestive of the skin of fish. Nothing is known of its causation; it is not dangerous to life; its cure is impossible.

Iconoclasts, ī-kŏn'ō-klăsts (image-breakers), that Christian party in the Church of the 8th and 9th centuries who would not tolerate images in the churches or places of worship. The Byzantine emperor, Leo the Isaurian, issued an edict in 726 ordering the people to abstain entirely from paying religious reverence to sacred images and a second edict soon after ordered the destruction of the images. This order occasioned commotions, first in the islands of the Archipelago; and as the Popes Gregory II. and III., as well as Germanus, the patriarch of Constantinople, declared the veneration of sacred images to be in consonance with the Church's doctrine and constant practice, and the Emperor Leo refused to recall his edict on their command, they excommunicated him, and his subjects in Italy threw off their allegiance. Thence arose two parties, the Iconolatræ (image worshippers) and the Iconoclasts. Leo's son and successor, Constantine Copronymus, held the same views as his father. He convened a council at Constantinople (754), in which the use as well as the worship of images was condemned. Constantine's son, Leo IV., who ascended the throne 775, followed the same course, but proceeded with more clemency and moderation. On the death of Leo IV., in 780, he was succeeded by his son Constantine, under the guardianship of Irene, mother of the latter, and widow of Leo. Irene favored the orthodox party, and on attaining this position of authority openly avowed her sentiments, and summoned a council to be held in 787, under her protection at Nicæa (Nice) in Bithynia, to pass upon the question at issue. This council condemned the Iconoclasts. Among the Greeks the controversy concerning images broke out anew after the banishment of Irene (802), and lasted about half a century. Her successor, Nicephorus, did not, indeed, remove the images from the churches, but he forbade the adherents of the images from persecuting their adversaries. Finally the Empress Theodora, by a council held at Constantinople (842), restored the worship of images among the Greeks, which was confirmed by a second council, held 869–70, in the same place.

Icteridæ, ĭk-tĕr'ĭ-dē, a family of birds, the American orioles, or hangnests, and blackbirds (qq.v.).

Icy Cape, Alaska, a promontory so named on account of the immense masses of ice by which it is usually surrounded on the north coast, and projecting into the Arctic Ocean west of the Otukah River, about midway between Capes Lisburne and Barrow. It was discovered by Cook in 1778, and was the farthest point that he reached north of Bering Strait.

Ida, (1) the classical name of Kaz-Dagh, a mountain range of Asia Minor, 30 miles southeast of the plain of Troy, with its highest peak, Gargaron (4,650 feet), near the head of the Gulf of Adramyti. In mythology it is famous as the range where Ganymede was stolen; where Paris pronounced judgment on the beauty of the rival goddesses and where the celestials stationed themselves to witness the battles for Troy on the nether plain. (2) The classical name also of a mountain (now Psilotri) in Crete (q.v.), the loftiest (7,500 feet) of the range which traverses the island. The most celebrated legends connected with it are those relating to the infancy of Zeus.

Ida Grove, Iowa, a town, the capital of Ida County, 28 miles north of Denison, on the Maple River, and on the Chicago & N. W. railroad. Farming and stock-raising are carried on largely in the vicinity, and the town has flour mills, grain elevators, and manufactures of machinery, harness, brooms and bricks. Among the municipalized installations is a heating-plant. Pop. (1900) 1,967.

Idaho (Indian, "mountain gem"), a Rocky Mountain State of the United States, next east of Oregon and Washington; its slender northern prong abutting on British Columbia; Montana and Wyoming lie on the east, Nevada and Utah on the south. Capital, Boisé. Length, 485 miles; breadth, 50 to 300; area, 84,800 square miles, 510 water. Pop. (1903) est. 177,000.

Topography.— Idaho is part of the high plateau known as the Great Basin, the main Rockies bounding it on the east and the Cascade Range on the west; it has a mean elevation of some 4,700 feet, but the Bitter Root range in the northeast, extended north by the Cœur d'Alêne and Cabinet, and the Salmon range in the centre, have snow-capped peaks rising in the latter to 12,000 feet, of rugged grandeur. These send out spurs extending west entirely across the State. The Saw Tooth range in the west centre, and the Goose Creek and Bear River ranges in the south, are the other chief ranges, the last two stretching across the State. The river system belongs almost entirely to Columbia, with a basin of some 60,000 square miles within the State; the Snake or Lewis Fork winding across its whole southern breadth and up much of the west boundary for some 850 miles, navigable from Salmon Falls, in the centre, to the entrance of the Powder River from Oregon. The chief Idaho affluents are the Salmon and Clearwater; others are the Boisé and Payette. In the north are the Spokane, Pend d'Oreille, Kootenai, and others, all flowing into the Columbia. A large area in the southern part is drained by streams which sink into the earth not far from the mountains (the "lost river" drainage system), and some reach the Snake River by subterranean channels. A small part of the south drains into Salt Lake by the Bear River. The chief lakes are Cœur d'Alêne, Pend d'Oreille, and Kaniksu, all in the extreme north, and Bear Lake, in the extreme south, half in Utah. The State has many beautiful waterfalls; four of them are on the Snake,— the 210-foot Shoshone Falls, the Twin, Salmon, and American.

Geology.— The most conspicuous physical and geological feature is the vast barren lava plain, some 400 miles by 40 to 60, and about 20,000 square miles in extent, stretching along the Snake River. This is a relatively recent (Tertiary) overflow, which in enormous volume flooded the Pacific Slope to the ocean. The but recent quiescence of the volcanic activity is shown by the geysers, steam and soda springs, and hot pools, still plentiful in this region. It is rich in fossils, including those of the elephant and mastodon, tapir, simiads, and saurians.

Forests.— The timber region occupies about 11,000 square miles, mostly in the northern part, but somewhat in the upper Boisé, Payette, and Weiser valleys; a dense growth mostly of conifers,— white and yellow pine, red cedar, spruce, hemlock, etc. Of the Bitter Root Timber Reservation, 5,400 square miles are in Idaho; the loftier regions, the Alpine Fir district, produce a poor quality. The forest products were over $1,000,000 in 1892.

Climate, Soil, and Agriculture.— The upper levels have the severe winters of the northern latitudes, and heavy snowfalls from the abundant moisture; the lower ones and the sheltered valleys have a very agreeable and equable climate. The rainfall is light and the soil consequently arid in the southern parts, as in the Great Basin generally, the mountains cutting off the vapors from either side; but in the mountainous districts rain is abundant, and agriculture can be carried on without irrigation. Here, however, the sandy and clayey soil makes it less profitable than ranching. In the mountain valleys and along the rivers, where irrigation can be brought into play, and the soil from lava decomposition is exceedingly rich, production is abundant. The chief districts irrigated are those near swift streams with shallow channels, as the headwaters of the Snake in the east and the district around the Boisé and Payette in the west. Over 600,000 acres were irrigated in 1900. In 1902 a great effort was made to increase this by nearly one half, irrigating 276,000 acres in the Snake Valley by two great canals, with power developed at Shoshone Falls. The chief crop is hay, which in 1902 amounted to 955,676 tons, valued at $5,256,218. Next to this was wheat, 6,021,946 bushels, valued at $4,215,362; other cereals, as oats and barley, produced several million bushels, but wheat made about three fourths of the total. The State raised some $4,000 worth of flaxseed. The raising of vegetables to supply the mining towns is assuming importance, and the fruits for which the Pacific Slope is becoming noted are shared by Idaho, chiefly apples and prunes, grown mainly in the Boisé basin,—

the fruit product being about $400,000 a year. The stock-raising interest is very important, nearly half the surface of the State being pasture; but the long severe winters and deep snows make it precarious and costly in precisely the sections best adapted to it, and the northern packers and cattlemen generally winter their stock and draft animals in the Snake and adjoining valleys, where they can live and forage in the winter. The most important item is sheep, which are increasing with great rapidity; from 1,956,467 in 1899–1900, they numbered 4,541,815 in 1902, fourth in the United States. Idaho ranks third in the wool clip, which was 21,639,387 pounds in 1902. The sales of wool and mutton together in 1902 were $4,775,000. There are some 60,000 dairy cows in the State, and nearly half a million meat cattle.

Mining.— Idaho ranks high as a mining State, having rich deposits not only of gold, silver, copper, and lead, but of iron, coal (several new mines opened in 1903), salt of excellent quality, and other minerals. Its lead is the purest in the country, the Cœur d'Alêne district producing about one third of all in the United States. The gold is distributed all through the State; not only in the quartz, but in the gravels of the rivers, especially the Boisé (the most noted), the Salmon, and the Snake. Dredging from the Snake River bed is carried on; but the great event of the last year (1902) was the discovery of immense new quartz ledges in the Thunder Mountain district, which are expected to raise production to the old level of the days before the partial exhaustion of the placers. The yield of metals in 1902 was 92,750 ounces of fine gold, valued at $1,917,150; 5,591,734 ounces of silver, valued at $2,577,789, and 68,953 long tons of lead, besides about 300,000 pounds of copper. The production is restricted by the American Smelting and Refining Company, in order not to glut the market.

Manufactures.— The production of lumber is the chief industry, and flour milling next. Railroad cars, harness and saddlery (always needful in a ranching country), foundry and machine-shop products, furniture, and cigars are also of some importance. There are about 1,600 persons employed in the various manufactures, earning about $1,000,000 yearly in wages; the annual output is about $4,800,000 in value.

Railroads.— The mountainous character of the State, and its slight development, have retarded the construction of means of transportation; the Oregon Short Line through the Snake Valley in the south, and the Great Northern and Northern Pacific through its extreme northern tip, furnish what it has, except a Northern Pacific branch along the Clearwater and a short distance north. There are about 1,400 miles of main track in the State.

Banks.— In 1901 there were 13 national banks in Idaho, with $650,000 of capital stock, $223,354 in outstanding circulation, and $231,650 in United States bonds. There were also ten State banks, three private banks, and a loan and trust company.

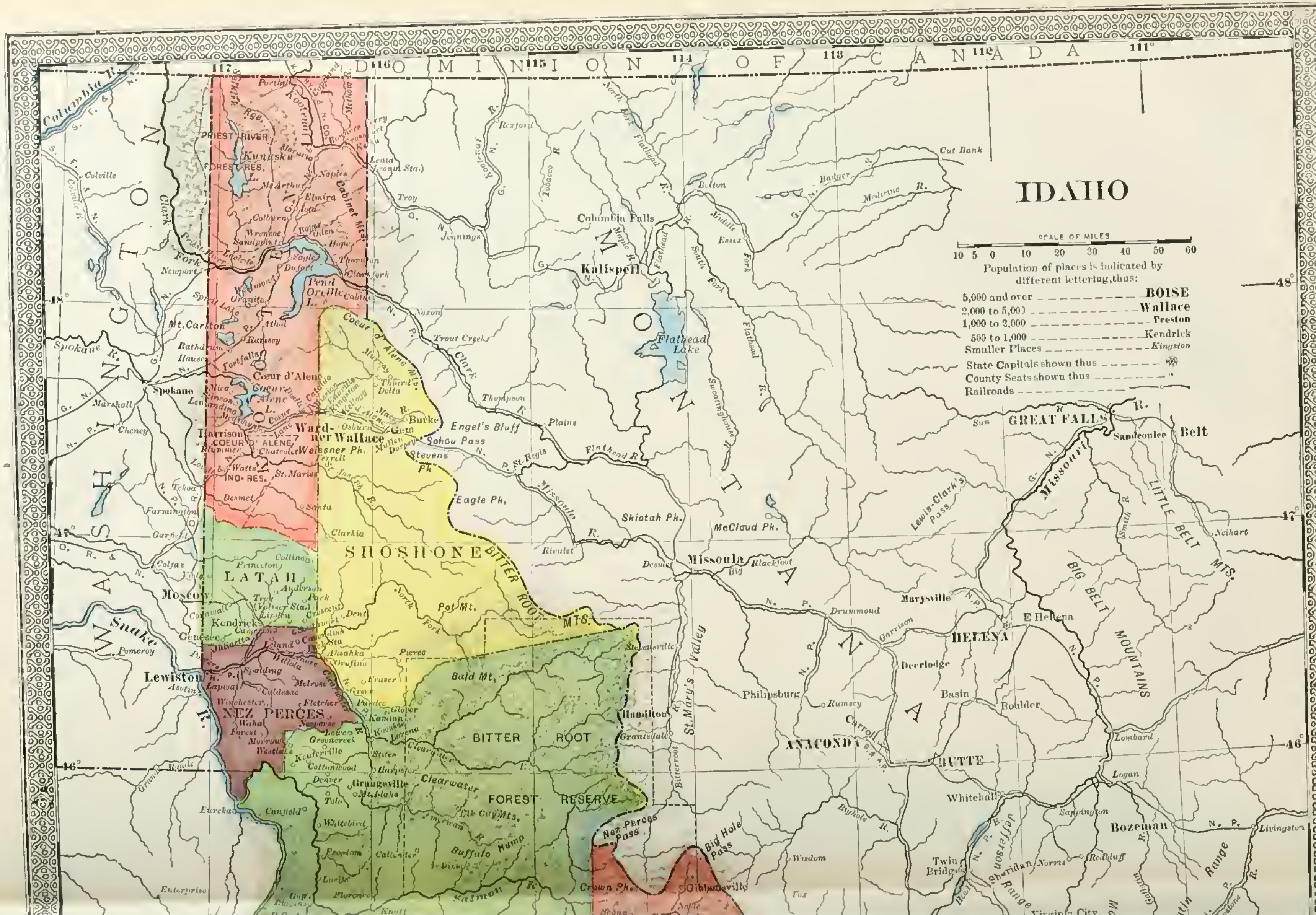
Education, Charities, Religion, etc.— The State has over 750 school buildings, and 1,100 teachers, and spends over half-million dollars annually on the schools. Besides ten public high schools, and as many private academies, there are two State normal schools, at Albion and Lewiston, the University of Idaho at Moscow, State Academy at Pocatello, and an agricultural and technological school at Idaho Falls; with two industrial schools at De Smet for the Cœur d'Alêne Indians, academies at Lewiston, Boisé, Genesee, and Pocatello. The State has an insane asylum at Blackfoot, and a State prison at Boisé. In religion, it is predominantly Mormon, with the Catholics next; Methodists, Baptists, and Presbyterians follow in that order.

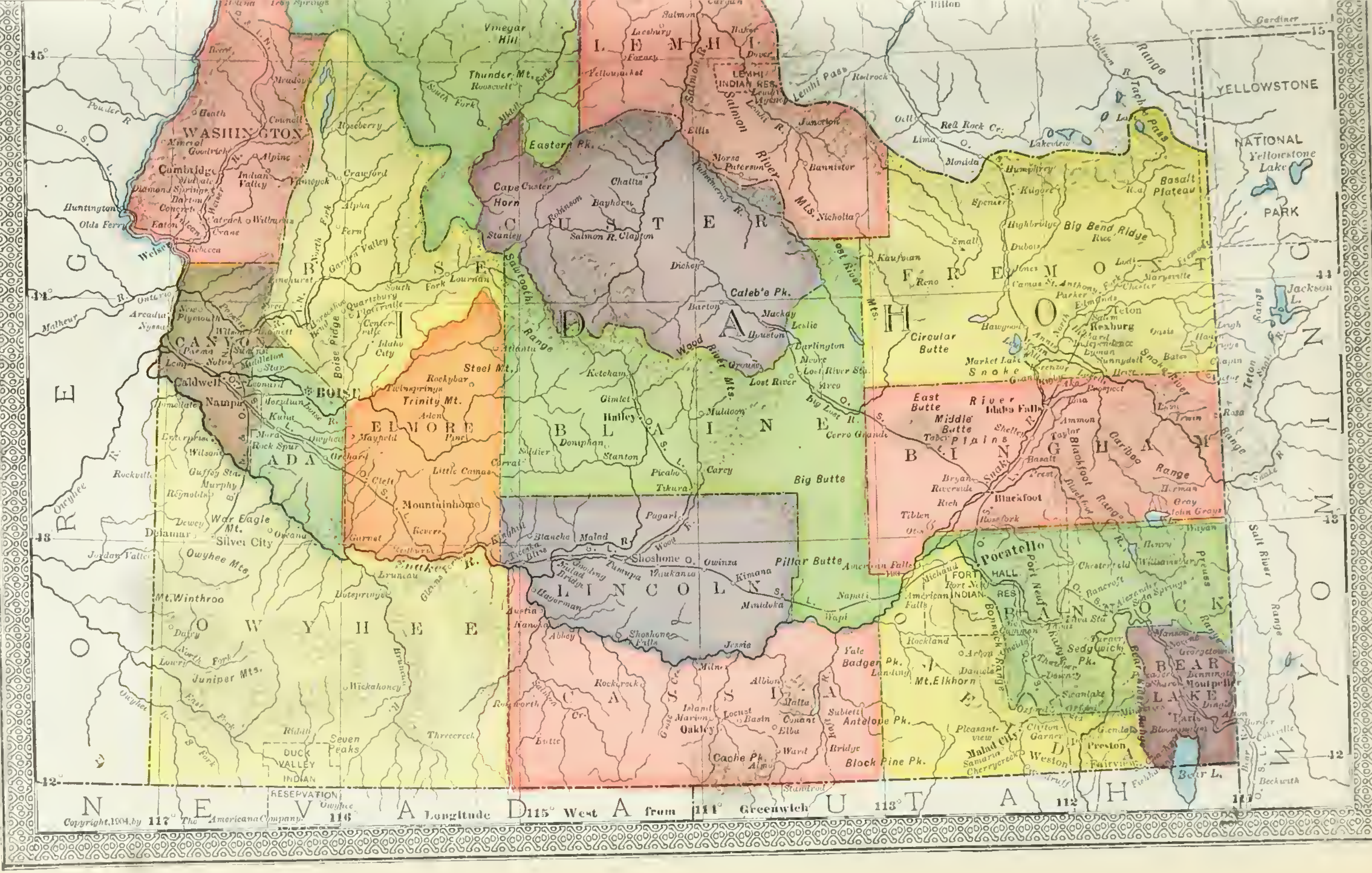
Indians.— There were 4,226 Indians in the State in 1900, at four reservations, Cœur d'Alêne, Fort Hall, Lemhi, and Nez Percé. But in 1902 the Fort Hall reservation was thrown open to settlement, and about 3,000 settlers took up claims. The Indians at Cœur d'Alêne and Nez Percé are self-supporting.

Government and Finances.— The governor and legislature are elected biennially; sessions are limited to 60 days, except at the members' expense. There are 21 members in the Senate and 46 in the House. The State has one Representative in Congress. After admission as a State a Republican governor was elected until 1897, when the Democrats and Populists united. Until 1902 the Fusion candidates for governor were elected, but in 1902 a Republican governor was elected, and the State is now Republican. The assessed valuation of property (1902) is about $52,000,000, and the bonded debt $443,500.

Population.— 1870, 13,999; 1880, 32,610; 1890, 84,385; 1900, 161,772. There were about 25,000 more males than females, as natural in a mining and ranching State. Only 24,604 were foreign born. The chief place was Boisé, with 5,957 inhabitants; next Pocatello, 4,046. The only others over 2,000 were Moscow, 2,484, and Lewiston, 2,425. There were 21 counties, as follows, with their capitals: Ada, Boisé; Bannock, Pocatello; Bear Lake, Paris; Bingham, Blackfoot; Blaine, Hailey; Boisé, Idaho City; Canyon, Caldwell; Cassia, Albion; Custer, Challis; Elmore, Mountainhome; Fremont, St. Anthony; Idaho, Mt. Idaho; Kootenai, Rathdrum; Latah, Moscow; Lemhi, Salmon; Lincoln, Shoshone; Nez Percé, Lewiston; Oneida, Malad City; Owyhee, Silver City; Shoshone, Wallace; Washington, Weiser.

History.— Idaho was first explored by Lewis and Clark in 1805 (See LEWIS AND CLARK'S EXPEDITION), and was part first of Oregon Territory, then of Utah, Washington, and Nebraska successively. The Jesuit, Father De Smet established a mission at Cœur d'Alêne in 1842, but till the discovery of gold in 1882 it was visited only by hunters and trappers. On 3 March 1883 it was organized as a Territory, but included the present Montana and most of Wyoming. In 1864 Montana was set off, and in 1868 Wyoming with other territory. When gold was discovered at Cœur d'Alêne, in 1882, a great migration set in, and in 1889 a convention framed a constitution and petitioned for admission to the Union. In 1883 all Mormons were disfranchised, a law held constitutional by the United States Supreme Court; but in 1893, on the Mormon Church disclaiming polygamy, the


IDAHO
SCALE OF MILES
10 5 0 10 20 30 40 50 60
Population of places is indicated by different lettering, thus:
5,000 and over BOISE
2,000 to 5,000 Wallace
1,000 to 2,000 Preston
500 to 1,000 Kendrick
Smaller Places Kingston
State Capitals shown thus
County Seats shown thus
Railroads
DOMINION OF CANADA
WASHINGTON
MONTANA
SHOSHONE
LATAH
NEZ PERCES
KOOTENAI
BITTER ROOT FOREST RESERVE
BITTER ROOT MTS.
Coeur d'Alene Mts.
Cabinet Mts.
LITTLE BELT MTS.
BIG BELT MOUNTAINS
GREAT FALLS
HELENA
BUTTE
ANACONDA
Missoula
Kalispell
Bozeman
Spokane
Lewiston
Moscow
Wardner
Wallace
Grangeville
Flathead Lake
Snake R.
Clark Fork
Missouri R.


IDAHO
OREGON
NEVADA
UTAH
WYOMING
MONTANA
YELLOWSTONE NATIONAL PARK
WASHINGTON
CANYON
BOISE
ADA
ELMORE
OWYHEE
CUSTER
LEMHI
BLAINE
LINCOLN
CASSIA
ONEIDA
BINGHAM
FREMONT
BANNOCK
BEAR LAKE
LEMHI INDIAN RES.
FORT HALL INDIAN RES.
DUCK VALLEY INDIAN RESERVATION
Boise
Pocatello
Blackfoot
Idaho Falls
Caldwell
Nampa
Weiser
Mountainhome
Shoshone
Sawtooth Range
Wood River Mts.
Lost River Mts.
Big Butte
Bear L.
Longitude West from Greenwich
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law was repealed. Miners' strikes in 1892 and 1899 caused great disturbances; in the latter year the United States soldiery were compelled to intervene and imprison a great body of miners.

While Idaho was a territory there were 13 governors, two of whom resigned without acting. Since it has been admitted as a State, five governors have been elected (1903). Equal suffrage has resulted in the passage of several laws intended to safeguard the morality of the people, also laws in favor of liberal education.

Consult: Bancroft, 'Washington, Idaho, and Montana'; Ouderdonk, 'Idaho, Facts and Statistics Concerning Its Mining, Farming, and Industries.'

LAWRENCE H. GIPSON,
University of Idaho.

Idaho Springs, Colo., town in Clear Creek County; on the Colorado & S. railroad; about 30 miles west of Denver. It is situated in the plateau region of the Rocky Mountains at an elevation of about 7,600 feet. Its cool temperature in summer, the magnificence of the scenery, and the hot and cold soda springs, all tend to make it a famous resort for health and pleasure seekers. In 1859 gold was discovered at Jackson's Bar, now a part of the town of Idaho Springs. This district has been most productive in its yield of gold. Some of the chief industrial establishments of the town are concentrating mills, lumber-yards, machine-shops, and wholesale stores in which are kept supplies for the miners. Pop. (1900) 2,502.

Idaho, University of, the State university situated at Moscow. Work was begun in 1892; it is open to both men and women, and there is no tuition for residents of the State; a small fee is charged to non-residents. The government is by a board of regents; the courses offered include the classical course, general science, civil and mining engineering, and agriculture. The university is also active in organizing farmers' institutes. The annual income, derived mostly from State appropriations is about $60,000; in 1902 the number of students was 347; the number of professors and instructors 30.

Iddesleigh, ĭdz'lĭ, EARL OF. See NORTHCOTE, STAFFORD HENRY.

Ide, Fannie Ogden, «RUTH OGDEN,» American author: b. Long Island 1853. She was married to C. W. Ide, and has written various juvenile stories, among them 'A Loyal Little Red-Coat' (1889); 'A Little Queen of Hearts' (1892); 'Little Homespun' (1896); 'His Little Royal Highness' (1897); 'Tattine' (1900); and 'Loyal Hearts and True' (1900).

Ide, Henry Clay, American jurist: b. Barnet, Vt., 18 Sept. 1844. He was graduated at Dartmouth in 1866. He was a member of the Vermont State Senate in 1882–5, a delegate to the National Republican Convention of 1888, and became a director of several manufacturing and banking establishments. In 1891 he was appointed United States commissioner in Samoa, and later (1893–7) was chief justice of Samoa under the joint appointment of the United States, Germany, and England. He became in 1900 a member of the Taft commission and in 1906 governor-general of the Philippine Islands.

Ide'alism, a metaphysical term, which has been used in various senses as expressing a theory of human perception and therefore of human knowledge. The idealism of Plato is associated with his theory of innate knowledge, supplemented as this is by reminiscence. He taught that there exist eternal forms or ideas in some supramundane sphere; that these forms are archetypes of all that the senses perceive on earth, as a cloud, a tree, a bird. These archetypes are perfect and eternal. Every human soul saw these archetypes in a prenatal state of existence, and recognizes the objects seen on earth by their likeness to the supramundane forms or ideas. Plato has allegorized this theory in his 'Shadows in the Cave.' Mankind are like people so confined in a cave that they can only see straight before them over a low wall which runs across the cave, and separates them from the fire that flings a glare upon the further wall. Between this lighted wall and the fire real things are passing, which the prisoners of the cave cannot see, though they perceive the shadows they cast moving across the lighted surface. Those shadows represent the objects of sense which are phenomena, appearances and not the things, the ideal and eternal things themselves. This was considered to be the theory of Idealism both to the Greeks, and after them, to the mediæval schoolmen. When philosophy became once more a living thing in the 17th century, Descartes arose as the founder of what has been called cosmothetic idealism. The things perceived by the senses, he taught, are not mere shadows, and subjective phenomena recognizable by reminiscence, they have a certain problematical existence, analogous to that which Plato attributes to his perfect and eternal ideas or forms. Kant was a cosmothetic idealist, and he was followed with some modifications by Malebranche. Berkeley came forward with a somewhat rough and ready correction of this hazy and indefinite theory. He cut the knot with the knife of theological dogma. All that we call material, he says, all that strikes our senses as objective, has no real existence whatever. The impressions and conceptions of the human mind are so many subjective creations called up by the direct interposition and an influence of the Supreme Being. Locke in his theory in which common sense and sensualism are combined has survived in modern intellectualism as the philosophic guide of scientific men. Without speculating on the truthfulness of sense, impressions, or the reality of the object, his idealism confines itself to what our senses and perceptions record as fact. An idea to him is nothing more than «whatever is the object of the understanding when a man thinks.» See LOCKE, JOHN; COMMON SENSE.

Ides, īdz, with the Romans, one of the threefold divisions of the month, the other two being the calends and the nones. The name ides, from a verb meaning «to divide,» was given to certain days (see CALENDAR) because they divided the month nearly in halves.

Idiocy, that state of permanent mental deficiency which arises from an affection of the brain either before or at birth or at an early period of life. In other words, it is a state of arrested development of the brain. It is thus distinguished from insanity, which is a condition of mental derangement occurring in the de-

veloped brain. Idiocy is a term of very wide applicability owing to the fact that very many grades of arrested development occur. In a general sense it is applied chiefly to the worst of these forms, while the term Imbecility is used to denote the milder forms. The distinction between idiocy and imbecility is thus a somewhat arbitrary one, for the two conditions shade into each other by almost imperceptible degrees.

Causes.— The causes of idiocy and imbecility are often very obscure. A large proportion of cases are congenital; that is, they arise from causes acting *in utero*. The child is born with a brain already hopelessly impaired. Heredity is thus a very evident cause; defects in the ancestral stock and vices in the parents and near progenitors are doubtless very active. Alcoholism, syphilis, and other toxæmias are certainly among these causes; as well as consanguinity and various diseases in the parents. Injuries to the mother while pregnant may be responsible. The subject of ante-natal disease is still a very obscure one, but evidence is not lacking to show that the fœtus may suffer from disease; and in the critical stage of development of the brain before birth this organ may suffer irreparable damage. The same may be said of the infant and very young child. Injury and disease may act most disastrously upon the undeveloped brain. Thus blows upon and injuries to the head may cause idiocy; also injuries at the time of birth, due to difficulties in the labor, may act. The various infectious diseases of childhood are responsible for some cases; thus scarlet fever, measles, whooping cough, and cerebro-spinal fever have been noted as causes of permanent arrest of development. No doubt in many cases it is difficult or even impossible to detect the active cause.

The following are the most universally recognized varieties of idiocy:

Microcephalus.— In this form the brain and its enveloping skull-case remain abnormally small. In extreme grades the deformity is very striking. These are among the lowest and worst forms of idiocy, and in some cases there is scarcely a spark of intelligence. The patient cannot be said to do more than vegetate. The original cause probably acts in these cases at a very early period in the ante-natal life, and determines an almost complete arrest of brain development.

Hydrocephalus.— In this form the natural cavities or ventricles of the brain become enormously distended and the skull is correspondingly enlarged. The mental impairment varies within wide limits. In some cases the idiocy is almost if not quite as great as in microcephalus, but in other cases a fair degree of intelligence is preserved. There may be also various forms of paralysis, speech defect, epileptoid seizures, and impairment of the special senses. Hydrocephalus probably depends upon closure of one or other of the outlets for the cerebro-spinal fluid between the ventricles of the brain.

Porencephalus.— Occlusion or stoppage of one of the main arteries of the brain at an early period of development, not necessarily ante-natal, may cause such an arrest of development of a portion of the brain-mass that a cavity results, and this is called porencephalus. Such a stoppage of an artery may be caused presumably by injury or by one of the infectious diseases. The symptoms are usually arrest of development of the mental faculties in various degrees, speech defects, paralysis, such as hemiplegia, athetoid movements, and epilepsy.

Mongolian Idiocy.— In some cases the patient bears a real or fancied resemblance to certain racial types, as the Negroid, Mongolian, etc. The latter of these is the best marked, and is now included (after Langdon Down) in most descriptions. The patient's head is deficient in the posterior region; he is of short stature, has oblique and widely separated eyes, and a flattened nose. The attempt is made by some writers to construct special mental features for the Mongolian idiot, but with not very great success. He is simply an idiot, with varying degrees of mental power, and his resemblance to a Calmuck is only accidental.

Paralytic Idiocy.— In the fœtus and in the infant and very young child certain accidents or diseases may cause cerebral hemorrhages, which, just as in the adult, cause in turn various kinds of paralysis. The most common are hemiplegia or paralysis of the arm and leg on one side; diplegia, or paralysis of both arms and legs; and monoplegia, or paralysis of one limb. Such an accident in early life is apt to cause more or less idiocy or imbecility in addition to the paralysis. Some of these patients are also epileptic.

Epileptic Idiocy.— A rather large proportion of feeble-minded children are epileptic. This symptom may be associated with paralysis of various kinds, as already said, or it may not be complicated in any way with marked physical defects. It is only too likely, however, to induce a progressive mental deterioration; or, to speak more accurately for some cases, to prevent a normal brain development. The epileptic child is usually feeble-minded — some more, some less.

Sensorial Idiocy.— In some cases the organs of sight or hearing, or both, may be defective, or undeveloped, and the child's brain does not develop normally merely because it is deprived of these important avenues of sensation. Such children may have more brain capacity than at first appears, and they can be educated. In some cases, however, as in some deaf-mutes, the mental faculties remain more or less undeveloped.

Genetous Idiocy.— Ireland, a well known authority, proposes this term for a certain class of congenital idiots, but it is not very distinctive. It includes feeble-minded children, usually of a rather low grade, who are born with undeveloping brains. The term really applies to many members of the other groups already referred to.

High and Low Grade Idiots. — These terms and intermediate ones are often applied merely to designate feeble-minded children according to the approximate degree of their lack of development. While lacking in scientific precision, such terms denote conveniently various grades of idiocy. There are many idiots who are not microcephalic, nor hydrocephalic, nor Mongolian, nor paralytic, nor epileptic, nor in fact to be included in any usually accepted class, and yet they are unmistakably idiots, and often of low grade. The truth is, that all classifications must remain unsatisfactory until we know more about the causation and pathology of the various forms.

Cretinism.— A highly specialized form of idiocy is cretinism. This is always associated with defect in the thyroid gland; sometimes this

gland is entirely absent, at others it is immensely hypertrophied, and thus practically destroyed. Cretinism is endemic in some countries, as in and about the Alps and Pyrenees. The cretin is both physically and mentally stunted. He is of low stature, of peculiar and characteristic physiognomy, of pale and unhealthy skin, usually beardless, sometimes sexually undeveloped, and with many defects in the skeleton and muscular system. Mentally he is usually an imbecile at least, and in some cases even quite idiotic. Cases vary widely, however, in the degree of feeble-mindedness. In the United States cretinism is only sporadic.

Pathology.— As already indicated, idiocy is due to a wide variety of causes, and therefore its pathology also varies extensively. Among the processes found in the brains of idiots are sclerosis, atrophy, porencephalic defects, old inflammations, occluded and destroyed blood vessels, distended ventricles, and thickened membranes.

Treatment.— In recent years the effort has been made to train and educate the feeble-minded child, and to develop in it as far as possible the defective mental faculties. Training schools for these patients now exist in this country and in Europe, and the most humane and enlightened efforts are being put forth to ameliorate the condititon of these unfortunates, and to render the more hopeful of them useful members of society. It is needless to say, however, that not much can be accomplished with feeble-minded children of low grade, and with the very lowest nothing whatever can be done. With the imbecile and demi-imbecile, however, the results obtained sometimes justify the pains and expense. For the vast majority of feeble-minded children asylum treatment is desirable, even indispensable. These unfortunate patients cannot associate with healthy children, and they require a special environment. The prospect for cure in most cases is quite hopeless. See also Insanity.

Bibliography.— Brush, 'Idiocy and Imbecility' in Keating's 'Cyclopedia of the Diseases of Children,' Vol. IV. (1890); Ireland, 'Idiocy and Imbecility' (1887); Seguin, 'Idiocy, and its Treatment by the Physiological Method' (1866); Tuke, 'A Dictionary of Psychological Medicine' (1892).

James Hendrie Lloyd,
Formerly Neurologist Philadelphia Hospital.

Idol, in a sense now obsolete, or nearly so, an image (Greek εἴδωλον) or likeness of anything; in later and chiefly present signification, any image or likeness of a deity used or designed as an object of worship. By extension the term has also come to be applied to anything which is an object of adoration or of supreme affection or regard. (See next article.)

Idol'atry, the worship of idols in any sense; in the restricted usage ordinarily observed, it is the worship of the Deity or of a deity under a visible form; and from the point of view of the Christian, or any other religion which rejects the worship of images, consists in worshipping as God what is not god. With regard to the origin and character of idolatry, there is a wide divergence of opinion. The Christian religion conceives idolatry as a declension from the one true God, sees in the various forms of heathen worship only more or less complete degradations of an original revelation, and ascribes to it the same origin as to sin. Some philosophical and historical writers, on the other hand, see in idolatry an innate searching after God, and accordingly the first stage of human development, the necessary beginning of a knowledge of God. Idolatry may assume various forms. One nation seeks its god in the powers of nature, worships the heavenly bodies and the elements, and creates for itself a nature-worship; another develops a hero-worship, and a third has merely an animal and image worship, the lowest form of which is fetishism (q.v.). To this last and rudest form of idolatry, that consisting in animal and image worship, the name of idolatry is sometimes confined. See Image Worship.

Idrisi, ĭd'rē-sē, or **Edrisi, Abu-Abdallah Mohammed,** Arabian geographer: b. about 1100; d. about 1180. He studied at the Moorish University of Cordova, traveled through various countries bordering on the Mediterranean, visited France and England, and was then invited to the court of Roger II. of Sicily, where he resided under the patronage of Roger and his successors till his death. He constructed at the request of Roger a terrestrial globe of silver, on which the figure of the earth was shown with as much accuracy as the state of geographical knowledge then permitted. He accompanied this with a descriptive treatise bearing the title 'Nuzhat Almushtâk,' completed about 1150. An old manuscript of this work was discovered at Paris in 1829, and published in a French translation by Jaubert.

I'dyl, or Idyll (from a Greek diminutive meaning a "little form or image"), the name originally and still most usually applied to a short and highly finished descriptive poem, especially if it treats of pastoral subjects. This last circumstance is not, however, an essential character of the idyl. All that is necessary to constitute a poem of this class is that it presents to view a complete picture in small compass, and accordingly the idyl may refer to a great variety of subjects, and the fact that the subjects of idyls are usually pastoral is due to this, that pastoral life, at once simple and picturesque, affords the best material for such short descriptive poems. The term idyl is sometimes used even more extensively but in a manner so capricious as to be incapable of definition.

Iglesias, José Maria, hō-sā' mä-rē'ä ē-glā'-sē-äs, Mexican historian and publicist: b. City of Mexico, 5 Jan. 1823. He studied law in the University of Mexico, was appointed professor of jurisprudence there, became secretary of justice in 1857, and, after service as head of the treasury department, again held the post in 1853–67. In 1868 he was elected to Congress, in the same year was appointed secretary of the interior, in 1873 chosen president of the supreme court. After the fall of Lerdo de Tejada, he established a government which soon yielded to the superior power of Diaz. His publications include: 'Apuntes para la Historia de la guerra entre Méjico y los Estados Unidos' (1852); and 'Revistas históricas sobre la Intervenciòn Francesca' (1870).

Igloo'lik, Canada, a small island in the Arctic Ocean, near the east end of Fury and

Hecla Strait in lat. 69° 21′ N. and lon. 81° 53′ W. It is noted as the place where Parry wintered in 1822–3.

Ignacio (ēg-nä′sē-oo) **Islands,** Mexico, a chain of islands in the Gulf of California, off the Bay of Topolobampo, in the State of Sinaloa. The chief are Macapule and Altamura.

Ignatius, ĭg-nā′shĭ-ŭs, **Father.** See LYNE, JOSEPH LEYCESTER.

Ignatius, Saint, bishop of Antioch, said to have been a disciple of the Apostle John, and on that account reckoned among the number of the apostolic fathers. According to the most trustworthy tradition he was appointed bishop of Antioch 69 A.D., and thrown to wild beasts in the circus of Antioch by the command of Trajan, about the time of that emperor's expedition against the Armenians and Parthians. Another account places his execution at Rome. The year of his death is variously stated; by some 107 A.D. is given as the date, by others placed so late as 116 A.D. By the Greek Church his festival is celebrated on 20 December, by the Latin on 1 February. In the literature of the early Christian church Ignatius holds an important place as the reputed author of a number of epistles. These have come down to us in three forms. In the longest text they are 13 in number, but since the discovery of a shorter text containing only seven (addressed respectively to the Ephesians, Magnesians, Philadelphians, Trallians, Smyrniots, Romans, and to Polycarp), the first has been universally recognized as in great part spurious, some of the letters entirely so, and others containing interpolations. But even in this shorter form the genuineness of the Ignatian epistles has been disputed by numerous scholars. Both of these texts are in Greek, but a still shorter text in the Syriac language, containing only three letters (to the Romans and the Ephesians, and to Polycarp), and even these in a shorter form, was published in 1845 by Cureton. There has been much discussion as to the genuineness of these shorter collections. At present the prevalent belief is that the seven are genuine, and the Syriac an abridgment of them. An edition of the Greek text of the seven epistles was published at Amsterdam by Voss in 1646. An English translation by Archbishop Wake was published in 1693. Lightfoot's edition of the Greek text in his 'Apostolic Fathers, Part II.' (St. Ignatius and St. Polycarp, 1889), supersedes all others, and presents a complete discussion of the subject.

Ignatius of Loyola. See LOYOLA, IGNATIUS OF.

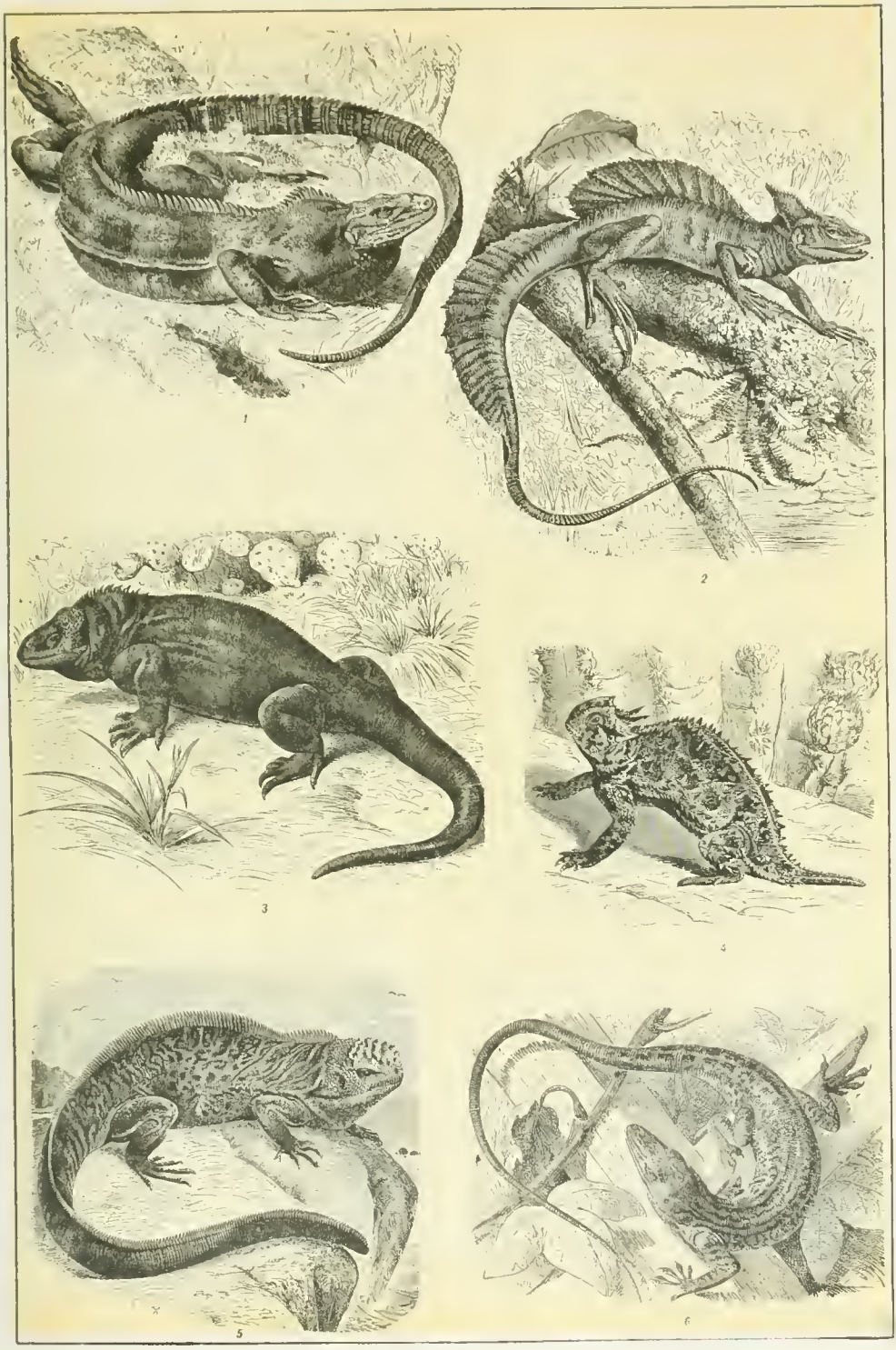
Igneous (ĭg′nē-ŭs) **Rocks,** the term applied in geology to those rocks the special structure of which is due to their having been once in a molten state, from which they were solidified into their present character. They include lava, basalt, granite (qq.v.), etc. Such rocks are not stratified, and may occur in connection with sedimentary rocks of any age, as the igneous rocks have usually been erupted from the heated interior of the earth and forced up toward, sometimes to, the surface. In petrological classification igneous rocks may be grouped under two heads — crystalline and fragmental — although petrography has not yet provided any method of classifying them which can be called complete or systematic. Many of the rocks considered as crystalline are rather to be classed as vitreous or glassy, while some others are partly of non-crystalline materials. Among the crystalline rocks, some of those called orthoclase contain much free silica (see QUARTZ). Most of the crystalline rocks called plagioclase contain less silica than the last-mentioned and a basalt to which close resemblance is found in nepheline and leucite rocks. Of the other crystalline rocks, the olivine and serpentine are generally rather basic, the former often showing much alteration into the latter. The fragmental igneous rocks consist of loose material which has been ejected from volcanic orifices. These rocks are frequently consolidated and, when fine-grained, it is sometimes difficult without the help of the microscope to distinguish them from compact crystalline igneous rocks.

Ignis Fatuus, ĭg′nĭs făt′ū-ŭs (Latin *ignis,* fire, *fatuus,* foolish), an atmospheric light or a luminous appearance sometimes seen in swamplands, in churchyards, and over stagnant waters. The light usually appears shortly after sunset; it is common in the north of Germany, in Italy, in the south and northwest of England, and the west of Scotland, and has been noticed in many other countries in undrained marshy districts.

The appearance generally resembles a flame; seen closely, the color appears as bluish, reddish, greenish, or yellowish, merging into purple, but never a clear white. Sometimes the flame seems fixed in position, shining steadily close to the ground or a few feet above it; again, it appears in rapid motion, sometimes rising high in the air, at others separating into smaller flames, which are seen advancing, retiring, recombining, etc.

Some supposed appearances of the ignis fatuus are probably due to luminous insects, or to the phosphorescence of decaying vegetable matter. By setting all such possible cases aside, both fixed and moving ignes fatui have been proved to exist, although the spectrum of the light seems not to have been fully observed. The common hypothesis that ignis fatuus is the flame of burning marsh-gas, CH_4, is untenable, for although this gas is produced abundantly in many marshy places, it cannot ignite spontaneously. The more plausible suggestion that phosphoretted hydrogen, PH_3, which is spontaneously inflammable, might be produced in churchyards or marshes where there is decaying animal matter does not account for some of the effects observed. The early supposition of a phosphorescent vapor is more reasonable, although excepting that of free phosphorus, which could not occur in nature, no such vapor is known to exist. The phenomenon was undoubtedly more common a century ago than it is now, and its disappearance in many localities may be directly traced to the draining of fens and marshes.

Popular names for the ignis fatuus — Will-o'-the-Wisp, Jack-a-Lantern, Spunkie, etc.— abound in folklore, and the superstitions regarding it are connected with many stories of travelers mistaking the marsh-lights for those of cottage windows, and with tales of evil spirits decoying men into dangerous places, often to their doom.



REPRESENTATIVE IGUANID LIZARDS.

1. Ring-tailed Iguana (Cyclura carinata)
2. Helmeted Basilisk (Basiliscus americanus).
3. Galapagos Land-lizard (Conolophus subcristatus).
4. Horned-toad Lizard (Phrynosoma cornutum)
5. Galapagos Sea-lizard (Amblyrhynchus cristatus)
6. Red-throated Anolis (Anolis carolinensis).

Ignorance of the Law. Every person is presumed to know the laws of his own country, and what is termed ignorance of the law is a lack of understanding of those laws. Such want of understanding furnishes no excuse for their violation, and cannot be pleaded even in extenuation of their infraction. But this presumption does not extend to the municipal laws of countries or States other than that in which a person resides. Such laws are regarded as foreign and a knowledge of them on the part of one who disregards them must be established by proof in the same manner as any other facts are proved. This applies only to a non-resident of such foreign state, and as soon as a person becomes even a temporary resident thereof he is presumed to know its laws and to yield obedience to them. He cannot plead his want of opportunity to become acquainted with them.

Igorrote, ē-gôr-rō'tā, a name given to various wild tribes of Luzon, especially to a people of mixed blood and language living mainly in Venguet province. The name is also more loosely applied to other wild Filipinos.

Igor's (ē'gŏrz) March, Song of, an antique battle song, associated with the name of Igor, Prince of Novgorod, son of Prince Swajatoslaw II. of Tchernigof. Igor, in his fifty-first year is recorded to have engaged in an unsuccessful war with his neighbors (1202), and from that time has been looked upon as the national poet of old Russia, on account of a lyrical epic poem, or ballad, called in Russian, 'Slavo o Polku Igoreve' ('The Song of Igor's March'). It has come down to modern times, somewhat like the songs of Ossian. The poem was probably produced by one of the followers of Igor, and in 1795 was found by Count Alexis Mussin-Putchkin in a cell of a monastery in Jaroslav. It was discovered among some 14th century MSS., and was first published by the Count at Moscow in 1800. The original was lost in the fire of the Napoleonic campaign (1812), which destroyed the Count's fine library. Another copy with many variants was found in 1864 among the papers of Katharine II. and published at St. Petersburg the same year. It has been translated into several European languages. Consult: Wolfsohn, 'Schönwissenschaftliche Litteratur der Russen' (1843); Wjasemski, 'Bemerkungen zum Igorlied' (1875).

Iguana, ĭ-gwä'nä, a large lizard of the typical genus of the family *Iguanidæ*. This family is distinguished by having pleurodont teeth, a thick, villous, nearly immobile tongue, a round pupil, and by various skeletal characters. The 350 species belong to about 50 genera and, with the exception of a few in the Fiji Islands and Madagascar, are confined to America, in the warm parts of which they fairly swarm. Only one species (*Sceloporus undulatus*) reaches as far north as the Middle States. They vary greatly in appearance and habits; most are arboreal, many terrestrial, and one, the Galapagos *Amblyrhynchus*, is even marine; the majority eat insects, but some are herbivorous. The true iguanas, of which *I. tuberculata* is the best known, are rather widely distributed through the West Indies, Central and South America. Owing to the high crest or fringe which extends along the back and tail, the deep, fringed, gular pouch, and the loose-fitting skin, these animals present a remarkable appearance. The trunk and tail are covered with small granule-like scales, and the head with larger plate-like ones; the feet are large and powerful; the tail very long, slender, and compressed; and the teeth high and finely serrated. A length of five feet or more and a weight of 25 pounds is commonly attained. The iguanas are arboreal, their mottled green color serving admirably to conceal them among the foliage; but when alarmed they have the habit, remarkable in a lizard, of retreating into the water of the streams along which they live. The 20 or 30 large eggs are deposited in a burrow usually dug in the bank of a stream or sometimes in a hollow tree. Notwithstanding its formidable size and aspect, the iguana is a timid, harmless creature, and the stories sometimes told of its ferocity are pure fabrications; moreover it is purely vegetarian in its diet. The flesh is a favorite article of food with the natives, and many travelers have pronounced it to be white, tender, and sweet, and is regularly brought to the markets. Consult Wallace, Müller, Bates, Belt, Gosse, and other authorities on South and Central America. See Lizard.

Iguan'odon, a dinosaur (q.v.).

Iguvium. See Eugubine Tables.

Ik Marvel. See Mitchell, D. G.

Ilagan, ē-lä'gän, Philippines, pueblo and capital of the province of Isabela, Luzon, situated on the Grande de Cagayuan River, 84 miles from its mouth at its junction with the Pinacanauan, 275 miles northeast of Manila. It has road and water connections with Bayombong and Manila; it is the trade centre for a large agricultural region, and also the industrial centre of the province. Pop. 13,800.

Iles, George, American author: b. Gibraltar 20 June 1852. He received a secondary education in Montreal, and from 1887 was employed in literary work in New York. His original works include: 'A Class in Geometry-Lessons in Observation and Experiment' (1894), and 'Flame, Electricity, and the Camera' (1900). He also edited: 'The Reader's Guide on Economic, Social and Political Science' (1891; with R. R. Bowker); 'A List of Books for Girls and Women and their Clubs' (1895; with A. H. Leypoldt); and 'A Bibliography of Fine Art' (1897), and gave $10,000 to the American Library Association to defray the cost of 'The Literature of American History' (1902), a bibliographical guide which appeared under the direction of the publishing board of the association.

I'lex, a tree often mentioned in the Latin classics, the evergreen oak or holm-oak (*Quercus ilex*). It is a native of the Mediterranean region, and often attains large dimensions. In general it grows singly or in small groups, and especially near the sea. Its leaves vary much in size, and from being very spiny at the edge to perfect evenness. Where it is indigenous, its astringent bark is used for tanning hides. Its wood is hard, heavy, and durable, and is useful for axles, pulleys, screws, etc. In modern botany Ilex is the generic name of the holly. See Aquifoliaceæ.

Ilfracombe, ĭl'fra-kōm, England, a seaport and fashionable health-resort in North Devon,

on the Bristol Channel, 41 miles by rail northwest of Exeter. It has a fine harbor and promenade, and the town built in terraces on a hill, is noted for its picturesque situation and the beauty of the surrounding scenery. Pop. (1901) 8,557.

Ili, il'ē, a river of Central Asia, flowing partly in China and partly in Russia. It is formed in Chinese Kuldja by two streams, the Tekes and Kunges, rising in the Thian-shan Mountains, and flows west, falling into Lake Balkash by several mouths after a course of 800 or 900 miles, half of which is navigable.

Iliad, in Greek literature, a celebrated epic poem, consisting of 24 books. Its composition is generally ascribed to Homer, of whose parentage, birth, and life nothing is known for certain. It is, however, a matter of dispute as to whether the poem is a homogeneous whole, or a series of ballads or rhapsodies on different episodes in the Trojan war, united into a continuous poem. It is further doubtful whether, in the latter case, the union was made by Homer himself, or by some person after his time. It is said that Pisistratus, tyrant of Athens, first collected and arranged the 'Iliad' and 'Odyssey' in the form in which we now have them. The chief subject of the poem is the wrath of Achilles, and the consequent troubles thence arising, whence we have the phrase *Ilias malorum* = an Iliad of woes or troubles, a world of disasters. The reader of the poem is assumed to know that the beautiful Helen has been carried off by Paris from her husband Menelaus. The action of the poem is confined to the 10th and last year of the siege of Troy. See HOMER.

Il'ion, N. Y., village, Herkimer County; on the Mohawk River, the Erie Canal, and on the West Shore and the New York C. & H. R. R.R.'s; about three miles west of Herkimer and 12 miles southeast of Utica. Ilion is in the vicinity of the locations of some of the old "castles" of the Indian tribes who inhabited the Mohawk valley. White people lived here in the early part of the 19th century, but no permanent settlement was made until 1828. It is situated in an agricultural county, but the village is noted for its manufacturing industries. The chief manufactures are typewriters, firearms, sewing-machines, filing-cases, bicycles, knit goods, flour, and some dairy products. Its export trade consists chiefly of the manufactured articles and farm products. It has a public library containing about 11,500 volumes, and a number of fine public buildings. Pop. (1890) 4,057; (1900) 5,138.

Ilini'za, or **Ilinisa**, a mountain of Ecuador, 20 miles south-southwest of Quito. It is capped by two peaks, the southernmost, as determined trigonometrically by Reiss and Stübel, being 17,406 feet high. Iliniza is presumably an extinct volcano, but there is no record of an eruption. The upper portion is covered with perpetual snow, and usually cloud-capped.

Ilissus, il-is'us, a small river in Greece, flowing through Athens, famous in the classical age, but now unimportant and often wholly dry.

Ilithyia, il-ith-ī'ya, in Greek mythology, the goddess who assisted women in childbirth. In after times she was almost identified with Artemis.

Ilium, or **Ilion**, a name of Troy, in Greece, which was founded by Ilus.

Iliyats, il'ē-yats, a nomadic Mohammedan race of Persia, Khiva, and Turkestan. The name Iliyat is the plural of *iel* (eel), a tribe equivalent to the Arabic *kabilah*. The Iliyats are mostly of Turkish, Arabic, and Kurdish descent, and form an important portion of the population of Persia and adjacent countries; their actual numbers are not known, but it is said that the Iliyat tribes tributary to Khiva number 195,000. They live in tents and have no settled habitations. They are of the Sunni sect, but are not very strict. The women are said to be chaste, and many of the best families in Persia are of Iliyat origin.

Illampu, or **Sorata**, a mountain of Bolivia, in the eastern Cordillera, overlooking Lake Titicaca; 50 miles north-northwest of La Paz. It is 21,484 feet in height, and is believed to be the highest mountain of the Bolivian Andes, though this distinction is also claimed for Illimani (q.v.); it is probably exceeded by the Cerro de Huascan in Peru and by Aconcagua in Chili. Illampu is a magnificent mass, with three principal peaks. Seen from Titicaca it is the grandest mountain in America. It has never been scaled.

Ille-et-Vilaine, ē-lā-vē-lān', France, a maritime department, formed out of the northeast portion of the old province of Brittany; area, 2,596 square miles; pop. 622,039, mostly of Celtic race. It is watered chiefly by the Vilaine and its tributary, the Ille, which unite near Rennes, the capital of the department. Ille-et-Vilaine consists of a granite plateau traversed by ranges of low hills. It is agricultural, cultivation having been greatly improved during recent years. The cider of this district is the best in France; the butter of Rennes is celebrated; the horses of the department are noted for their endurance, and are in great request for the army; and bee keeping is prosecuted. Iron is mined; slates are quarried; and salt is extracted. Saint Malo is the principal seaport.

Illegit'imacy, the legal status of children born out of wedlock, is a subject discussed under three points of view, moral, legal, and economic. As to what constitutes illegitimacy, is variously defined in different countries where great variety exists both in theory and practice. As to the legal status of illegitimate children from the moral point of view, see BASTARD.

Only in a few European countries are statistics available to show the extent of illegitimacy, and there are no statistics in Canada. In the United States there seems no efficient national system of registration of marriages and births. Some of the individual States record the illegitimate births, but the figures are misleading, because incomplete. Thus, the State of Indiana a few years ago, returned 38,370 legiti-

mate and 560 illegitimate births — the illegitimate being only about 1.40 of the whole.

In the following table is shown the comparative prevalence of illegitimacy in the principal European cities:

ILLEGITIMATE BIRTHS TO EVERY 1,000 BORN.

Vienna 449	Leipzic 211	Ghent 144
Prague 439	Dresden 208	Hamburg ..138
Munich 439	Milan 204	Frankfort ..132
Stockholm ..396	Rome 194	Turin 132
Moscow 300	Venice 189	Antwerp ...129
Budapest ...299	Breslau 186	Cologne ...124
Copenhagen 279	Bucharest ..175	Palermo ...101
Paris 268	Liége 174	The Hague. 99
St. Petersh'g 236	Christiania ..162	Naples 86
Trieste 211	Berlin 154	Rotterdam . 70

None of the above figures are presented as absolutely accurate. They can only be approximate in the best case, for in every country there must always be a large number of bastards who either are not registered at all, or who are registered as legitimate. But as far as they go the figures are instructive. They do not, however, enable one to form any conclusion as to the causes of illegitimacy in respect either of religion, of education, of industrial occupation, or of distribution of population. Neither can any theory be well evolved from a racial basis.

From the only available statistics the following table has been prepared showing illegitimacy in various countries, from 1881 to 1900:

	Per cent of illegitimates to total births.		Per cent of illegitimates to total births.
England and Wales.	4.6	Portugal	14.00
Scotland	8.34	Roumania	5.00
Ireland	2.9	Russia	3.00
Austria (average)...	14.89	Spain	5.40
Lower Austria	26.00	Sweden	14.88
Upper Austria	20.00	Norway	7.90
Dalmatia	3.50	Switzerland	4.80
Hungary	8.00	Brazil	25.00
Belgium	9.30	Canada	....
Denmark	10.00	Costa Rica	24.00
France	8.20	Guatemala—Whites..	50.00
Germany (average)..	9.47	Indians..	25.00
Upper Bavaria....	15.67	New South Wales...	4.65
Prussia	8.24	Victoria	4.78
Alsace-Lorraine ..	8.10	Queensland	3.97
Greece	1.60	West Australia	3.95
Holland	3.22	Tasmania	3.40
Italy	7.45	New Zealand	3.12

In Scotland, where education is general, and thrift national, the rate of illegitimacy is notoriously high. And, as regards morals, it should be remembered that a high percentage of illegitimacy may mean that there is little or no prostitution. In Europe, generally, although not universally, there seems a tendency to decrease in the rate of illegitimacy; but how far that appearance may be due to moral causes it is impossible to say.

Illimani, ēl-yē-mä'nē, Bolivia, a volcanic mountain mass of the East Andean Cordillera, about 20 miles south of La Paz. It is a serrated ridge with four principal peaks, the loftiest of which, Condor Blanco, is 21,149 feet above sea-level. Illimani signifies "snow-mountain"; the line of perpetual snow commences at 15,000 feet, and there are glaciers on the north side at an elevation of 16,350 feet. At an altitude of 15,950 feet there is a considerable lake also bearing the name of Illimani. Among the first Europeans to make the ascent of the highest peaks are Wiener, Grumbhow, and Ocampo in 1877 and Sir Martin Conway in 1898.

Illinois, ĭl-lĭ-noi' or -noiz', the name given to a confederacy composed of five distinct Indian tribes, who at one time occupied what is now the State of Illinois and parts of Wisconsin, Missouri, and Iowa. The tribes were the Michegamia, Peoria, Cahokia, Kaskaskia, and Tamaroa. The confederacy was most powerful and many attempts were made to secure by war the lands of the Iroquois. In 1675 Marquette visited the Illinois tribes and established missions among them. In 1769 a member of the Kaskaskia tribe murdered Pontiac, the Indian chief, for which offense the Lake tribes destroyed the Kaskaskia and killed many of the members of the other tribes of the confederacy. In 1840 the remnant of the Illinois tribes was removed, by the government, west of the Mississippi. The few now in existence are in the Indian Territory.

Illinois, the eighth State admitted into the Federal union, and since 1890, the third in population. It is bounded upon the north by Wisconsin, upon the east by Indiana, upon the south by Kentucky, and upon the west by Iowa and Missouri. It is separated from the two last named States by the Mississippi River; by the Wabash and the Ohio from Indiana; and by the Ohio from Kentucky. Its water courses flow generally from the north and northeast, to the southwest and south. Its soil consists of a rich black loam, or mold, underlaid by drift deposits in many places of great depth.

Topography.— By the enabling Act of Congress by virtue of which the State was organized, its boundaries were fixed as follows: "Beginning at the mouth of the Wabash River, thence up the same, and with the line of Indiana, to the northwestern corner of said State; thence east with the line of the same State to the middle of Lake Michigan; thence north along the middle of the lake to north latitude 42° and 30'; thence west to the middle of the Mississippi River, and thence down along the middle of that river to its confluence with the Ohio River, and thence up this latter river along its northwestern shore to the beginning." The total land area of the State is 56,000 square miles — 35,840,000 acres; its extreme length 385 miles, and extreme breadth 218 miles. With the exception of Georgia its area is greater than that of any one of the original States of the Union. It comprises a territory larger than England; larger than Belgium, Switzerland and Holland united. Illinois is no longer in the class of States denoted "western" upon the old maps, but is now chief of the great interior States of the Union. With two exceptions — Louisiana and Delaware — it is the most level of the States. Its greatest elevation is 1,150 feet above the sea, and its mean elevation 550 feet. The greater part of Illinois consists of level or slightly undulating prairies; a portion of the extreme northwestern part of the State is hilly, and there are occasional bluffs upon the Illinois and Mississippi rivers. The counties lying between East St. Louis and the Wabash River are the great apple growing region, and thence southward to its border other fruits are grown in large quantities. Of its total population in the year 1900, 2,459,638,

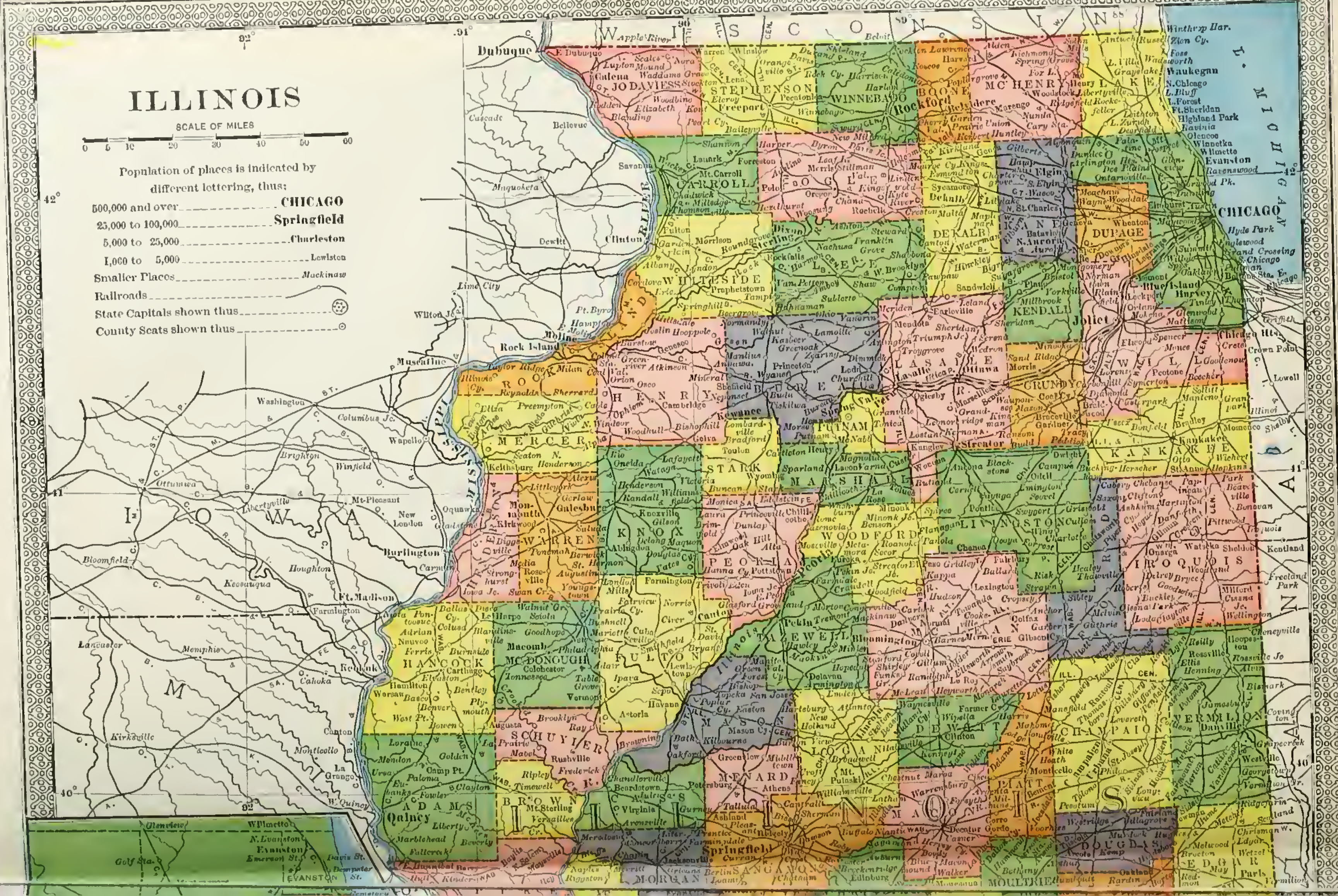
or 51 per cent reside in its seventy principal cities and towns.

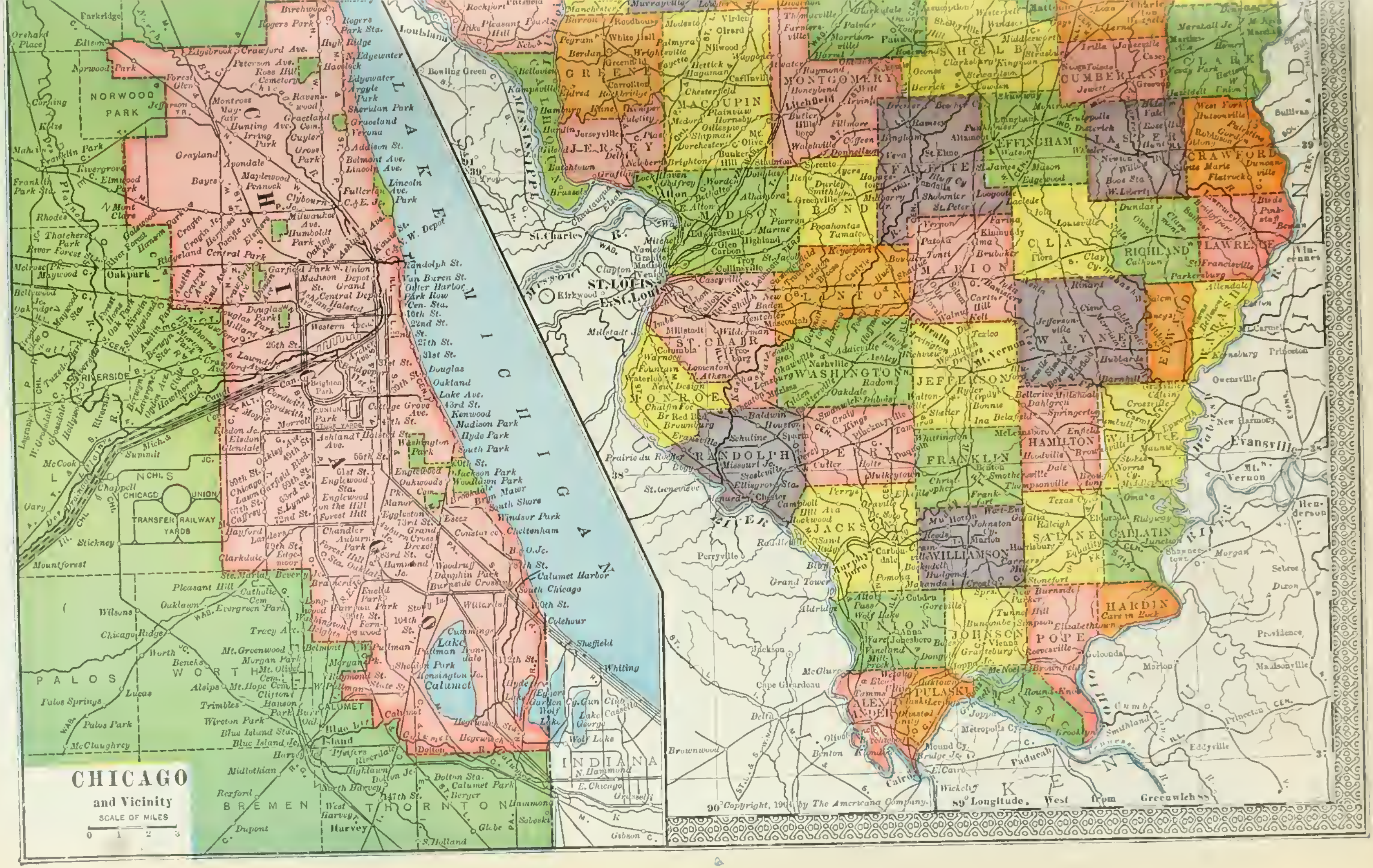
Population.— In 1810, one year after its organization as a territory, the population of Illinois was 12,282; in 1820, two years after its admission its population was 55,211, and in rank it was the 24th State in the Union; in 1830, population 157,445 and its rank the 20th; in 1840 population 476,183, and rank the 14th; in 1850 population 851,470, and rank the 11th; in 1860, population 1,711,951, and rank the fourth; in 1870 population 2,539,891, and rank the fourth; in 1880 population 3,077,871, and rank the fourth; in 1890 population 3,826,351, and rank the third; in 1900 population 4,821,550, and its rank still remains the third. Of the aggregate population given for the year 1900, 85,078 are negroes, 1,538 Mongolian, and 16 Indian; 3,854,803 of the population of the State are natives, and 966,747, foreign born. The excess of the male over the female population of the State as shown by the last census is 124,014. The population above the age of 10 years is, 3,727,745; of this number 1,804,040 are engaged in gainful occupations; 462,781 in agricultural pursuits; 96,321 in rendering professional service; 366,342 in domestic or personal service; 397,046 in trade or transportation; and 481,550 in manufacturing or mechanical pursuits. The total number of dwellings in the State is 845,836, and of families 1,036,158.

Cities.— The following cities of the State have each a population exceeding 10,000, viz.: Chicago, 1,698,575 (as shown by census of 1900, now exceeding 2,000,000 as appearing by local census reports of later date); East St. Louis, 29,655; Joliet, 29,353; Peoria, 56,100; Quincy, 36,252; Rockford, 31,051; Springfield, 34,159; Alton, 14,210; Aurora, 24,147; Belleville, 17,489; Bloomington, 23,286; Cairo, 12,566; Danville, 16,354; Decatur, 20,754; Elgin, 22,433; Evanston, 19,259; Freeport, 13,258; Galesburg, 18,607; Jacksonville, 15,078; Kankakee, 13,595; La Salle, 10,446; Moline, 17,248; Ottawa, 10,588; Rock Island, 19,493; Streator, 14,079. Fifty-seven other cities in the State have a population each, exceeding 3,000. The land surface in square miles of the largest county in the State, McLean, is 1,166; while that of the smallest, Putnam, is 176.

Manufactures.— The development of manufacturing in the State is unprecedented. This is due in large measure to its transportation facilities. There were 10,997 miles of railroad in the State in the year 1900, a mileage greater than that of any other State. Illinois now ranks third in the value of its manufactured products —the gross value thereof for the last mentioned year being $1,259,730,168. The greatest number of wage earners employed in manufacturing establishments at any one time in the year 1900, was 528,099, or 11 per cent of the total population of the State. As tersely stated in the last census report: "The communication with the East afforded by Lake Michigan and its connecting waters early made Chicago the great distributing centre for eastern products to all points in the West and Southwest, while the Mississippi River bordering the western portion of the State afforded communication with the entire Mississippi Valley. Superior railroad facilities were a direct result of the trade routes established by these operations for water transportation; for when railroad building began Chicago was the natural focusing point, and to reach that city all sections of the State were traversed and opened up to settlement." It holds the first place in the States of the Union in the manufacture of agricultural implements; its proportion of the entire capital invested in this industry in the United States being 39 per cent. It leads in the production of alcoholic liquors; the output in 1900 was 32,508,435 gallons. This industry is concentrated in a few large establishments located principally in the city of Peoria. An important factor to be considered in this connection, is the abundant supply of bituminous coal in many parts of the State. In 1900, the 24 leading industries of the State embraced 8,209 establishments; capital used $477,485,672; wage earners employed, 219,415; value of their products for the year mentioned was $810,636,482.

Agriculture.— Illinois takes high rank as an agricultural State; 32,794,728 acres — or something over 91 per cent of its total land area — are included in farms. The total number of farms in the State as shown by the last official report is, 264,151; the estimated value being $1,765,581,550; of this amount 14 per cent represents the value of buildings, and 8.6 per cent the value of the land, and other improvements; the value of farm implements and machinery in June 1900 was $44,977,310, and of live stock $193,758,037. The total value of farm products for 1899 exceeds that of the year '89 by $160,890,598. The average size of farms for the State is 124 acres. The larger farms are generally in the north and the smaller in the extreme southern portion of the State. The value of all live stock on farms in June 1900 was $193,758,037; of this amount 36 per cent represents the value of horses; 24 per cent that of neat cattle other than dairy cows; 17 per cent that of dairy cows, and 12 per cent that of swine. Twenty-eight counties each reported more than $1,000,000 received from the sale of live animals for the year last named. Of the total area of cereals in the year 1899, 61 per cent was devoted to corn, 27 to oats, 10 to wheat, and the residue principally to rye, barley and buckwheat. Some idea of the enormous yield of what is known as "the corn belt" can be gleaned from the following: for the year 1899 the corn product of the county of Iroquois exceeded 12,000,000 bushels; that of the counties of La Salle and Livingston, each exceeded 13,000,000, while the counties of Champaign and McLean each produced over 15,000,000 bushels. Twenty-seven other counties produced from 5,000,000 to 10,000,000 bushels of corn each. In the decade 1890 to 1900 the apple trees in the State increased 100 per cent in number, and of some other varieties of fruit the increase was even greater. Of the total number of fruit bearing trees in the State in 1900, 74 per cent were apple, 13 per cent peach, and 5 per cent pear trees. Apples were grown generally throughout the State, but the four counties of Clay, Jefferson, Marion, and Wayne produced one fifth of the entire amount. The entire vegetable product for the year 1899 exceeded $10,000,000 in value; of this amount 45 per cent represents the value of potatoes. The small


ILLINOIS
SCALE OF MILES
0 5 10 20 30 40 50 60
Population of places is indicated by
different lettering, thus:
500,000 and over CHICAGO
25,000 to 100,000 Springfield
5,000 to 25,000 Charleston
1,000 to 5,000 Lewiston
Smaller Places Mackinaw
Railroads
State Capitals shown thus
County Seats shown thus
WISCONSIN
IOWA
MISSISSIPPI RIVER
L. MICHIGAN
INDIANA
ILLINOIS
JO DAVIESS
STEPHENSON
WINNEBAGO
BOONE
MC HENRY
LAKE
CARROLL
OGLE
DE KALB
KANE
DUPAGE
WHITESIDE
LEE
KENDALL
ROCK ISLAND
HENRY
BUREAU
LA SALLE
GRUNDY
WILL
KANKAKEE
MERCER
STARK
PUTNAM
MARSHALL
LIVINGSTON
IROQUOIS
WARREN
KNOX
PEORIA
WOODFORD
HENDERSON
HANCOCK
MC DONOUGH
FULTON
TAZEWELL
MC LEAN
FORD
SCHUYLER
MASON
LOGAN
DE WITT
CHAMPAIGN
VERMILION
ADAMS
BROWN
CASS
MENARD
MACON
PIATT
DOUGLAS
EDGAR
MORGAN
SANGAMON
MOULTRIE
CHICAGO
Springfield
Rockford
Joliet
Quincy
Dubuque
Burlington
Keokuk
Ft. Madison
Muscatine
Rock Island
Moline
Peoria
Bloomington
Decatur
Danville
Elgin
Aurora
Evanston
Waukegan
Kankakee
Streator
Galesburg
Freeport


CHICAGO
and Vicinity
SCALE OF MILES
0 1 2 3
LAKE MICHIGAN
CHICAGO
NORWOOD PARK
PALOS
WORTH
BREMEN
THORNTON
CALUMET
INDIANA
Oakpark
Riverside
Lake Calumet
South Chicago
Calumet Harbor
Hammond
Whiting
TRANSFER RAILWAY YARDS
CHICAGO UNION
MISSISSIPPI
St. Louis
E. St. Louis
St. Charles
JERSEY
GREENE
MACOUPIN
MONTGOMERY
SHELBY
CUMBERLAND
CLARK
EFFINGHAM
JASPER
CRAWFORD
LAWRENCE
RICHLAND
CLAY
FAYETTE
BOND
MADISON
ST. CLAIR
CLINTON
MARION
WAYNE
EDWARDS
WABASH
WASHINGTON
JEFFERSON
MONROE
RANDOLPH
PERRY
FRANKLIN
HAMILTON
WHITE
JACKSON
WILLIAMSON
SALINE
GALLATIN
UNION
JOHNSON
POPE
HARDIN
ALEXANDER
PULASKI
MASSAC
OHIO
Evansville
Cairo
Paducah
Cape Girardeau
KENTUCKY
38°
39°
90° Copyright, 1904, by The Americana Company.
89° Longitude, West from Greenwich

fruits were grown upon 56,763 farms. Of late years there has been a steady decrease in tobacco production; in the year 1899 the total in tobacco being 2,242 acres; the total value of the production being $85,411; Saline County in the extreme southern part of the State taking the lead and producing near one third of the entire amount. During the last decade the broom corn product of the State has increased almost four fold; the total value of this product for the year 1899 was $2,357,066; five sixths of the amount produced was in the east central part of the State in the five counties of Coles, Douglas, Moultrie, Edgar, and Cumberland. Sugar beets were grown in 15 counties in the year 1899, 1,370 acres being devoted to this production, and the value of the total product being $36,223. The value of nursery stock sold in the last named year was $578,306; area in cultivation 7,760 acres, its valuation $1,442,220. The area devoted to the cultivation of ornamental plants and flowers for the year 1899 was 679 acres; the value of the product $1,894,960. The total expenditure for labor on farms in Illinois for the year 1899 was $22,182,550; this included the value of board furnished and averaged $84 per farm. The gross value of the agricultural products of the State for 1900 was $345,649,611 — placing it second in rank.

Rivers.— The Illinois, the principal river of the State is formed by the junction in Grundy County, 40 miles southwest of Chicago, of the Kankakee and Des Plaines. The last named river takes its rise in Wisconsin and flows in a southerly direction, while the head waters of the Kankakee are in northern Indiana. The Illinois empties into the Mississippi after a somewhat tortuous flow of near 500 miles, at a point 40 miles above the city of St. Louis. The Illinois is navigable for 245 miles, and is connected by the Illinois and Michigan canal with Lake Michigan. Other rivers in the State are the Kaskaskia, which flowing in a southwesterly direction empties into the Mississippi near the ancient village of Kaskaskia, the first capital of the State; Rock River, which flowing in a southwesterly direction from Wisconsin empties into the Mississippi not far from the city of Rock Island; of other smaller streams, are the Little Wabash and the Embarras, which flow into the Wabash in the southeastern part of the State, and the Vermilion and the Fox, tributaries of the Illinois.

Education.— Illinois has an excellent public school system. The number of persons in the State between the ages of 6 and 21 years 30 June 1902, was 1,601,175; of these, 811,724 were males, and 789,451 females. The number of persons enrolled in the schools during the year ending as above was 971,841; of these, 489,109 were males, and 482,732 females. The average daily attendance was 765,057. The number of school houses 12,865. The estimated value of the school properties is $52,764,922; this includes buildings, grounds, libraries and apparatus. The number of male teachers employed in the common schools in 1902 was 6,800; of female teachers 20,386; total 27,186. The amount expended for the years 1901–2 for the salaries of teachers and superintendents was $12,132,075. The Normal Universities of the State, five in number, are located as follows: the State Normal University at Normal; the Southern Illinois State University at Carbondale; the Northern Illinois Normal School at De Kalb; the Eastern Illinois Normal School at Charleston, and the Western Illinois Normal School at Macomb. These universities are appropriately located for the convenience of their patrons, and the attendance is large. The first to be organized was the State University at Normal, and the total number of students in attendance there for the years 1901–2 was 1,529. In addition to the above is the Chicago Normal School, which has since 1896 been maintained by appropriations made by the Chicago Board of Education. In large measure the teachers in the public schools of the State have received their training in some one of these Normal Schools. The purpose of the Normal Schools of the State will appear from the following clause in the organic act of one of the last to be organized: "The object of the said Northern Illinois State Normal School shall be to qualify teachers for the common schools of this State by imparting instruction in the art of teaching in all branches of study which pertain to a common school education, in the elements of the natural and of the physical sciences, in the fundamental laws of the United States and of the State of Illinois, in regard to the rights and duties of citizens." The University of Illinois (q.v.) is located at Urbana, and has in its various departments a total of near 3,000 students.

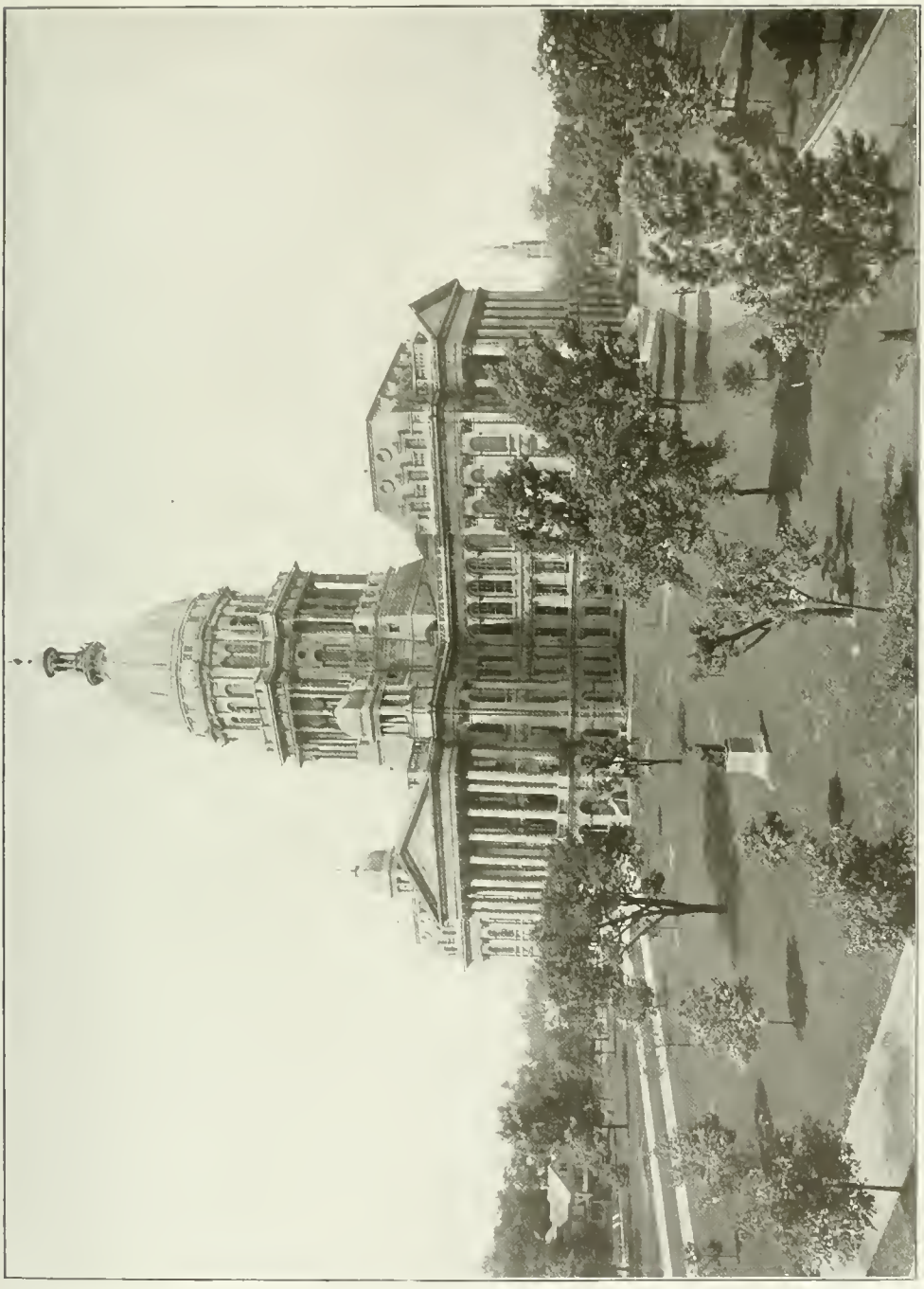
Charities.— The State charitable institutions, 16 in number, are as follows: Northern Hospital for the Insane at Elgin; Eastern Insane at Kankakee; Central Insane at Jacksonville; Southern Insane at Anna; Western Insane at Watertown; Incurable Insane at Bartonville; Criminal Insane at Chester; Deaf and Dumb at Jacksonville; Blind at Jacksonville; Feeble Minded at Lincoln; Soldiers and Sailors at Quincy; Soldiers Orphans' Home at Normal; Soldiers Widows at Wilmington; Eye and Ear at Chicago; Girls Training School at Geneva; Boys Home at St. Charles. The sums appropriated by the General Assembly for the two years ending 30 June 1903 for these institutions aggregated $4,438,024.92.

Penal Institutions.— The Illinois State Reformatory is located at Pontiac, has excellent buildings and appointments for the care of its inmates. The total number of inmates confined in this institution during the 21 months ending 30 June 1902 was 2,352, of whom one fifth had reached the age of 19 years. Under the law no one could be admitted who had reached the age of 21 at the time of the commission of the offense for which he was sentenced. Trade schools, and a farm are provided for in the act creating this institution, and every effort practicable made to reform its inmates. The total amount appropriated by the General Assembly for the support of this institution for the two years beginning 1 July 1901 was $400,000. The State penitentiaries, two in number, are located as follows: The Illinois State penitentiary at Joliet and the Southern Illinois penitentiary at Chester. The number of inmates in the former is about 1,300; and in the latter about 900.

History.— The name of the State is derived from "Illini," an Indian word signifying "men." The euphonic termination added by the early French explorers gives the name "Illinois." The veritable history of Illinois begins with the coming of the French explorers Marquette and Joliet.

Their names are inseparably interwoven with the early history of the great Mississippi Valley. In June 1673 they landed upon the east bank of the Mississippi upon the soil of what is now Illinois. Their first visit was to one of the villages of the "Illini," the ancient and once powerful tribe from which the State takes its name. It is said that upon the first appearance of Marquette and Joliet at the door of the principal wigwam of the village they were greeted by an aged chieftain with the words: "The sun is beautiful Frenchmen when thou cometh to visit us; thou shall enter in peace into all our cabins."

Upon this historic expedition Marquette and Joliet bore the commission of the French Commandant at Quebec — the seat of authority of France in the New World. The narrative of the adventures and discoveries of Marquette and Joliet savors rather of the romantic than of the real. But it was theirs to add the vast domain under the name "New France" to the empire of the Grand Monarch. After descending the Mississippi to a point possibly within 400 miles of the Gulf, these bold voyagers reluctantly turned their faces to the northward. After his separation from Joliet, Marquette visited the Indian villages near the Mississippi and established a mission of his church at the ancient village of the Kaskaskias. He died upon the banks of a small stream within the present limits of the State of Michigan and was buried at Saint Ignace in that State. The city of Joliet in northern Illinois, was named in honor of his daring fellow-voyager, while his own statue has been given place in the great historic hall in the Capitol at Washington. The names of Hennepin and La Salle likewise are associated with these events and times. The first was the scholarly historian and priest, the latter the knightly adventurer. Much, indeed, that is romantic surrounds the entire career of La Salle (q.v). Severing his connection with a theological school in France, his fortunes were early cast in the New World. From Quebec, the ancient French capital of this continent, he projected an expedition which was to add empire to his own country and to cast a glamor about his own name. It has been said, that his dream was of a western waterway to the Pacific Ocean. In 1669 with an outfit that had cost him his entire fortune, with a small party, he ascended in canoes, the Saint Lawrence, and a few weeks later was upon the broad Ontario. Out of the mists that envelop much of his subsequent career, it is impossible, at all times, to gather that which is authentic. It is enough, that with Hennepin as one of his fellow-voyagers, he reached the Ohio and in due time navigated the Illinois, meantime visiting many of the ancient villages. But his great achievement — and that with which abides his imperishable fame — was his perilous descent of the Mississippi from the falls of St. Anthony to the Gulf of Mexico. On 9 April 1682 upon the east bank of the lower Mississippi, with due form and ceremony, and amid the solemn chanting of the Te deum and the plaudits of his comrades, La Salle took formal possession of "the Louisiana country," in the name of his royal master, Louis XIV. of France. For the period of 92 years, beginning with the coming of Marquette and Joliet, Illinois was a part of the French possessions. Sovereignty over the vast domain of which it was a part, was exercised by the French king, by his commandant and his subordinate officers. First, the dependency of Canada, "the Illinois country," by decree of the Royal Council in 1717 passed under the government established for Louisiana. Subsequently in 1721 it became, by virtue of the same authority, one of the separate provinces into which the Louisiana country was then partitioned. A commandant and judge were duly appointed, and the seat of authority transferred to Fort Chartres. Population meanwhile gradually increased in the great American bottom, then embracing the French settlements in Illinois. Cahokia and the other villages were, in a measure, prosperous. In the words of one of our own historians: "The early history of the French settlements reads in these days of a higher civilization and broader culture, like a romance of Arcadia. The wants of the people were few and simple. In each hamlet was a rude chapel, with its attendant priest, who was not only in matters of religion, but in all the affairs of everyday life, 'the guide, philosopher, and friend, of his rude parishioners.'" The same writer referring to this period of foreign domination, truly said: "The French sought and claimed more than they had the ability to hold or possess. Their line of domain extended from the Saint Lawrence around the Great Lakes and through the valley of the Mississippi to the Gulf of Mexico, a distance of over 3,000 miles." Truly a magnificent domain, but one destined soon to pass forever from the possession of the French monarch and his line. Upon the North American continent, the ancient struggle for supremacy between France and her traditional enemy was to find bloody arbitrament. Great Britain claimed as a part of her colonial possessions in the New World, the territory bordering upon the Great Lakes and the rich lands of the Ohio and the Mississippi Valley. As to the merits of the French and English contention as to superior right by discovery, or conquest, it were idle now to argue. Our concern is with the marvelous results of the long continued struggle which for all time determined the question of race supremacy upon this continent. Passing rapidly the minor incidents of the varying fortunes of the stupendous struggle which had been transferred for the time from the Old World to the New, we reach the hour which was to mark an epoch in history. The time, 13 Sept. 1759 — the place, the Heights of Abraham at Quebec. Here and then, was fought out one of the pivotal battles of the ages. It was the closing act in a great drama. The question to be determined: whether the English speaking race, or their hereditary foe, was to be master of the continent. It was literally a struggle for empire — the magnificent domain stretching from the Saint Lawrence to the Gulf of Mexico. The incidents of the battle need not be told. Never were English or French soldiery led by more knightly captains. The passing years have not dispelled the romance or dimmed the glory that gathered about the names of Wolfe and of Montcalm. Dying at the self-same moment — one amid the victors, the other amid the vanquished — their names live together in history. By the treaty of Paris which followed, France surrendered to her successful rival, all claim to the domain east of the Mississippi River. In accordance with the terms of the treaty, Gage, the commander of the British forces in America,



STATE CAPITOL AT SPRINGFIELD.

took formal possession of the recently conquered territory. Proclamation of this fact was made to the inhabitants of the Illinois country in 1764 and a garrison soon thereafter established at Kaskaskia. Here the rule of the British was, for the time, undisputed. British domination in the Mississippi Valley was, however, to be of short duration. Soon the events were hastening, the forces gathering, which were in turn to wrest from the English crown no small part of the splendid domain won by Wolfe's brilliant victory at Quebec. An event of transcendent interest and one of great consequence is now reached. While our Revolutionary War was in progress, General George Rogers Clark planned an expedition whose successful termination has given his name to the list of great conquerors. Partly to mete out punishment to the savage bands whose depredations upon the sparse white settlements in Kentucky were unrestrained by the British commander at Kaskaskia, and partly for the purpose of reducing to possession territory claimed by an ancient charter of the colony of Virginia — the famous expedition was undertaken. Bearing the commission of Patrick Henry, governor of Virginia, with 200 followers equally brave as himself, the heroic Clark crossed the Ohio River and began his perilous march. After enduring great hardships, the undaunted leader and his little band reached Kaskaskia. The British commander and his garrison were surprised and quickly captured. This was on 4 July 1778, 15 years after the Treaty of Paris. The British flag was lowered — and the Illinois country taken possession of in the name of the commonwealth whose governor had authorized the expedition. Thus on the anniversary of our historic day, the symbol of British authority disappeared forever from the Illinois country. In the month of October following the capture of Kaskaskia, the House of Delegates of Virginia extended civil jurisdiction over what had previously been known as the Illinois Country. A law was enacted creating "the county of Illinois," and a commandant was appointed by Patrick Henry, who has, by one of our historians been called "Ex-officio the first Governor of Illinois." Courts were established at Cahokia and Kaskaskia and an election held for civil officers. This was the first election held in Illinois. The history of the next few years is enveloped in much obscurity. Evidently there was but little progress until the close of the Revolutionary War and the ratification of the treaty of peace between the colonies and Great Britain in 1783. The event now to be mentioned, was one of deep consequence and has been called the genesis of Illinois history — the cession by Virginia of the vast territory of which Illinois was a part, to the general government. The claim of Virginia to the vast area mentioned was controverted by some of the other colonies. In fact, this claim was for a time an obstacle to the ratification of the Articles of Confederation. Pending the ratification, the Continental Congress resolved: "That it be earnestly recommended to those States who have claims to the Western country, to pass such laws as may remove the only obstacle to the final ratification of the Articles of Confederation." This important resolution was, a few days later, supplemented by one declaring, "that the lands ceded to the United States pursuant to the above recommendation, shall be disposed of for the common benefit of the United States, and shall be formed into distinct republican States, which shall become members of the Federal Union, and have the same rights of sovereignty, freedom, and independence, as the other States." In response to the above, the House of Delegates of Virginia in January 1781, proposed to cede to the general government the lands mentioned upon the conditions named. After much discussion and delay the proposition of Virginia was accepted by the Congress and in time a deed of cession was duly executed. To this famous instrument — by virtue of which Illinois became a part of the United States — are attached as commissioners upon the part of Virginia, the historic names of Thomas Jefferson, Arthur Lee, and James Monroe. In the manner indicated, the territory out of which Illinois has since been carved became part and parcel of the Federal Union. The daring and successful expedition of George Rogers Clark and the subsequent act of Virginia, form a bright page in our history. As has been truly said "The timely campaign of Colonel Clark was the outgrowth of Virginia foresight, enterprise, and valor. But for this conquest, the Northwest, at the close of the Revolution, would have been in possession of the British and would have doubtless so remained as did Canada; and the western line of the United States would have been the ridge of the Alleghanies and the Ohio River, instead of the channel of the Mississippi.

Another milestone is now reached on the pathway of "the Illinois country," to the dignity and sovereignty of statehood; reference is had to what is well-known in our political history as the Ordinance of 1787. Not inaptly has it been called "the second Magna Charta." On the historic day, 1 March 1784 that Virginia ceded to the United States the domain stretching from the Mississippi to the Ohio, Mr. Jefferson proposed to the Continental Congress a plan for its government. His far-seeing statesmanship is unmistakably evidenced by two provisions in the plan he formulated. One, that slavery should not exist in the territory after the year 1800; the other, that the States to be carved from the territory were to remain forever members of the American Union. This plan failed to receive the sanction of that Congress — and in later days and by other hands, the great ordinance was destined to come into being. Antedating the Federal Constitution, the ordinance for the government for the Northwestern Territory was enacted 13 July 1787. As this was indeed the genesis of Illinois history under the Federal government, it may be well to note briefly some of the provisions of the great ordinance. By its terms, a government was established for the territory and a governor, secretary and judges duly appointed, with power to adopt such laws of the original States as were most convenient; a Legislature was authorized when the territory should have five thousand free male inhabitants; religious freedom and civil rights — not to depend upon religious belief — were guaranteed; likewise the writ of habeas corpus and trial by jury, and judicial procedure according to the common law; private property to be taken for public use only after just compensation; and provision to be made for the encouragement of education. Two of the provisions of the famous ordinance possessed a value that cannot be measured by words. One, the States to be

formed from said territory, were to remain forever a part of the United States of America; the other, that neither slavery nor involuntary servitude should exist in the territory, otherwise than for crime whereof the party should have been duly convicted. The value of the great ordinance to that generation and to the millions who have since found homes within the limits of the vast area embraced within its provisions, cannot be overstated. In pursuance of the recommendation of Mr. Hamilton, Secretary of the Treasury, a General Land Office was established for the new territory and a surveyor-general, registers, and receivers duly appointed, and provision made for the sale of the public lands to actual settlers, in small holdings, and at nominal prices. The commission of General Arthur Saint Clair, the first governor of the Northwest Territory, bears date 1 Feb. 1788, and soon thereafter judges and other officers were appointed, and the new government duly organized. The first visit of Governor Saint Clair to Kaskaskia was in 1790, the county bearing his name meanwhile having been established. Five years later out of its territory, the county of Randolph was created and Kaskaskia established as its county-seat; Cahokia being that of the county of Saint Clair. Thus was the beginning of the historic counties — out of which so many have since been carved — and whose history is, in so large a degree, that of the two first decades of Illinois. Pursuant to the provision of the ordinance of 1787, the Northwest Territory having attained the requisite population, a General Assembly was convened in Cincinnati in February 1799. Illinois was now, for the first time, represented in a legislative chamber. In May 1800 the Congress of the United States provided by law for the division of the Northwest Territory, and the creation of a political division to be known as the "Indiana Territory." The new territory embraced the present States of Indiana and Illinois, and the seat of government was established at Vincennes. The first governor was General William Henry Harrison, at a later day the President of the United States. Of his wise and efficient administration of the affairs of the territory, too much cannot be said. By judicious treaties with the Indian tribes, peace was maintained and cession obtained of valuable grants which in time became the homes of the white emigrants. It is an interesting fact, that the fierce hatred of the great Shawnee chief, Tecumseh, to the whites, was at a later day, in a measure, the result of the grants already mentioned. His own tribe allied with the Pottawatomies and the Kickapoos failed to exterminate — as was the intention of Tecumseh — the white settlers, and ended in his own disastrous defeat at Tippecanoe in 1811, by which the power of these tribes was forever broken. Events were now leading up to the separation of Illinois from Indiana and its own organization as a territory. From the time of the presentation of the first petition to that end in 1806, the legislative chamber at Vincennes and the entire territory in fact, was the theatre of exciting controversy. Its culmination, however, was in February 1809, when by Act of Congress, "the territory of Illinois" was duly organized. The seat of government was established at Kaskaskia — and henceforth Illinois has a history, separate and apart. A wave of emigration from the older States had now reached the new territory, and additional counties were organized by the Territorial Assembly. The people were, in a measure, prosperous, and the question of statehood soon became the theme of earnest discussion. By the year 1818 the population of the Territory was near 40,000 and the General Assembly in January of that year forwarded a petition to Congress, praying the necessary legislation preparatory to its admission to the Union. The people were, indeed, fortunate in having as their Territorial delegate, Nathaniel Pope, eminent at a later day, as a United States judge. The bill providing for the legislation indicated, was introduced into Congress in April 1818. The valuable service rendered by Judge Pope to the future State, will now appear. The bill as reported back to the House of Representatives, by the committee to which it had been referred, fixed the northern boundary of the new State on the north parallel of 41°, 39′. Pending the consideration of the bill, Judge Pope offered an amendment to that part fixing the boundary, containing the significant words: Thence north along the middle of Lake Michigan to north latitude 42° and 30′. This amendment was adopted and became part of the bill. Thus amended, the bill became a law, under it a convention was held at Kaskaskia, a constitution framed, and in December 1818, Illinois was duly admitted as a State of the Federal Union.

During the first decade which followed the organization of the State, the habits of the people, in the main, were simple and their wants few. Barter in a large measure supplied the place of a medium of exchange. Commerce, in so far as it had an existence with the outer world, was by wagons across the Alleghenies, and by flat boats down the Ohio, and the Mississippi. The log cabin furnished protection to the pioneer from the winter's storm. With rude implements of his own construction, he cultivated his fields, and with his rifle defended his loved ones from the incursions of the savage. At the time of its admission, there were but 23 post-offices within the limits of the entire State. At the period indicated and for years afterwards, the frontiersman regarded himself as especially favored if located within a dozen miles of a post-office. The mails reached the settlements weekly or monthly upon horseback or by stage-coach. The log cabin with its puncheon floor supplied the double purpose of temple of learning, and place for public worship. Articles of apparel, were, with rare exception, of home manufacture. Railroads, colleges and universities were unknown. Less than 10,000 persons within the entire State were engaged in agricultural pursuits. Chicago had hardly a place upon the map. The rapid emigration which immediately followed its admission soon rendered the selection of a capital nearer the centre of population a necessity. The commissioners designated by the legislature, for this purpose, having in view the possible flow of emigration northward, chose a site for the new location, 140 miles north of the Ohio River, to which was given the name Vandalia — then a wilderness, but now a beautiful and prosperous city. During the two decades which followed the location of the capital at Vandalia, the population of the State increased to 476,000. The drift of emigration was to the Wabash, to the Sangamon, to the Vermillion, to "the Military Tract," to the

rich lands drained by the Kankakee and the Fox, and to the grand prairies stretching northward and westward to Wisconsin and to the Mississippi. In 1836 Springfield became the seat of government. Then a village of but a few hundred inhabitants, it is now a splendid city and an honor to the commonwealth. Its nearness to the geographical centre of the State; its accessibility and the erection of a superb State House, renders the present location, for our time at least, permanent.

Constitution.— Three constitutions have been in force in Illinois since its admission as a State. The first was formulated by a convention of 32 delegates — representing the fifteen counties of the territory — which assembled in Kaskaskia in August 1818. This constitution — under which the State was admitted — remained the organic law of Illinois for 30 years, and until the adoption of the constitution of 1848. Meanwhile the State had gradually increased in wealth and in population. Many new counties had been organized and the northern boundary of actual settlement extended from the county of Madison to the Wisconsin line. Chicago and other cities unknown to the framers of the first constitution, had sprung into being. An attempt to procure the calling of a convention to frame a constitution to supplant the first, was made in 1823. By Article 7 of the latter, the legislature was empowered, by a two thirds vote thereof, to submit to the electors of the State, the question of calling a convention to alter or amend the existing constitution. By the legislature of 1823 there was such submission under the above provision. The purpose of the originators of this movement unquestionably was to secure by constitutional provision, the introduction of slavery into the State. For more than a year this was the all-absorbing topic of debate. Political leaders and newspapers were divided and fierce personal antagonisms engendered. The discussions at the fireside, in the public press and upon the hustings, touched all phases of the question from the standpoint of material advantage, as well as from the high plane of right. The verdict of the people was rendered 2 Aug. 1824 against the proposed convention and the introduction of slavery into Illinois. The question of calling a convention was again submitted by the legislature in 1846; the returns showed a large majority favorable, and delegates were chosen in April 1847. This convention consisting of 162 members assembled in Springfield in June of that year and its deliberations were concluded 31 August. Unlike the first constitution, this was submitted to the people. It met popular approval and by its terms went into operation on the first Monday of April 1848. This remained in force until the adoption of the present constitution. The latter was formulated by a convention consisting of 85 members which assembled in Springfield 13 Dec. 1869. The constitution it framed was submitted to popular vote and approved, and has since August 1870 been the fundamental law of the State. The existing constitution is in large degree an improvement upon both of those which preceded it. Some of its most important provisions are: the division of the powers of the government of the State into three departments — the legislative, the executive, and the judicial; vesting the legislative power in a General Assembly to consist of a Senate and House of Representatives, both to be elected by the people; senators required to be 25, and representatives 21 years of age; also to be citizens of the United States, and five years resident of this State; no person convicted of infamous crime or a public defaulter to be eligible as senator or representative or to any office of profit or trust in the State; in addition to the ordinary official oath each senator and representative is required to swear in substance that his election has in no manner been secured by bribery; the number of senators was fixed at 51, and of representatives at 153; minority representation was provided for in the election of members of the House; senators to be elected for four years and members of the House for two years; a majority of the members elected to each House shall constitute a quorum; bills may originate in either House subject to amendment in the other; upon the final passage the yeas and nays shall be taken upon each bill separately; every bill to be read at large upon three different days in each House; no act to embrace more than one subject and that to be embraced in its title; no money to be drawn from the treasury except in pursuance of an appropriation made by law; the General Assembly permitted to make appropriations for expenditures incurred in suppressing insurrection, or repelling invasion; compensation of senators and members fixed at $5.00 per day during the session; the General Assembly prohibited from releasing the indebtedness, liability or obligation of any corporation or individual to the State, or to any municipal corporation therein; to have no power to authorize lotteries or gift enterprises for any purpose. Two important mandatory provisions upon the General Assembly were incorporated in the constitution: one requiring legislation protecting coal miners, and the other the passage of liberal homestead and exemption laws. Under the former constitution, the State and people had suffered from special legislation. To the end that such legislation be discontinued and general laws when necessary enacted, the General Assembly was prohibited from passing local or special laws in any of the following cases, viz.: for granting divorces; changing the names of persons or places; laying out, opening, altering and working roads or highways; vacating roads, town plats, streets, alleys and public grounds; locating or changing county seats; regulating county and township affairs; regulating the practice in courts of justice; regulating the jurisdiction and duties of justices of the peace, police magistrates and constables; providing for changes of venue in civil and criminal cases; incorporating cities, towns or villages or changing or amending the charter of any town, city or village; providing for the election of a board of supervisors; summoning and impaneling grand or petit juries; providing for the management of common schools; regulating the rate of interest on money; the opening and conducting of any election or designating the place of voting; the sale or mortgage of real estate belonging to minors or others under disability; the protection of game or fish; chartering or licensing ferries or toll bridges; remitting fines, penalties, or forfeitures; creating, increasing or decreasing fees, percentage or allowance of public officers during the term for which said officers are elected or appointed; changing the law of descent; granting to any corporation, association

or individual the right to lay down railroad tracks or amending existing charters for such purpose; granting to any corporation, association or individual, any special or exclusive privilege, immunity or franchise whatever.

Government.— The supreme executive power of the State is vested in a governor, "who shall take care that the laws be faithfully executed"; his term of office fixed at four years; he is required to be 30 years of age and for five years next preceding his election, a citizen of the United States, and of this State; he is required at the commencement of each session to give to the General Assembly, information by message of the condition of the State, and recommend such measures as he shall deem expedient; he can, by proclamation, convene the General Assembly upon extraordinary occasions; may remove officers of his appointment for incompetency, neglect of duty or malfeasance in office; may grant reprieves, commutations, or pardons after conviction for all offenses; shall be Commander-in-Chief of the Military and Naval forces of the State — except when they are called into the service of the United States; is vested with a qualified negative upon all bills passed by the General Assembly, but bills can be passed over his veto by a two-thirds vote of each House; in case of his death, resignation, or conviction upon impeachment, the duties of his office devolve upon the lieutenant-governor; the last named officer is president of the senate, and is, with the secretary of state, auditor of public accounts, treasurer, superintendent of public instruction, and attorney-general, elected in the same manner, and except the treasurer, for the same length of time as the governor; two years is the term of the treasurer. The judicial powers of the State are vested in a supreme court, circuit courts, county courts, justices of the peace, police magistrates, and in such courts as may be created by law for cities and incorporated towns; the supreme court consists of seven judges, and their term of office is nine years; the terms of the circuit judges fixed at six years, inferior appellate courts of uniform organization and jurisdiction to be composed of circuit judges, to be created.

Suffrage.— One year's residence in the State necessary to its exercise; voting to be by ballot; persons convicted of infamous crimes to be excluded from the right of suffrage.

Revenue.— The General Assembly to provide for needed revenue by levying a tax, by valuation, so that every person and corporation shall pay a tax in proportion to the value of his, her, or its property; certain property, religious, charitable, etc., may by general law be exempt from taxation.

Corporations.— No corporation to be created by special laws, except those for charitable, educational, penal, or reformatory purposes, and these to be under State patronage and control; the General Assembly to provide by general laws for the organization of all corporations hereafter to be created; no State Bank hereafter to be created, nor shall the State own any stock in any corporation for banking purposes; every stockholder in a banking corporation to be individually liable to its creditors for double the amount of his stock; the rolling stock and all other movable property of all railroads in the State, to be considered personal property, and subject to execution for the debts of such company; railroad corporations prohibited from consolidating with parallel or competing lines; all railroads in the State declared to be public highways, and free to all persons for the transportation of their persons and property thereon, under such regulations as may be prescribed by law — the General Assembly to establish reasonable maximum rates of charges for the transportation of passengers and freight; the right of eminent domain by the State against such corporations never to be abridged; the General Assembly by appropriate legislation to prevent unjust discrimination and extortion in the rates of passenger and freight tariffs on all railroads in the State; appropriate legislation authorized for the protection of producers, shippers and receivers of grain and produce. By a two thirds vote in each House the General Assembly may submit to the electors, the question of calling a convention to alter or amend the Constitution, to be voted upon at the next general election; by the same vote in the General Assembly proposed amendments to the constitution (without the intervention of a convention) may be submitted to the electors for adoption or rejection. The General Assembly prohibited from releasing the Illinois Central Railroad Company from its charter obligation to pay the State the agreed percentage of the gross earnings of said company; no county, city, town or township permitted to become a subscriber to the capital stock of any railroad, or private corporation, or to make donations to, or loan its credit in aid of any such corporation.

Politics.— Under the recent apportionment by virtue of the 12th census of the United States, Illinois has 25 representatives in Congress. The electoral vote of the State at successive Presidential elections, since its admission has been cast as follows, viz.: In 1820, for Monroe; in 1824 one vote for Adams and two for Jackson; in 1828 and 1832 for Jackson; in 1836 and 1840 for Van Buren; in 1844 for Polk; in 1848 for Cass; in 1852 for Pierce; in 1856 for Buchanan; in 1860 and 1864 for Lincoln; in 1868 and 1872 for Grant; in 1876 for Hayes; in 1880 for Garfield; in 1884 for Blaine; in 1888 for Harrison; in 1892 for Cleveland; in 1896 and 1900 for McKinley. The vote of Illinois in the electoral college during the 85 years of its existence as a State, has increased from 3 to 27. The Black Hawk war of 1831–2 and the Mormon war of 1844 are chief among the interesting historical events of the State. As the result of the first, Indian depredations ceased, and the remnants of once powerful tribes disappeared forever from the State. What is known in local history as "the Mormon War" occurred in Hancock County on the Mississippi River. Nauvoo in the last named county was the Mormon city, the home of Joseph Smith, "the prophet" and head of the church; it was the seat of Mormon authority, and the site of a splendid temple. The assassination of Joseph Smith by an anti-Mormon mob in 1844 was soon thereafter followed by the complete exodus of his followers from the State.

Bibliography.— Ford, 'History of Illinois'; and a 'History of Illinois' by Davidson and Stuve; Moses, 'History of Illinois'; the twelfth census of the United States; the several official reports of State officers published by authority of the General Assembly.

ADLAI E. STEVENSON,

Illinois Central Railroad. The history of the Illinois Central Railroad embraces many interesting episodes, some of which bore directly in their effect on the building up of the nation, of the State of Illinois and of the city of Chicago. Prior to the incorporation of this line, the State of Illinois had vainly endeavored to establish an effective and profitable central railroad. In doing this, a large State debt accumulated and the outlook for wiping out that debt was not at all promising when the act to incorporate the Illinois Central Railroad Company was approved by Governor French, on 10 Feb. 1851. As events have proved, this act produced results more momentous in the history of the State and of the United States than any act approved by an Illinois Executive before or since.

The inception of this important enterprise dates back to 1835, when two of the State's most famous men, Hon. Sidney Breese and Hon. Stephen A. Douglas, first discussed publicly the advisability of penetrating the centre of the State by means of a railroad and thus opening up a vast territory which at that time was an uninhabited and partially unexplored wilderness. On 16 Jan. 1836, the State Legislature passed an act incorporating "The Illinois Central Railroad Company." Two years later an attempt was made to start this road, which was intended to run 457 miles. The sum of $3,500,000 was appropriated for the route, but within a few months the difficulties surrounding the situation in the matter of actual track-laying became so great that, after an expenditure of $506,000, principally on surveys and preliminary work, the plan was abandoned.

In 1843, a private corporation entitled "The Great Western Railroad" secured a charter and began work, but soon became discouraged and surrendered their charter. In 1849 this charter was renewed, only to be again surrendered to make room for the road now operating and known as The Illinois Central Railroad. At the time the road was commenced by the present corporation, it was estimated that the aggregate cost would be about $15,000,000. The actual cost for construction, including all extension up to the present time, has been nearly $50,000,000.

Original Charter Directors.— The twelve directors selected in 1851, under the charter and known as the "Charter Directors" included nine prominent New York men and three well-known citizens of Boston. The directors from New York were Robert Schuyler, George Griswold, Governeur Morris, Jonathan Sturges, Thomas W. Ludlow, John F. A. Sanford, Henry Grinnell, Joseph W. Alsop and Leroy M. Wiley. Those from Boston were Franklin Haven, Robert Rantoul, Jr., and David A. Neal.

Population.— In 1850, shortly before the chartering of the railroad, Illinois stood 11th in population and 17th in wealth among the States. The marked difference during the following 10 years is worthy of note as showing the direct effect of improved and extended railroad accommodation. In 1860, Illinois stood fourth in population among the States, also fourth in wealth.

Railroad Conditions in 1851.— In 1851, when the charter of the present road was granted, the population of Chicago was 30,000. That city had no railroad connection with the east nor in any other direction. In the same year the Hudson River Railroad, 140 miles, from New York to East Albany, was opened. Other events of importance during 1851 were the extension of the Baltimore and Ohio Railroad to Cumberland and the opening of an Erie Railroad line from Pierpont on the Hudson to Dunkirk on Lake Erie. Wisconsin had 20 miles of railroad at that time. The railroad mileage of Indiana was 228 miles, and of Kentucky, 78 miles. Just prior to the chartering of the Illinois Central there were 111 miles of railroad track in the State. When the 50th anniversary of the road was held at Chicago in 1901, it was announced that the company was then operating railroads in 13 States.

Development.— The first section of the road, covering 705.50 miles, and running from Chicago to Cairo and from Centralia to Dubuque, was opened on 27 Sept. 1856, being about five and one half years after the issuing of the charter. Since the opening of this main line other lines have been purchased, including part of the Saint Louis, Peoria and Northern railroads from Springfield to East Saint Louis, Illinois, in 1900. This purchase was followed by a number of other purchases and absorptions.

Roads Acquired by Purchase, etc.— From Springfield to East Saint Louis, Ill. (part of the Saint Louis, Peoria and Northern); Indiana Division of the former Peoria, Decatur and Evansville, extending from the Illinois State line to Evansville, Ind., with a branch to New Harmony, Ind.; Evansville and Mattoon, from the State line to Mattoon, Ill. This was formerly a division of the Peoria, Decatur and Evansville; Chicago, Madison and Northern; Kankakee and Southwestern; Chicago and Springfield; Saint Louis, Alton and Terre Haute; Chicago, Havana and Western; Mound City; Chicago and Texas; Riverside and Harlem; the parts of the Rantoul and Illinois and Indiana railroads lying in the State of Indiana, extending from West Lebanon to State line and from Switz City to State line.

Leased Lines.— The leased lines of the Illinois Central Railroad are Chicago and Eastern; South Chicago; Blue Island; Peoria, Decatur and Mattoon; Peoria and Pekin Union; Dubuque and Sioux City; Chicago, Saint Louis and New Orleans, and the Canton, Aberdeen and Nashville railroads.

Mileage.— The corporation now controls one of the most important groupings of railroad lines in the United States. The total mileage operated, according to the latest official report available, is 4,374.04, exclusive of the Yazoo and Mississippi Valley Railroad (1,209.91 miles). The length of the main line, from Chicago to Cairo, Illinois, is given as 364.73 miles; Omaha Division, from Chicago to Council Bluffs, Iowa, 513.96 miles; New Orleans Division, from Cairo to New Orleans, Louisiana, 547.79; Louisville Division, from Memphis, Tennessee, to Louisville, Kentucky, 398.12 miles; other lines owned or leased operated in the system, 2,549.12.

Additional Tracks.— The length of line having two tracks is 654.33 miles; third and other additional main tracks, 72.56 miles; sidings, etc., 1,514.04. The gauge of this system is 4 feet 8½ inches. The average weight of steel rails is 72.78 lbs

Charter Tax.— The charter of the company, reserved to the State of Illinois, calls for payment, in lieu of taxes, of 7 per cent of the gross receipts of the 705.50 miles of road originally built under that charter. The total amount paid to the State of Illinois under the provisions of this charter, from the opening of the road in 1855 to 30 June 1904, was $22,359,316.21.

Dividends.— Between the beginning of operations in 1851 and 30 June 1904, the stockholders received $118,403,661.59 as dividends out of the earnings of the company.

Rolling Stock.— The rolling stock of the company, 30 June 1904, included 1,086 locomotives, 444 passenger and chair cars, 14 café dining cars, 148 baggage, mail and express cars, 42 postal cars (3 of these partly owned), and 52,957 freight cars, making a total, with minor items under this head, of 55,809 cars.

Earnings.— The earnings of the road, for the year ending 30 June 1904, amounted to $46,831,136, or $10,789.72 per mile. These earnings were divided as follows: Passenger traffic, $9,554,743; freight traffic, $31,692,575; mail and express service, $1,694,280; miscellaneous earnings, $3,889,538. For 1905, the total earnings were $49,508,649.

Net Earnings, Receipts and Dividends.— The net earnings of the road for the year ending 30 June 1904, were $14,037,885, or 29.48 per cent; for 1905, $14,396,943; net receipts from land sales, $41,053; investments and miscellaneous profits, $2,675,495.72; surplus dividend fund (30 June 1903), $1,178,186.92; surplus dividend fund, 30 June 1904, $1,225,766.92.

Expenses.— The total expenses of the road for the year ending 30 June 1904, amounted to $32,793,251.31, or $7,555.44 per mile; for 1905, $35,111,706. The amount paid for taxes, rents, interest and sinking fund during the same period was $7,888,506; in dividends at 6 per cent, $5,702,400.

Bonded Debt.— The bonded debt of the road, including 25 investments, aggregates $137,599,525. Of this total the first issue yet to mature is $88,000, issued in 1880 and maturing in 1910. An issue of $2,800,000, placed in 1869, matures in 1917. The next, following in order, is an issue of $968,000 made in 1881 and maturing in 1921; an issue of $470,000 made in 1883 and maturing in 1923; an issue of $538,000, made in 1886 and maturing in 1931; an issue of $241,000, made in 1887 and due in 1932.

Opening up of the State.— The beginning of active operations in establishing the line marked the beginning of State development throughout a vast area which, up to that time, had been inaccessible to traffic of any kind except by means of the most rural contrivances, utterly inadequate for any but the most restricted local demands. The new move toward opening up commercial possibilities immediately doubled the price of public lands. These tracts were readily bought up as conditions improved and steadily increased in value year by year.

At a critical juncture in the nation's history, when it became necessary to move regiments, brigades and divisions of western troops to the scene of active civil war operations, the Illinois Central Railroad provided the only available means of adequate rapid transportation. At the same time, the existence of that railroad and its excellent management made the prompt supply of rations and forage possible.

Payment of State Debt.— As mentioned in a previous paragraph, the attempt of the State to operate successfully a central railroad ended in utter failure. In 1851 the people of Illinois were under a burden of some $60,000,000 as the outcome of the experiment. The establishment and active operation, with ever continuing development of the road, enabled the whole of that debt to be paid off in due course with proper interest.

Other Benefits to State and City.— The persistency of the railroad authorities in extending their own lines and giving added vitality to smaller railroads made possible the cultivation of the Grand Prairie, previously waste, thereby raising the prestige of the State as a productive national factor of extraordinary importance. It is on record that over $3,000,000 has been expended since about 1836 by the railroad company upon the construction of dikes, piers and breakwaters to protect the city against lake encroachments. Very great benefits, too, have been derived by Chicago from being brought into close commercial touch with prairie lands and the agricultural area of the Lower Mississippi Valley. Chicago has also gained an outlet by rail to the Gulf of Mexico. It is said, to the credit of the Illinois Central Company, that the extent and vigorous administration of its affairs during the period extending from the inception of the World's Fair in 1893 until its close made the success of that enterprise possible by furnishing ample transportation within its jurisdiction for the immense passenger and freight traffic which impended there from start to finish.

Statistical.— The States in which the Illinois Central Railroad is now operating are Illinois, Indiana, Wisconsin, Iowa, Minnesota, South Dakota, Kentucky, Tennessee, Mississippi, Louisiana, Missouri and Alabama. The present total mileage of the road, including leased lines and the Yazoo and Mississippi Valley Railroad, is nearly one-half the railway mileage of the State. The total number of stockholders in the company, according to the latest report of the Interstate Commerce Commission, is 9,123. The value of stock outstanding, according to the latest quotations, 1905, is $95,040,000. The highest rate at which stock was quoted in 1904 was 159; lowest 125¾. The highest rate quoted for 1905 was 183; lowest 152¾.

Other lines operating in Illinois are the Santa Fe; Baltimore and Ohio; Chicago and Alton; Chicago and Northwestern; Chicago, Burlington and Quincy; Chicago Great Western; Chicago, Indianapolis and Louisville; Chicago, Milwaukee and St. Paul; Chicago, Rock Island and Pacific; Cleveland, Cincinnati, Chicago and St. Louis; Erie; "Frisco System"; Grand Trunk; Great Central Route; Iowa Central; Lake Erie and Western; Lake Shore and Michigan Southern; Louisville and Nashville; Michigan Central; Missouri Pacific; Mobile and Ohio; New York, Chicago and St. Louis; Pennsylvania; Southern; Toledo, St. Louis and Western; Vandalia; Wabash, and Wisconsin Central.

Illinois College, an institution located in Jacksonville, Ill., the oldest college in the State, founded in 1829, largely through the efforts of the "Yale Band of Seven," an Eastern organization of college men. The courses of study are arranged according to the group system, which permits a fair amount of choice. In 1902 the attendance was 125 students with 17 instructors. In 1903 the college was affiliated with the University of Chicago. The same year the endowment fund was increased from $155,000, in 1902, to nearly $500,000. The college library contains 12,000 volumes, and the literary societies 1,000, available for reference.

Illinois River, an affluent to the Mississippi, formed by the confluence of the Kankakee, Des Plaines, and Du Page rivers, in Grundy County, about 44 miles southwest of Chicago. Its entire course of over 350 miles is within the State, through a fertile, undulating country, rich in bituminous coal deposits. It flows first westward to Ottawa and Lasalle, at Depue bending southwestward past Lacon, Chillicothe, Peoria, Pekin, Havana, and Beardstown, and near Naples turning due south and joining the Mississippi about 18 miles above Alton, at the mouth of the Missouri. The river is 1,200 feet wide at its mouth and is navigable throughout to Lasalle where a ship canal about 120 miles long connects it with Lake Michigan at Chicago, thus ensuring a clear waterway from the Great Lakes to the Mississippi and the Missouri. The Illinois has numerous tributaries of which the Fox and Sangamon rivers are the chief.

Illinois State Normal University, located at Normal, a suburb of Bloomington, Ill., was founded in 1857. It is the oldest State normal school in the Mississippi Valley, and has furnished principals or instructors for nearly all of the younger normal schools in the central and western States. Up till 1904 it had given instruction to 15,652 normal students, nearly all of whom have become teachers. Its graduates number 1,549. The school occupies three buildings upon a beautiful campus of 57 acres. It is well equipped with library, laboratories, gymnasium, and apparatus for instruction in all the various branches of study. Its revenue, about $60,000 per year, appropriated from the State treasury, includes the interest derived from the College and Seminary Funds granted by the Federal government in 1818. It is governed by the Board of Education of the State of Illinois, a body of 15 appointed by the governor. The State superintendent of public instruction is *ex-officio* secretary of the board. Its sole purpose is to prepare teachers for the schools of the State, accordingly students are required to sign a pledge declaring their intention to teach. Tuition is free. The programmes of study leading to graduation vary from two to four years, according to the preparation of the student. The required work includes courses in pedagogy, psychology, and general method, history and philosophy of education, school management and the Illinois school system and one year of practical teaching in the training department. Along with these are provided courses in special method in the various branches of elementary and high school course. Special courses are provided in manual training, art, vocal music, kindergarten and elementary agricultural science. The attendance in 1902–3 was 1,014, besides 502 in the training department. The faculty of instruction numbers 31. The presidents of the institution have been: Gen. Charles E. Hovey (1857–61); Richard Edwards (1862–76); Edwin C. Hewett (1876–90); John W. Cook (1890–99); Arnold Tompkins (1899–1900); David Felmley (1900——).

David Felmley, *President.*

Illinois, University of, the State university situated at Urbana. It was founded in acceptance of the national land grant of 1862 (see Colleges, Land Grant), and was incorporated in 1867 as the Illinois Industrial University. In 1870 women were admitted; in 1877 the State legislature granted power to confer degrees; and in 1885 the name was changed to the University of Illinois. It was the first American university to give shop instruction, a mechanical shop being equipped in 1870. It is governed by a board of trustees, consisting of three *ex-officio* members, including the governor, and nine elective members. The undergraduate department includes the college of literature and arts, of engineering, of science, and of agriculture; corresponding graduate courses are given: other departments of the university are the academy, State library school, the school of music, the college of law, the college of medicine, the school of dentistry, and the school of pharmacy, the three latter being situated in Chicago. The university has a number of valuable scientific collections; the agricultural experiment station organized under the Federal law of 1887 is controlled by the university trustees, but is separately supported by the national appropriation; the general university library numbers 71,039 volumes besides pamphlets; other libraries under university control are the library of State Laboratory of Natural History (15,000 volumes), the library of the college of law, and the special collection of the department of education (1,500 books and 3,000 pamphlets). The annual income amounts to $900,000; the number of students in all departments was 3,725 in 1904–5, the number of professors and instructors, 392.

W. L. Pillsbury,
Registrar University of Illinois.

Illinois Wesleyan University, founded in 1850 under the auspices of the Methodist Episcopal Church, at Bloomington, Ill. The college courses provide for the degrees of B.A., B.S., Ph.B., LL.B., M.A., Ph.D., and two honorary degrees. It has, also, a preparatory school. In 1902 the number of students was over 1,400, of which 478 were non-residents; professors and instructors, 38; volumes in the library about 11,000.

Illit'erates, those unable to read or to write, or to do either. The percentage of illiterates indicates the average intelligence, or at least of education, in the people of a country. The United States, Hungary, Italy, and Portugal, and the Australian colonies of Victoria and Tasmania, have attempted to take an exact census of illiterates; all children below six years of age were excluded, except in the United States, where all children below 10 years of age were excluded. The following gives the result:

	Per cent
United States (1880)	22.15
Italy (1881)	54.30
Hungary (1880)	57.14
Portugal (1878)	79.07

But the most exact results are gained by estimating the number of men and women who

are unable to sign their names in the marriage registers. From this estimate the following are the results for 1886:

	Men	Women	Mean
England and Wales..	9.60	11.50	10.55
Scotland	4.65	8.28	6.46
Ireland	23.40	25.30	24.35
Victoria	2.00	1.98	1.99
New South Wales...	3.76	4.20	3.98
Queensland	4.52	6.71	5.62
South Australia	3.04	3.49	3.26
New Zealand	1.92	2.89	2.40
Prussia (1884)	3.31	5.11	4.21
France (1882)	14.39	22.62	18.50
Italy (1887)	42.36	62.80	52.58

The subjoined table gives the number of conscripts of the countries named who were illiterate in the fullest sense of the term:

	Per cent		Per cent
Baden (1884)	0.02	Holland (1887)	8.5
Würtemberg (1884)..	0.02	France (1886)	10.30
Bavaria (1884)	0.08	Belgium (1887)	13.87
Saxony (1884)	0.15	Austria (1888)	25.00
Sweden (1883)	0.27	Hungary (1888) ...	38.60
Denmark (1881) ...	0.36	Italy (1888)	42.98
Germany (1884) ...	1.27	Russia (1882)	78.79
Switzerland (1888)..	1.3	Servia (1881)	79.31
Prussia (1884)	1.97		

At the last general election in Great Britain and Ireland there voted in England and Wales 38,587 illiterate persons, in Scotland 4,836, in Ireland 36,722, giving a percentage of 2.69 out of a total of 2,969,381 voters. Illiteracy among voters, both white and black, increased greatly in the South between 1870 and 1880. In Texas in 1870 there were 17,500 illiterate voters; in 1880 there were 33,085. But between 1880 and 1890 the illiteracy in the States was reduced to 13.4 per cent of the total population.

Illuminati, ĭ-lū-mĭ-nā'tī ("the illuminated"), the name given to themselves by an association of people who professed to have attained to a higher knowledge of God, and heavenly things, and a deeper insight into the spiritual world than the rest of mankind. They were represented by the *Alombrados* in Spain and the *Guérients* in France. In the last half of the 18th century a sect of mystics rose in Belgium which from its foundation 1 May 1776 at Ingolstadt, spread over a large portion of Catholic Germany. At first they called themselves "Perfectibilists." Their founder was Adam Weishaupt (q.v.), a professor of canon law at Ingolstadt.

Illuminating of Manuscripts. See Books; Manuscripts, Illuminating of.

Illusion. In mental pathology it is necessary to distinguish the term "illusion" from the terms "delusion" and "hallucination." In common parlance these terms are often confused, and many persons in using them have not very clear ideas of what they wish to express by them. But this is not so among writers in psychiatry, for in this science these three terms are very clearly and very strictly demarcated. And it is highly necessary that these distinctions should be observed, because these terms stand for very different phenomena in mental disease — phenomena of different value and importance, and each with its own special significance as to the patient's welfare.

By an illusion is meant a misinterpretation of a sensory impression. Ordinarily, when the mind is acting in a perfectly normal way and there is nothing to confuse its impressions or to obstruct its proper perceptive powers, a sensation, whether of the eye, ear, taste, or skin, is conveyed to the consciousness and is recognized correctly. Thus a sound, as the note of a bird or the voice of a friend; or the sight of some object, as of an animal moving in the distance, is properly conveyed to the intelligence and is properly recognized. But this process may be interfered with in various ways. The senses, notoriously, are not always to be relied upon. Even the normal mind may make mistakes in the interpretation of sensations, and still more so may the mind that is impaired. It thus happens that all illusions are not necessarily evidences of a diseased mind; this faulty action of the senses, or of the perception, may and often does happen in the cases of persons of sound mind. For instance, a person walking along a path in the dusk may mistake a bush for an animal; he simply misinterprets an object, and this object is not imaginary but has a real existence. So, too, the mirage which sometimes appears at sea, might lead a perfectly ignorant person to maintain that he saw a ship inverted sailing in the sky. These are instances of illusions in which the normal mind may be temporarily deceived. But the normal mind tends to correct its illusions, and this it does sooner or later according to its opportunity and its degree of knowledge. In this respect the insane mind differs from it; the illusions of the insane are usually firmly believed in; there is no spontaneous tendency on the part of the insane mind to correct its illusions. On the contrary, they are firmly embraced, and are often made the starting point of a train of associated morbid ideas, whereby the mental disorder is all the more confirmed.

An hallucination differs from an illusion in the fact that it is entirely subjective. In a strict sense it is a disorder of perception in which the external sense organs do not participate, and it leads to a belief on the part of the patient that he perceives some external object, whereas in fact there is no such object corresponding to the perception. In other words, it is a disorder of perception giving rise to a false belief in a sensation. For instance, a person believes that he hears the voice of an acquaintance speaking to him, when there is no voice either of the acquaintance or of any one else; or, again, a person thinks he has a vision of a deceased friend or of some other spiritual being, whereas there is no external object or person whatever giving rise to this or any other sensation. The whole process, therefore, is subjective, or within the patient's own mind; it is without any objective equivalent. It is thus readily seen that an hallucination is much more deeply seated than an illusion, and is a much more direct evidence of a disorder of the mind. Some authorities doubt indeed whether a true hallucination ever occurs in a normal person; what appears to be so in any given case would probably be found on strict inquiry to be an illusion. Although this may be an extreme position, the fact remains that hallucinations are very rare in the sane and very common in some forms of insanity; and that, as in the case of illusions,

the sane tend to correct them, while the insane adhere to them with unswerving belief. The most common hallucinations of the insane are the visual and the auditory, and they are sometimes very grave symptoms. Auditory hallucinations are especially dangerous, for they may lead the patient to commit acts of violence in response to their suggestions.

A delusion differs from both an illusion and an hallucination in the fact that it is not a sensory disorder — but a derangement entirely within the intellectual sphere. It is an erroneous belief, but one which is due entirely to mental disorder. The latter part of this definition is essential, because a delusion is essentially something more than a mere error of belief or judgment. It is an erroneous belief that is due to insanity, or to a disordered mind. Mere errors of belief may and do occur in persons who are sane: no person, in fact, is exempt. Such errors may be due to ignorance, prejudice or faults of education, but they are not evidence of insanity; otherwise the whole world would be insane. In the case, however, of an insane pauper who believes that he is a multi-millionaire, or that he is emperor of the United States, there is obviously something more than a mere erroneous belief in the sense of an error of judgment or opinion. Such a patient has developed an idea which no sane man in similar circumstances could have developed; in other words, he has a delusion, and he is not insane because he has the delusion, but he has the delusion because he is insane. The insanity or mental unsoundness is the fundamental fact, and is shown usually by other symptoms besides the tendency to form delusions. As in the cases of illusions and hallucinations, the insane cling to their delusions with great tenacity; no argument, no logic moves them. The delusions of the insane are usually distinguished as systematized and unsystematized. In the former the delusion has a certain consistence, coherence and endurance; in the latter the ideas are more or less incoherent and changing. Delusions again may be expansive or depressive, according to the emotional tinge. See also IMAGINATION; INSANITY.

JAMES HENDRIE LLOYD,
Formerly Neurologist Philadelphia Hospital.

Illustra'tion of Books, the art of making and reproducing pictures to supplement or adorn the text. In England book illustration may be said to have reached its culminating point as regards engraved and etched plates, in the first half of the 19th century, in the series of annuals, keepsakes, and the higher class books illustrated by such masters as Stothard, Turner, etc. The revival of wood engraving by Bewick and his pupils gradually led to the restoration of that art as an illustrating medium. In this it was greatly aided by the facility with which wood-engravings can be printed along with the text, together with the advance made in typographic printing. The series of Christmas books illustrated by John (afterward Sir John) Gilbert and Birket Foster had no small share in that advancement. Among the artists who have helped to raise the art to its present high position may be mentioned Cruikshank, H. K. Browne ("Phiz"), Doyle, Leech, Tenniel, Millais, F. Walker, W. J. Linton, Herkomer, etc. The development of what has been called the American school of wood-engraving has still further increased the influence of that branch of art for illustrative purposes.

Relief-Block Processes for Book Illustrations.— Many processes have been invented to produce relief blocks with a view to supersede wood-engraving in book illustration. The object aimed at is to reproduce drawings in line or wash, in fac-simile, on a relief block capable of being printed from the surface on the type-press. That is, the lines or parts which impress the paper are to be left in relief, while the white parts are cut out so as to leave the paper unprinted. "Process" relief blocks may be divided into two kinds, those reproduced from black-and-white, or line drawings in pen and ink; and those from half-tone photographs, or wash drawings. When pen-and-ink drawings, engravings, or any other drawing in line are to be produced the subject is photographed to the required size. This process allows the drawing to be made of any convenient size, while a drawing on transfer paper must be of the exact size required. There are also several gelatine processes, all of which are based on practically the same principle. The production of relief blocks from ordinary photographs or drawings made by washes of black and white baffled all efforts till the invention of Meisenbach's process. In relief block every part which touches the paper prints black, and every part which does not touch the paper leaves it white. Some method had to be devised of turning the smoothly graded tones of a photograph into pure black and white. The method sought after was to break up the photo-tones into a grain, stipple, or line, which should be closest in the darkest parts, and become more open as the lights were approached. That patented by Meisenbach of Munich in 1882 as the one on which nearly all the most successful subsequent processes are based, may be briefly explained. A glass plate is prepared with fine parallel lines. This is exposed between the lens and the sensitive plate in the camera, at a very short distance from the plate, and when the exposure is half completed the cap is put on the lens, the lined plate is taken out and put in with the lines in the reverse direction, and the exposure is completed. The resultant negative is thus broken into minute regular dots. In a successful process invented by Mr. Ives, of Philadelphia, and patented in 1884, a swelled gelatine relief is taken of the subject, and on a plaster cast of this a stipple is impressed by means of an elastic stamp, which gives the operator greater control over the effect. He is then able to ink the plaster cast and transfer an impression of it to a sheet of india-rubber, and from that to a plate of zinc. A "grained" photograph being finally obtained by means of any of the thousand and one processes, it is transferred to zinc and etched. Besides these photo-chemical processes there are various mechanical methods of producing relief blocks. Some of them are very technical. Dawson's typo-etching process, an improvement on Palmer's glyphographic process (patented in 1848) is very extensively used for the production of maps, plans, diagrams, etc. This process is carried to great perfection in the United States, where most beautiful maps are produced by it.

These processes, though simple enough in theory, give great scope for skill in manipulation, and much of their success depends on the

ability of the operator. The rapidity with which they can be produced has rendered the daily illustrated paper a possible and accomplished fact. As to cost, blocks can be produced for from 8 to 30 cents a square inch of surface, according to the nature of the drawings — the stipple process being the more expensive. In France, Germany, and the United States the processes have been much more employed as a means of book illustration than in Great Britain, though even there every year shows rapid advance in their use. As to the comparative merits of wood-engraving and the processes, opinions differ greatly. Generally, it may be said that the processes are more suited for subjects on a large than on a small scale, unless they are very slight, in which case they can never pretend to be more than sketches. In wood-engraving the photograph can be transferred direct to the wood and engraved without further expense for drawing, and the result, both artistically and from a printing point of view, is much more satisfactory. Though within its limits the process makes good work and the future is before it, the fact remains that as yet for finished picture work, good wood-engraving has not been superseded. See Books: Engraving; Lithography; Manuscripts, Illumination of; Photo-Engraving; Photogravure

Halsey C. Ives,
Director School of Fine Arts, St. Louis.

Illyria, ĭ-lĭr'ĭ-ạ, or **Illyricum,** a name anciently applied to a considerable region on the east side of the Adriatic Sea, the inhabitants of which were the ancestors of the modern Albanians. In 228 B.C. it became a Roman province. After various vicissitudes under different rulers it formed part of the Franco-Napoleonic empire as the Illyrian provinces. In 1815 it reverted to Austria and became the kingdom of Illyria, a title it retained until 1849, when it was divided into the provinces of Carinthia, Carniola, and the Coast-lands.

Il'menite, or **Menaccanite,** also known as titaniferous iron ore, is a black, heavy, mineral crystallizing in the hexagonal system. It is widely distributed, occurring in diorites and many other igneous rocks. It is an oxide of iron and titanium containing when pure 36.8 per cent iron and 31.6 per cent titanium, and is frequently associated with magnetite. Iron ores containing ilmenite occur in vast masses in the Adirondack region of New York, in Quebec, Canada, and in northern Minnesota, and ilmenite is a common constituent of the black sands found on some ocean beaches. The presence of titanium decreases the fusibility of an iron ore, hence the failure of many attempts to work black sands in the blast furnace. It is likely, however, that the titaniferous iron ores will become important sources of iron by the development of special methods for their treatment. See Titaniferous Iron Ores.

Ilocos Norte, ē-lō'kōs nōr'tā, Philippines, a province of Luzon, occupying the northwestern part of the island; greatest length, 79 miles; area, 1,265 square miles (including the dependent islands). Two mountain chains inland extend parallel with the coast; the surface otherwise is much broken by foothills, but it is fertile and well watered. Among the natural wonders of the province is a grotto 39 acres in extent and of great beauty, situated in Lice Mountain. The products include rice, cotton, chocolate, corn, sugar, and a fair grade of tobacco; there are deposits of iron and copper in the mountains, the latter having been worked by the natives. The chief industries are agriculture, horse and cattle raising, fishing, and the weaving done by the women. Civil government was established in September 1901; the people of the province are among the most progressive and industrious of the native races, and the new government was received with general satisfaction. Pop. 164,000, mostly Ilocanos.

Ilocos Sur, soor, Philippines, a province of Luzon, on the west coast, bounded on the north by Ilocos Norte and on the south by Unión; length 70 miles; area 492 square miles (including dependent islands). The eastern boundary consists of a chain of mountains which slope toward the coast in terraces; the rivers are small. The coast road runs through the province from north to south, connecting the important towns and villages. The soil is fertile, the principal products are rice, corn, sugar, indigo, chocolate, peanuts, and vegetables; the chief industries, other than agriculture, are the weaving of cotton cloth, the manufacture of baskets, hats, card cases, and pipes, and cattle raising. There is also considerable trade, carried on mainly through the native markets in the different towns, and some export. Civil government was established 1 Sept. 1901. Pop. 180,000, mostly Ilocanos.

Iloilo, ē-lō-ē'lō, Philippines, province of Panay, including the eastern and southeastern coast of the island; greatest length, 111 miles; area 2,102 miles (with dependent islands). A range of mountains follows the northern and western boundary lines; the rest of the surface is undulating, sloping to the sea. There are several large rivers, the most important being the Jalaur and the Jaro. This province has some of the best roads in the archipelago; the principal towns are connected with the capital, Iloilo, and some of the rivers are navigable for native boats to the foot of the mountains. The products include sugar-cane, corn, rice, coffee, chocolate, tobacco, and hemp; there are also in the province deposits of gold and iron, stone quarries, and extensive forests. The chief industries are live-stock raising, the weaving of fabrics of pineapple fibre (piña) and cotton, and the manufacture of sugar. In 1899 the United States troops occupied the province, immediately began operations against the insurgents who were located there with headquarters at Santa Barbara, and succeeded in dispersing their forces. In April 1901 civil government was established. The inhabitants are mostly of the Visayan race and are generally Catholics, though some of the mountain tribes are still heathen. Pop. 423,500.

Iloilo, Philippines, capital of the province of Iloilo, Panay, situated on the Iloilo Strait at the mouth of the river of the same name. It is irregularly built, but the public buildings and the houses are of good construction. It has an excellent harbor, and is the second town of the Philippines in commercial importance; it is the centre of the trade of the province and has also a large foreign trade, exporting tobacco, rice, coffee, hides, and hemp, and im-

porting Australian coal and general merchandise. There are also several industries, chief among them being the manufacture of piña, jusi, and sinay. In February 1899 the insurgents who were in possession of Iloilo fired upon the United States gunboats Petrel and Baltimore; the town was then bombarded and taken by the Americans. Pop. 10,500.

Ilopango, ē-lō-pän'gō, **Illabasco,** or **Cojutepeque,** San Salvador, Central America, a lake of volcanic origin, 6 miles southeast of the city of San Salvador, about 14 miles long by 6 miles broad. It is surrounded by high, precipitous hills, composed of scoriæ and volcanic stones, and has several islets, one of conical shape about 400 feet high, formed during a volcanic eruption in 1879–80. Fish abound, although the waters exhale a disagreeable sulphurous odor, and are unpotable. The surface of the lake is 1,200 feet below the level of the surrounding country; when ruffled by a breeze the waters have a singularly brilliant parrot-green color.

Image, in optics, the picture or impression produced by the luminous rays from an object reflected or refracted in mirrors or lenses when they enter the eye of an observer as if they had proceeded from a representation of the object. More correctly, the image is the locus of the foci (or circles of least confusion. See Focus) of rays from consecutive points of the object. When the light rays actually pass through the points of the image the image is real and may be thrown upon a white screen. If no screen is interposed the image can be seen by an eye placed in the pencil of rays which pass through it. When the light rays do not actually pass through the points of the image, but diverge from one another on leaving the mirror or lens, the image is said to be virtual, and cannot be thrown upon a screen; it becomes visible to an eye placed in the pencils of rays which appear to have passed through it. See Mirror; Lens.

Images, Veneration of, the practice of venerating and honoring in public or private graven or painted representations of sacred things or persons. Because of the general prevalence of idolatrous worship of images, the Jews in the Old Law were forbidden the making of images, although evidence of the lawfulness of the practice is afforded in the positive command to "make two cherubim of beaten gold on the two sides of the oracle," to "make a brazen serpent and put it up for a sign." The walls of the catacombs, which were the refuge of the first Christians in times of persecution, show many sacred pictures, and after the period of the persecutions the use of sacred images or paintings became open and undespised. Consult Damascene, 'Treatise on Holy Images,' translated by M. H. Allies (1898).

Imaginary Quantity, the result of an algebraic calculation, when the application of the rules for resolving equations leads to an operation that cannot be performed. The operation referred to is the extraction of the square root of a negative quantity. Thus in the equation

$$x^2 = -a^2,$$

to find the value of x we should require to take the square root of $-a^2$; and this is impossible. To indicate this impossibility the roots of the equation above are written thus: $x = +\sqrt{-a^2}$, $x = -\sqrt{-a^2}$, or more frequently and more neatly $x = +a\sqrt{-1}$, $x = -a\sqrt{-1}$. The name imaginary quantity is given to the $\sqrt{-1}$, and any algebraic expression containing $\sqrt{-1}$ is called an imaginary expression: thus $a + b\sqrt{-1}$ is an imaginary expression.

These imaginary roots have proved of great importance in algebraic geometry. In fact, the employment of imaginary quantities systematically is the foundation of some of the greatest modern discoveries and improvements in geometry. Even in algebra, although it is impossible to obtain a value for the expression, or to explain the meaning of it, yet it may prove of use in indicating how to alter the statement of a problem so as to obtain a real solution.

Imagination, that mental power which, according to McCosh, puts in new forms and dispositions what had been previously in the mind. It is therefore not a productive but a reproductive power, for it cannot create anything *de novo,* but can only reproduce in new forms those ideas or images of which it has derived the elements from previous experience. This is in accord with Locke, who says that man's power is much the same in the material and intellectual worlds, the elements in both being such as he hath no power either to make or to destroy.

The imagination differs from the memory, which is also one of the reproductive powers of the mind, in the following way. The memory reproduces what had formerly been before the mind in the form in which it first appeared, but the imagination separates and combines the mental contents in various ways. An act of memory is also accompanied with a belief in the past reality of what the mental picture represents, but an act of imagination (at least in the normal mind) is not accompanied with such a belief. As McCosh has expressed it, the memory may be compared with the mirror which reflects exactly what is before it; whereas the imagination may be likened to the kaleidoscope which reflects objects in an infinite variety of shapes and colors.

When an attempt is made to analyze the workings of the imagination, it is found that this faculty, like all the other mental functions, is governed by certain laws. First in importance among these are the laws of association of ideas. According to these laws the ideas which are summoned up and utilized by the imagination arise according to the principles of contiguity and correlation. By the association of ideas is meant the tendency of ideas to recur in the order or groups in which they naturally stand, either by virtue of some resemblances or some identities of time and place. Thus by correlation is meant the association of ideas in the mind because of some mutual resemblances of parts or qualities; and by contiguity is meant such association because of the proximity in time and place, and not because of any mutual resemblances. In analyzing any act of the imagination it will be found that it follows one or other of these laws of association, although they can be variously grouped and subdivided.

The uses of the imagination and its moral and hygienic relations open up vast questions which can scarcely be more than named

here. It is almost enough to recall the activity of this faculty in the realms of poetry, of fiction and of art, but its offices are not confined to these fields, for in science also its activity is very great and of first importance. Imagination goes before theory, and theory points the way to new discoveries in science. Of such widespread activity is this faculty that practically it is almost impossible to dissociate it from the other mental functions. It is always manifesting itself in some way in even the most prosaic affairs of daily life. The conduct or control of the imagination is a subject that suggests many moot points in psychology, in psychiatry and in ethics. That the imagination is subject to control within certain limits may be granted, although these limits are not fixed, and outside of them the imagination may often run riot without the possibility of control. Its action, in fact, like that of most mental faculties, is largely automatic, and its control by the will, the intelligence and the conscience, is often a matter of the mental training and mental health of the individual. In ethics the control of the imagination, or at least its guidance, so that it shall not minister to sensuous or immoral pleasures, even though these be purely imaginary, is a self-evident rule of conduct, but one which is doubtless often broken with some degree of impunity. In mental discipline its control is also essential, for its too great or mere idle indulgence is no doubt unwholesome and wasteful.

In psychiatry, the imagination, like most or all of the other faculties, is found to be subject to derangement, and this in various degrees, according to the patient and the form of disease. That it is active in the formation of delusions, and is much disturbed in both depressed and exalted states of the mind, is quite evident. In all insane states, except the advanced dements, the kaleidoscopic function of the imagination is apparent. The mental pictures are broken reflections of past mental contents, arranged often at seeming haphazard, and often of only the most sombre and melancholy tints.

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James Hendrie Lloyd,
Formerly Neurologist Philadelphia Hospital.

Imam, ĭ-mäm, or -mâm', a Mohammedan chief or leader; a title given to the four successors of Mohammed, and to the twelve great leaders of the shütes. In Turkey, applied to the functionaries who call the people to prayer from the minarets, perform circumcision, etc. They are chosen by the people, and confirmed by the secular authority, under whose jurisdiction they also are in criminal and civil affairs.

Imbriani, Vittorio, Italian poet: b. Naples 24 Oct. 1840; d. 1 Jan. 1886. He pursued historical and philosophical studies at Naples, Zürich, and Berlin, but later became a soldier, serving in the wars of 1859 and 1866. The best known of his works are 'Canti populari delle provincie meridionali' (1871–2); 'Dodici canti pomiglianesi' (1876); and 'La novellaja fiorentina' (1877).

Im'bricated Snout-beetle. See Snout-beetle.

Imbros, an island in European Turkey, west from the entrance to the Dardanelles. It is 18 miles long, east to west, 8 miles broad, and terminates west in Point Auflaka, and east in that of Basse. It is mountainous, rising in its loftiest peak to the height of 1,959 feet; well wooded, and intersected with richly-fertile valleys, producing wine, honey, oil, cotton, and lead. It has only two towns — Flio and Castro. Pop. 10,000, mostly Greeks.

Imide, ĭmīd, or -mīd, a chemical substance derived from ammonia, NH_3, by replacing two of the hydrogen atoms by a divalent radical. If all three of the hydrogen atoms of the ammonia are replaced by one trivalent radical, the compound is called a nitrile. When one or more of the hydrogen atoms of the ammonia are replaced by a corresponding number of monovalent radicals the compound thus formed is called an amide or an amine, according to the nature of the radical by which the hydrogen is replaced. See Amide; Amine.

Imitation. Imitation is the process of reproducing by one's own act the observed actions of others. Its beginnings lie therefore in perception. It is the result of a desire to change from the role of spectator to that of actor. Imitation may be of two kinds (1), a primitive and (2) a developed form. The primitive form is an unconscious copying of some object of perception; and is simply a reaction in response to the outer stimulus which excites it. The best example of this kind of imitation is to be found in the sounds which a baby is wont to repeat when it has once heard them. It is a peculiar characteristic of the primitive imitation that the sound, for instance, when once imitated becomes in turn a new stimulus to start the process over again, the result being that the imitated sound is repeated rapidly again and again until the organs are wearied, or the attention is diverted. The exercise is evidently found to be pleasurable, and is therefore continued indefinitely. Mr. Baldwin has given the name "circular reaction" to this kind of imitation, the phrase indicating a sort of self-perpetuating process. The name also of "suggestive imitation" has been given to this class of acts which appear imitative to an observer, but are not consciously felt to be so by the imitator.

The second form of imitation is more complex, and marks a more developed stage of consciousness. The imitation has now become a conscious act. The object perceived has aroused some degree of interest, and there is consequently a conscious effort to reproduce it with the original set before one as a model. In imitation which is of this form, we find the process intimately connected with the attention. In attention there is always a conscious striving for a more accurate knowledge of the object of perception, and imitation serves to gratify this desire, inasmuch as one comes to closer quarters as it were with any act when one tries to reproduce it. Knowledge of it comes then from the inside. This means a concentration of attention, and a consequent result of more definite and satisfying knowledge. Moreover, attention will vary as the interest, for that which one attempts to do himself is always far more interesting than merely that which is observed.

In the development of consciousness imitation as a social factor plays a most conspicuous part. Through it a child acquires all of its social tendencies, and becomes a part of the social organism in which it is to live and move and have its being. Its education starts with the first rudimentary efforts at imitation; and is carried on from this initial stage to the very highest and most advanced forms in constant dependence upon the imitative tendencies. Through imitation the knowledge of one generation is acquired by the succeeding, and a continuity in development is assured which makes for the progress of the race.

In this connection, it is to be noted, however, that with the imitative impulse there are two other tendencies which have free play and a wide scope. These tendencies must be reckoned with also. They are the tendency to social opposition, and the tendency to inventiveness. The tendency to social opposition is a desire for self-assertion, an impulse primarily to do something different from that which others are doing merely from a feeling of native opposition. This impulse is seen in very young children, and remains throughout life. It is often recognized as unreasonable, but nevertheless irresistible. It is a fertile source of the differences of opinion which so early develop in childhood. It prevents a slavish imitation and the loss of initiative in action. However in order to act in a manner which differs radically from one's social environment, there is implied a preliminary training of an imitative sort; for there must be a basis of common activity in order that a departure from the accepted mode may have any significance, and there must be also a body of common beliefs, in order that there may be any such thing as a real difference of opinion. The other tendency is a more pronounced and a more definite form of opposition to imitation; it is the tendency to inventiveness, not for the sake of opposition, nor as the result of an inevitable clash of opinion in one's social setting, but for the sake of producing that which is suggested from within, and not from without. It is the working out of one's own individuality without waiting for a copy or model. It is a shifting of the centre of interest from some object which is perceived, to some object of the inner sense, a fancy born within the brain, an idea which has its origin in the depths of one's own consciousness. This tendency is seen even in early acts of imitation, a tendency to depart from the copy, to introduce variations of design, to improve upon the model.

Here again in order that there may be increased power of independent production, there must be a previous schooling in the art of exact imitation. The original artist is not one who has never copied from a model nor studied the works of the masters. It is the interplay of the imitative impulse with the tendencies to social opposition, and to inventiveness which make progress possible. Progress is not repetition nor is it on the other hand activity which swings clear of any past. Where there is progress there is imitation, but the kind of imitation which allows full range for inventive play, and independent opinion.

There is a special form of imitation which appears on a large scale in the so-called mob impulse, where individuality seems merged in the tendencies of the mass, and imitation is in the nature of a reaction. The individual is swept along with the crowd, not because he wills it necessarily, but because the action of the crowd carries him away as with a flood. This kind of imitation has been given the name of "plastic imitation." Much study has been devoted of recent years to the relation of imitative impulses in animals to congenital tendencies. The instinctive furnishes a strong predisposition to imitation, and in many of the early activities of animals it is most difficult to draw a line of distinction between instinct and imitation.

JOHN GRIER HIBBEN,
Professor of Philosophy, Princeton University.

Immaculate Conception of the Blessed Virgin Mary, a doctrine of the Roman Catholic Church whereby it is declared that "The Blessed Virgin Mary, at the first instant of her conception, was, by a singular privilege and grace of Almighty God, in virtue of the merits of Jesus Christ, Savior of mankind, preserved immaculate from all stain of original sin." In these words is the doctrine proposed for the acceptance of the faithful in the Apostolic Letter of Pope Pius IX., dated 8 Dec. 1854. Previously, for at least 600 years, the doctrine of the Immaculate Conception had been canvassed in the theological schools, and had from an early period in the Church's history been entertained with more or less definiteness by eminent Fathers of the Church and other ecclesiastical writers. The most notable passage from the writings of any of the Fathers relating to this subject is, doubtless, that quoted from St. Augustin's treatise on 'Nature and Grace' (c. 25) in which he makes an exception of Mary when he declares that all mankind are in sin because of Adam, "except the Holy Virgin Mary," he writes, "concerning whom, for the honor of the Lord, I would have no question at all raised in treating of sin — *nullam prorsus, cum de peccatis agitur, haberi volo quæstionem.*"

In the 12th century the great St. Bernard protested vigorously against the usage of certain churches of France in commemorating by an annual festival the Conception of the Blessed Virgin; but the ground of St. Bernard's complaint was, not that the belief in the Immaculate Conception was erroneous, but that the See of Rome had not signified its approval. At the same time St. Bernard refers the whole matter of his dispute with his opponents, the canons of Lyons, to the judgment of the Holy See. The authenticity of his letter has been disputed, but on grounds, as Benedict XIV. implies, absolutely insufficient. Throughout the 13th and following centuries the doctrine of the Immaculate Conception was a subject of keen disputation in the theological schools, its chief advocates being theologians of the order of the Franciscans, its opponents the children of St. Dominic. But the doctrine won ground steadily. In 1439 the Council of Basel declared it to be "A pious doctrine consonant with Catholic faith"; the Council of Trent abstained from formally approving it as an article of Catholic belief; but in their definition of original sin, the Tridentine Fathers took care, with St. Augustin, to except the Blessed Virgin out of the number of those bearing the stain of original sin.

At last, in 1849, Pope Pius IX. judging that the time had arrived for expressing the mind of the Church upon this question, addressed letters to all the bishops of Catholic christendom inviting them to report the opinion and feeling of their respective churches regarding the expediency of declaring the doctrine to be an article of Catholic belief. Five years were allowed to elapse before the next step was taken — that of pronouncing with the unanimous consent of the chief pastors throughout the world and of the churches, the dogmatic definition that "the doctrine was revealed by God, and therefore should firmly and constantly be believed by all the faithful." To catholic-minded men, says Cardinal Newman (Apologia p. 279). "there is no burden at all in believing that the Blessed Virgin was conceived without original sin: indeed it is simple fact to say, that Catholics have not come to believe it because it is defined, but it was defined because they believed it."

JOSEPH FITZGERALD.

Immigration to the United States. The subject divides itself broadly into seven heads: (1) the general history of the foreign influx, its numbers, fluctuations, and causes; (2) its relation to the previously existent population; (3) its sources, and the changes in them; (4) its distribution, the changes in it, and the constituents of the population due to it; (5) its industrial character; (6) its social effects, in occupations and wages of the native population, politics, crime, insanity, pauperism, and illiteracy; (7) the legislation with regard to it, and the public feeling which produced the legislation.

1. The same causes which were bringing a small but steady stream of European emigrants to this country before the Revolution continued to operate after it. From 1783 onward, it was estimated at 4,000 a year till 1794, when the French-English war raised it to 10,000. It dropped again to about 6,000 a year till 1806, when the British and French Continental blockades and the American Embargo practically annihilated it for a decade. (See EMBARGO.) In 1816 the passenger arrivals (including returned Americans) numbered toward 8,000, in 1817 22,240. The numbers and hardships from overcrowding drew out legislation noted later; and from 1 Oct. 1819 account has been kept at all customs ports of the number, sources, and conditions of arriving aliens. The following table gives the number in each year since.

IMMIGRATION TO UNITED STATES BY YEARS.

Year ending 30 Sept.		Year ending 30 Sept.	
1820	8,385	1843	52,496
1821	9,127	1844	78,615
1822	6,911	1845	114,371
1823	6,354	1846	154,416
1824	7,912	1847	234,968
1825	10,199	1848	226,527
1826	10,837	1849	297,024
1827	18,875	1850	310,004
1828	27,382	1850 (1 Oct. to 1 Dec.)	59,976
1829	22,520	1851 (Jan. to Dec.)	379,466
1830	23,322	1852	371,603
1831	22,633	1853	368,645
1832 (to 31 Dec.)	60,482	1854	427,833
1833 (Jan. to Dec.)	58,640	1855	200,877
1834	65,365	1856	195,857
1835	45,374	1857 (to 30 June)	112,123
1836	76,242	Year ending 30 June	
1837	79,340	1858	191,942
1838	38,914	1859	129,571
1839	68,069	1860	133,143
1840	84,066	1861	142,877
1841	80,289	1862	72,183
1842	104,565		

Year ending 30 June		Year ending 30 June	
1863	132,925	1884	518,592
1864	191,114	1885	395,346
1865	180,339	1886	334,203
1866	332,577	1887	490,109
1867	303,104	1888	546,889
1868	282,189	1889	444,427
1869	352,783	1890	455,302
1870	387,260	1891	560,319
1871	321,350	1892	479,663
1872	404,806	1893	439,730
1873	459,803	1894	285,631
1874	313,339	1895	258,536
1875	227,498	1896	343,267
1876	169,986	1897	230,832
1877	141,857	1898	229,299
1878	138,469	1899	311,715
1879	177,826	1900	448,572
1880	457,257	1901	487,918
1881	669,431	1902	648,743
1882	788,992	1903	857,046
1883	603,322		

Totals since 1820, 20,952,467. But it must be remembered, first, that up to 1856 the record is of all "alien passengers arrived," without discriminating passengers from immigrants, so that much should be abated from this total; second, that the immigration overland from Canada and Mexico is not counted in — and in 1900 Canada was put down as the birthplace of 1,183,255 persons, and Mexico 103,445 — so that a great amount should be added to the total. On the whole, it seems probable that these accessions have far more than balanced the above duplications, though not the other duplications of the same emigrants coming and going.

IMMIGRATION BY DECADES.

1821-1830	143,439	1861-1870	2,318,824
1831-1840	599,125	1871-1880	2,812,191
1841-1850	1,713,251	1881-1890	5,246,616
1851-1860	2,598,214	1891-1900	3,844,420

Since 1900, 1,993,707, or half as much in the past three years as in the whole previous decade. The number of arrivals reported in 1903 exceeds the largest number for one year (1882) by 68,054.

The barest glance at the first table shows that it has eight well-marked periods, though with notable fluctuations within them. The first is from the beginning to 1826 inclusive, with a slow increase to about 10,000 in 1794. Thence to the end of 1831 it rather more than doubles; probably from reports of the fertile lands just reaching a wider stratum of peoples, and the miserable European industrial conditions of the time of the Holy Alliance. Then with a sudden bound it almost trebles, and with a sharp drop after the panic of 1837, rises to seven-fold in 1846; the first leap perhaps due to the opening up of the West by steamer navigation, the steady increase due to the same and to railroads making the central lands easy of access. The Irish famine then begins to swell it to a torrent, shortly increased by the California gold discoveries, which do not exhaust their effect till 1854. The sudden drop then, and its continuance later, may be laid to several causes. The anti-foreign agitation in this country, owing to the flood of foreigners demoralizing politics and industry, probably had much effect; then the business depression of 1857 and the following years, merging into the War, kept it down in spite of the efforts of the steamship agents, now penetrating every country for business. Later in the War, the scarcity of labor here, owing to the drain of the able-bodied, drew in a larger immigration of laborers; but the new period fairly begins only after the War. From 1866 to 1873, the great

inflation time, when countless new enterprises were started and new railroads built by thousands of miles, was naturally a palmy time of immigration. Then the great panic and the ensuing hard times struck it down and kept it down till 1879. The revival in 1880 brought it back instantly to the mark of eight years before, and two years later it reached a climax not again attained till 1903; and it has never gone down to near its old mark except for two years, 1897 and 1898, the drop 1894–8 being due to the panic and hard times. Of course each increase tends to widen the next, arrivals encouraging others to come.

2. The following table shows the number and proportion of the foreign-born for the past half-century, and also the native-born of foreign parentage, single or mixed, for 30 years, indicating the foreign strain in American blood.

Census years	Total Pop.	Foreign-born		One or both parents foreign	
		Number	Per cent	Number	Per cent
1850	23,191,876	2,244,602	9.7	.....	.....
1860	31,443,321	4,138,697	13.2	.....	.....
1870	38,558,371	5,567,229	14.4	10,892,015	28.2
1880	50,155,783	6,679,943	13.3	14,922,744	29.8
1890	62,622,250	9,249,547	14.8	20,676,046	33.
1900	76,303,387	10,460,085	13 7	26,198,939	34.3

Comparison of this table with the first two shows some striking facts. In 1850, of the 2,500,000 (about) who had come into the country since 1815, only one tenth were dead or had re-emigrated in the 35 years. It is true that nearly one half the whole had come in within five years; but even so, this is a suspicious showing, and suggests a large overland emigration from Canada (especially during the gold fever 1849–50) which does not figure on the records. Every succeeding census has shown a large and increasing discrepancy between the arrivals and the remaining foreign population, the falling-off being sometimes difficult to explain except by duplications, re-emigrations, and a heavy death-rate. As the grandchildren of the arrivals of two generations ago are now "Americans," the percentage of foreign-born is not rising, and even that of the whole foreign-parentage class is but little greater than that of old, under the enormous flood of immigrants.

3. Most of the early arrivals came from Great Britain; about 110,000, or 76.5 per cent, from 1820 to 1830, while Germany sent about 10,000. In 1850 the foreign-born of Anglo-Saxon blood, English, Scotch, and Canadian, must have been over 750,000, while that from Celtic Ireland was probably 650,000 — about 60 per cent from all Great Britain; the Germans furnished 584,000, or 36 per cent. The Teutonic blood was overwhelmingly dominant still, and the Anglo-Saxon largely so. In 1860 the elements were still much the same: Great Britain claimed nearly 2,500,000, or 60 per cent, Germany 1,276,000 or over 30 per cent. None others were of much account. In 1870 the totals were much larger for the older elements, but the British percentage was dropping, and other elements coming forward: Great Britain and Canada showed 3,120,000, or about 55 per cent; Germany 1,690,000, about 30 per cent as before; but there were nearly 250,000 Scandinavians against some 60,000 the decade before, and 40,000 Bohemians. Of the Canadians, probably 150,000 were French. In 1880 the still increasing British and English-Canadian contingent showed about 47.5 per cent; the German holding its own well, some 30 per cent; making over 2,000,000 in all. But there were 85,000 Bohemians, 48,000 Poles, 440,000 Scandinavians, 44,000 Italians, and 35,000 Russians. In 1890 the change was marked, though the Teutonic strain was still farther to the fore: the Germans and German Swiss and Austrians footed up nearly 3,000,000, or about 33 per cent, Great Britain and English Canada furnished about 2,700,000, now only about 29 per cent. But Poland, Russia, and Bohemia now showed nearly 450,000; Italy, 182,500; Hungary, 62,435; Austria, 123,271, much of it Slav; Scandinavia, 933,000. In 1900, the tendency had become so striking as to necessitate a further grouping for clear perception of its meaning: Poland, Russia, Bohemia, and Hungary — in a word the Slav countries — were the birthplaces of over 1,000,000 Americans, nearly 10 per cent of all our foreigners; Italy of nearly 500,000; Mexico of over 100,000; Scandinavia of over 1,000,000; France and French Canada of about 500,000: the whole representing nearly as great a share as Great Britain. If the showing is by immigration and not by the masses still living from the old immigrations, the account is far more impressive: the percentage of Great Britain had sunk in half a century from over half the total to 19.4 per cent; of Germany, from 38 per cent to 14; while the Scandinavian had risen from a neglectible quantity to about 10 per cent of the whole, and the East European, from practically nothing, had risen in the decade to 1,186,000, or nearly 31 per cent. The following table for half a century by decades, and for 1901–3 separately, tells its own story:

	England and Scotland	Ireland	Germany	Norway and Sweden	Italy	Russia including Poland	Austria-Hungary
1851-1860.....	423,974	914,119	951,667	20,931	9,231	1,621	.....
1861-1870.....	606,896	435,778	787,468	109,298	11,728	4,536	7,800
1871-1880.....	548,043	436,871	718,182	211,245	55,759	52,254	72,969
1881-1890.....	817,357	655,482	1,452,970	568,362	307,309	265,088	353,719
1891-1900.....	342,357	403,496	543,922	325,943	665,668	588,866	597,047
1901-1903.....	64,065	94,542	90,041	144,547	544,993	328,697	491,380

A still further condensation will present the essential elements even more clearly:

	Teutonic and Anglo-Celtic	South and East European
1871-1880	1,914,341	179,982
1881-1890	2,494,171	926,116
1891-1900	1,615,718	1,841,581
1901-1903	393,195	1,365,070

Nearly as many have come from southern and eastern Europe in the past three years as

in the entire preceding decade; while the Teutonic strain, even when reinforced by the great Scandinavian flood, has dropped to less than a fourth of that, and less than a sixth of what it was 20 years before.

4. The distribution of this mass of immigrants in the United States may be considered in various aspects — of foreigners as a whole, and of special races; of foreign-born as bearing on politics and industry, and of all with immediate foreign blood as bearing on heredity and sociology. Here we shall consider both; the latter to some extent, but the second first. In the last census, of 25,928,462 persons of foreign parentage, about seven eighths were in the North Atlantic and North Central divisions, where are the great manufacturing cities and abundance of fertile land. The first division had slightly the more. Only 1,659,069 were in the South Atlantic and South Central divisions together. Of cities, too many to mention have a majority of this population of foreign parentage; of cities with 25,000 and over, by the census of 1900, 93 had over 50 per cent, and 18 over 75; while 6 — Fall River, Holyoke, and Lawrence, Mass., Hoboken, N. J., Woonsocket, R. I., and Milwaukee, Wis. — had over 80 per cent. The highest percentage was in Fall River, 86.1. Of Massachusetts' 20 cities of this size, only 1, Haverhill, had less than half of foreign parentage, and that had 48.9.

Of course these figures, which seem very large, have no bearing on the question of Americanism in feeling or action. The children of foreign parents are not less intensely American than those of natives; it is their own country. The figures of actual foreign birth are very different. North Dakota still leads, but with only 35.2 per cent; Rhode Island 31.1, Massachusetts 29.9, Connecticut 26.1, New York 25.9, Minnesota 28.8, Wisconsin 24.8. Of cities, none have a majority of foreign-born, and but one over 40 per cent. But this concentration of the foreign-born in the cities is precisely one of the gravest elements in the problem. In 161 principal cities in 1900 was nearly half — 49.2 per cent — of the total foreign-born, making 26.1 of their population, against 9.4 per cent of the total in the rest of the country.

Of the nationalities which have formed "colonies" in the different places, those with the less understood tongues are of course the most prominent. Religion is occasionally potent, as well as proximity: thus the French Canadians keep together as Roman Catholics, and mostly in New England as nearest home. The Italians, city more than farming folk, are most numerous in New York, Boston, Chicago, New Orleans, and San Francisco; the Norwegians, mostly agriculturists, in Wisconsin, Minnesota, and the Dakotas; the Poles, city men, chiefly in New York, Boston, Philadelphia, Chicago, Milwaukee, Detroit, Minneapolis, and St. Paul; the Bohemians in New York, Chicago, and Cleveland; the Swedes in New York, Boston, the Connecticut cities, Philadelphia, Illinois, and Minnesota; the Welsh, not as Celts but as miners, mostly in the Pennsylvania mines. In 29 cities of which the census gives a special report, the Germans predominate over all other foreigners in 17: the greatest actual number being in New York, which had 322,343; though the greatest percentage, 65.9 of the whole foreign population, is in Cincinnati, Milwaukee having 60.5, Louisville 57.8, and St. Louis 52.8. The Irish nave a majority in 9, the chief lead being in Cambridge, Mass., 36.9. The French Canadians predominate in Fall River and Lowell, Mass., cotton-mill cities, with 40.3 and 35.8 per cent. The Swedes have the greatest number in Minneapolis, 32.8 per cent.

5. The question of occupations of the foreign-born is of the first importance, as bearing on that of wages, which they are supposed to lower. We have to discriminate between several facts in this: (1) their distribution between occupations; (2) the total number of working age; (3) their concentration in cities where most of the manufacturing is carried on. The last has already been shown. For the others, the government volume dealing with the census of 1900 is not yet issued; but that of 1890 in this regard probably differs little. The report of the occupations assigned by intending immigrants year by year gives little help, as they drift into various occupations; but it may be said that in 1902, of 495,500 male adults, only 80,000 were skilled laborers, and less than 3,000 professional men. This is natural, the best men being fairly placed at home, as a rule. In 1890, while the foreign-born over 15 formed 22 per cent of the whole population of that age, they formed 36 per cent of the domestics and menials, and 34 per cent of the hands in the manufactories. In special employments, they showed far more striking totals. They formed 71.12 per cent of all tailors, 59.52 per cent of bakers, 53.13 per cent of hucksters and peddlers, 49.66 per cent of restaurant and saloon keepers, 47.62 per cent of leather-workers, over 46 per cent each of stone-cutters, textile-mill hands, and cabinet-makers, and 44.5 per cent of gardeners, florists, and that class.

6. As to social effects, where the foreign-born are of moderate numbers, and do not increase faster than the general development of industries, they can hardly depress wages much; and two of the complaints made against them — that they lower wages by willingness to accept a poor standard of living, and demoralize industry by readiness to strike — cancel each other. They cannot at once be satisfied with poor pay and unsatisfied with fair pay. But when concentrated into special occupations in the cities, as the enormous tailoring contingent in the sweat-shops, where for a time they are willing to work for starvation wages to get on their feet, they can and do for a considerable time ruin all decent workers' prospects, depress wages below an endurable point, and drive natives or better-grade foreigners out of the trade, after extreme distress.

Politically, facts do not warrant the belief that the foreign element exercises the corrupting influence, either by ignorance or venality, that is often attributed to it. There are no worse governed or more corrupt cities in the Union than some where the foreign element is relatively small; nor is there any evidence that as a whole they are more easily swayed by appeals to selfishness. They are, however, the chief ingredient of political and industrial mobs.

Regarding crime, the usual statistics are misleading both for and against the immigrants. On the one hand, they restrict the records to the serious crimes, in which the native-born

"tough," from his rearing and training into thorough knowledge of his surroundings, and superior chances of escape, naturally takes the lead; while the foreigner, from his great predominance among those with short sentences, seems to swell heavily the volume of petty crime. It is believed also, probably with truth, that the native-born of foreign parents are worse than their fathers and vastly worse than the native white. On the other hand, the statistics of crime are for the whole population, not for the adult males of youth and middle age, who mainly commit it; on the same basis, the foreign portion makes no worse showing than the native. Still again, it is believed that the fact of the foreign population being mostly of the lower orders in wealth and social position has much to do with it, and that class for class, there is little difference.

In pauperism, there can be no question that the foreigners, mostly coming with nothing and having no friends to care for them, should swell the pauper population immensely. In 1890 there were over 3¾ times as many foreign-born as native-born paupers.

As to insanity, there is a considerably larger tendency to it in the foreigner than the native; most likely from greater average debility of constitution, which shows in the brain as well as in other organs. Between the ages of 25 and 55, the period which furnishes most of the patients, there was in 1890 a percentage of insane foreigners more than half as large again as that of natives.

With regard to illiteracy, while the foreign-born white is naturally much less educated than the native, his children average fully as well.

7. The first legislation in the United States on the subject of immigration was of 2 March 1819, and merely provided that a record should be kept of the number of passengers arriving in each customs district, with their sex, age, occupation, and country of birth. For many years there was no thought of anything but exultation in the number of arrivals, as increasing the wealth of the country, and providing an asylum for the poor and oppressed. Even the Know-Nothing agitation of the fifties, prompted by political reasons (see AMERICAN PARTY), led to no restrictive legislation. In 1864 the first immigration act was passed by Congress, and was to promote and not restrain it; this was repealed 1868. Several States established immigration bureaus to encourage it and draw it their way. On 3 Aug. 1882 the first restrictive act was passed, but only to bar out criminals, insane, paupers, etc. Head taxes were imposed as a fund for relieving the distressed, etc. Foreign convicts (non-political), lunatics, idiots, and those liable to be a public charge, were to be returned at the expense of the owners of vessels on which they came. The secretary of the treasury was empowered to carry it out and make suitable regulations, and to make contracts with the State officials. On 26 Feb. 1885 a more drastic one was passed, which was well meant, but from its sweeping character has been, as enforced by fanatical or interested persons, the source of much useless hardship, and has tended to make the country ridiculous. This was to prohibit any laborer coming over under contract to work; it did not except professional men or skilled laborers, and while it was aimed at strike-breakers and cheap gangs, was enforced against artists, musicians, architects, etc., and even clergymen, to the discredit of the country's good sense. It has since been somewhat modified. In 1891 the act of 1882 was extended to other classes, and to all "assisted" immigrants not affirmatively shown to be without the terms of the act. This act took the entire matter into the hands of the general government. The act of 3 March 1903 still further amended it by requiring a preliminary inspection at point of departure, and giving the government the right to deport the immigrant landed in defiance of the act within two years after arrival; it also extended to all persons advocating the overthrow of all governments and the assassination of public officials. The number of persons deported under the act of 1882, mainly for pauperism, had been 28,184 from 1891 to 1900, out of 3,844,420 immigrants.

For statistics, see 'Monthly Summary of Commerce and Finance,' by the government; and U. S. Census, 1890 and 1900. See also 'Reports of the United States Industrial Commission on Immigration,' and the article 'Restriction of Immigration,' by Francis A. Walker, in the 'Atlantic Monthly,' LXXVII., 23.

FORREST MORGAN.

Immortality, the survival of the individual, with complete self-consciousness, after death. The belief in immortality can be traced with more or less clearness in the general races of mankind, excepting the most primitive and barbarous.

Barbarous Races.— Sir John Lubbock, in his 'Origin of Civilization, and the Primitive Condition of Man,' denies that the African negroes have any idea of a future life. He quotes Captain Burton as saying that "they believe in a ghost but not a spirit, in a present immaterial, but not in a future; counting on nothing but a present life there is for them no hope beyond the grave." Other negroes, however, think that after death they become white men, a belief which is found in Tasmania, in Tanna, New Guinea, and New Caledonia. In the Tonga islands the chiefs are regarded as immortal; Tooas or common people are mortal. Although the Fijians believe that almost everything has a spirit, few spirits are immortal; the road to Mbulu, the abode of the happy dead, is long and well-nigh impassable, so that few attain to immortality; and a similar view is held by Eskimos and Kaffirs. "The hill tribes of Bengal," says Colonel Dalton in his 'Ethnology of Bengal,' "utterly reject all notions of a future state." The Haitians, however, believed that there was a paradise of the dead situated in the beautiful western valleys of their island. In Tonga the souls of the dead are thought to be transported to a large island stocked with the richest fruits and the fairest flowers. In Dahomey the king constantly sends messages to his deceased father, by messengers who are put to death for that purpose. But there is much contradiction in the reports given by travelers and ethnologists; thus Daniel G. Brinton, in his 'Religions of Primitive Peoples', says: "So filled was the mind of primitive man with the vision of universal and immortal life, that to him there was no such thing as death. The fact, indeed, remained. The tree was shriveled by the lightning, the brute fell by the arrow, man himself gasped his last breath, and lay an inert mass. The

loved child, the warrior hero, passed out of sight to the unseen beyond. But not forever. No! They hovered around the familiar spot, they visited the living in dreams, their voices are heard in the rustling leaves and the falling waters." According to Tylor and Brinton the Indians of both North and South America believe in a future state of existence. The Scandinavians had their Valhalla; the Celts of Britain and Gaul would lend money, taking a note for its repayment in the next world, as the Japanese of to-day are said to do.

Among civilized peoples the idea of immortality has been one of the clearest and most potent elements in their religious systems. Man is a religious animal, and generally his belief in his own survival beyond the grave has been the centre of his creed.

Assyrians.—According to Maspéro, the Assyrians did not, like the Egyptians, believe that the tomb was a house for eternity. The eternal dwelling-place for the soul was far from the tomb, either in the bowels of the earth, or at the Oriental or southern extremities of the universe. There they are judged by the gloomy goddess Allat, who assigns them their places. But the great and good are welcomed into a fertile island, cheered by the sun and having in the midst of it the tree and the river of life. At last heroic souls are received by the gods into their own kingdom on the serene summit of the mountain of the world.

Egyptians.— The Egyptians had dogmatized their views of immortality into a clear and consistent system. After embalming and burial, the soul takes the form of a double, and leaves the tomb occasionally in search of food; but it is also believed that after a longer or shorter sojourn with the dead body the soul migrates to another land. This land consists of three kingdoms of the dead, over each of which reigns a separate divinity. Those Egyptians who have been especially devout toward the sovereign divinity are welcomed here. The most populated is the kingdom of Osiris, consisting of many islands, which may be seen from the earth at the southern extremity of the Milky Way. The voyage to these islands is long and perilous. At last they are reached and the souls are ushered into the court of Osiris, with his 42 assessors. The hearts of the dead are weighed in the scales of Thoth, and they are eventually declared worthy of entering the Field of Beans, a place of teeming fertility, where their life is spent in cultivating and harvesting the crop, and in feasting, singing, playing during their hours of leisure.

Hindus.— The followers of Brahma and Buddha believe in the eternity of the human soul under some form or other, Nirvana or metempsychosis; the Chinese, by their ancestor-worship, acknowledge the immortality of mankind; while the Parsees, like their forefathers, the Zoroastrians of Persia, have always believed in the undying nature of the soul.

Greece.— Before the dawn of Ionian philosophy in Greece there was a vague and poetic anticipation of a future life among the Hellenic races. In Homer we see the under-world revealed to Ulysses, where the wrong-doers are punished. Heroes, like Hercules, are given a place among the gods of Olympus, where they are classed as demigods. More or less conventional as was the idea of a future state, it was yet permanent in Greek religious thought. Both as suggested in the mysteries and in poetry, which was the theology of the age, the notion of a prolonged existence beyond the tomb was never extinguished. The death of Œdipus was hinted at by Sophocles as a sort of translation to a happier life. When Greek philosophy reached its highest culmination in Plato the doctrine of the soul's immortality became an integral part in accepted doctrine, and Socrates drank the hemlock with the immortal declaration, "Those who have lived well and piously, pass from these scenes of earth, like prisoners set free, to a home on high, where they shall dwell in unclouded peace."

Romans.— In the palmy days of their literature the Romans absorbed the ideas of the Greeks with regard to a future life. Cicero had a philosophical belief in immortality, but he does not allude to it in the time of his bereavement. Virgil and Horace each reflect the mythologic imagery of the Greek poets. Horace sees "Augustus with gleaming face sipping nectar" with the Olympian divinities; Virgil copies Homer in his description of the Elysian Fields and the torments of the under-world. None of the Greeks or Romans, excepting Epicurus and Lucretius, his Latin expounder, ever maintained that death is the end of all things.

The Hebrew View.— It has sometimes been considered that the Jews had no definite ideas or beliefs about a future life. It would not be safe to assert this. There can be no doubt that the patriarchs' creed of the future, "of the last days," was one of hope. In the 8th century B.C. all the prophets looked forward to what they styled "The Day of the Lord," that is, the day of final and universal judgment. That day was terrible to the wicked; by the just it was looked forward to with unmixed joy, for with it was the coming of the perfect kingdom of God, which, according to Ezekiel, would result in a restoration of Israel even from the dry bones of the Valley of Death.

The Christian View.— The Christian view of immortality is well known. It is stated by Christ and Saint Paul in the most distinct and literal terms. It is connected with "the Day of the Lord" of the Jews, the coming of Christ to judgment, the opening of the graves, the resurrection of the body, the punishment of the wicked, the eternal life of the faithful in Jesus and through Jesus.

The Philosophical View of Immortality.— The belief in immortality among savages has been largely a matter of instinct. Among the non-Christians of the civilized world it has been a portion of a hieratic tradition enforced by custom. Among the Hebrews and Christians it has been considered matter of revelation and subject of faith. There have nevertheless been many attempts made to base this doctrine on reason. The first attempt was made in Plato's 'Phædo,' which no one nowadays can seriously consider. Kant, Locke, and many other modern metaphysicians have excluded the immortality of the soul from the province of natural theology. Other philosophers maintain the immortality of the soul on the ground that the soul has capacity for knowledge and goodness not attainable in this life; that the law of contraries obtains in nature, and if life ends

in death, death itself must be succeeded by life. They argue for immortality from the reminiscences of a previous existence which the soul seems to bring with it into this life; from the invulnerability and vitality of the soul, which survives the loss of sight, hearing, taste, dismemberment, or power of locomotion, and does not suffer with the body, and must therefore outlive it.

The belief in immortality has been a great motive power in human regeneration since the collapse of the Roman empire. It was certainly the keystone of the arch in the splendid civilizations of Egypt and of Assyria. It has been claimed for this doctrine that it raised the conquered barbarians of the broken Roman rule to a refined reign of humanity and order, that it abolished slavery in Europe and taught the equality of man; that it opened a new era of justice in government, of pity to the weak and poor. It is certain that without this doctrine there would have been no Saint Paul, no Saint Francis, no Dante, none of the great works of Christian piety, the great Christian institutions which have preserved and disseminated letters, fostered the arts of medicine, raised the fairest monuments of architecture, and not only discovered new islands and continents, but opened up the great missionary highways which have carried light and civilization to the ends of the earth.

Consult: Lubbock, 'Origin of Civilization, and the Primitive Condition of Man'; Dalton's 'Ethnology of Bengal'; Brinton's 'Religion of Primitive Peoples'; Maspéro, 'Ancient Egypt and Assyria'; Johnson, 'Oriental Religions,' including 'India,' 'China,' 'Persia'; Sellar, 'Roman Poets of the Augustan Age'; Dyer, 'The Gods in Greece'; Plato, 'Phædo'; Colani, 'Jesus Christ et les Croyances Messianiques de Ses Temps'; Drummond, 'Jewish Messiah'; Salmond, 'Christian Doctrine of Immortality'; Alger, 'History of the Doctrine of a Future Life,' with bibliography by Ezra Abbott; Weiss, 'The Immortal Life.'

EPIPHANIUS WILSON, M.A.,
Editorial Staff of the 'Encyclopedia Americana.'

Immortelle. See EVERLASTING FLOWERS.

Immunity. It has been a common observation that certain individuals are prone to the infectious diseases, and others not. Some children in a family always "take things hard," while others are not susceptible. This resistance to the poisons of the infectious diseases, or to the bacteria that cause the poisoning, is termed immunity. It is a relative quality of living matter, and is not confined to man alone, for lower animals, and even plants, show marked variations in their reactions to chemical and organic poisons. Thus certain plants are capable of growing in soils impregnated with metallic poisons of sufficient strength to destroy animal life; many animals are immune to poisons that would kill man; thus birds are comparatively immune to strychnine; young children can take comparatively larger doses of belladonna than adults; the diseases of plants are almost unknown among animals, and *vice versâ;* certain diseases affect the lower animals and are rare or unknown in humans, and the reverse condition also holds true; thus swine-plague is comparatively unknown in other animals than pigs, and such human diseases as typhoid fever and cholera are not common in lower animals; thus plants, lower animals, and man, individually and collectively, enjoy certain relative immunity from destruction when exposed, under ordinary circumstances, to disease-producing agencies.

Natural immunity may be so modified as to be lost entirely, certain forms of disease predisposing the sufferer to ready secondary infection, as, for instance, is seen when tuberculosis follows measles; or a partial immunity be made more effective, or a new immunity conferred. This has been termed acquired immunity. The evolutionary doctrine would tend to interpret natural immunity as an inherited acquired immunity. In the case of man immunity sums up those powers of resistance which the body naturally possesses, or which it acquires in the struggle with infectious diseases, both in endeavoring to destroy the bacteria — bacteriolytic power—and to counteract the toxins—antitoxic power. Modern pathology has shown that the battle-field is a large one, and that the opposing forces are numerous and their powers largely unknown; and it must be remembered that the struggle has been going on perhaps for millions of years.

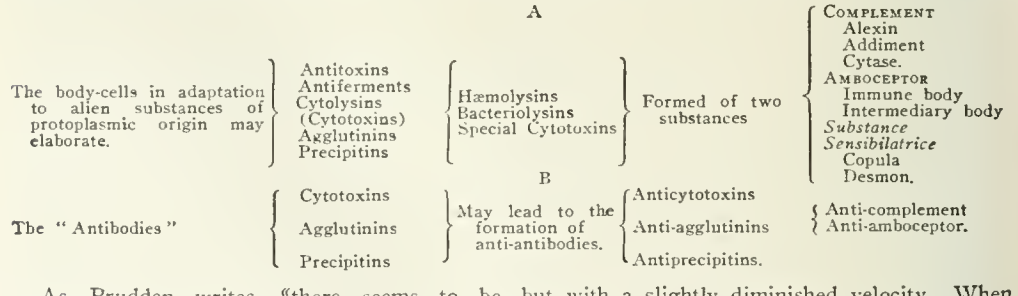
The observation that certain diseases—as measles, scarlet fever, smallpox—once acquired, confer a marked immunity, led up to vaccination, this inoculation against smallpox being the first conquest of disease by such means. It is certain that others will follow. Certain diseases—notably pneumonia, influenza, erysipelas—confer an immunity, but it is not lasting; thus demonstrating the principles of variability in the "immune bodies" as a class, and of an active and a passive immunity which may be conferred by various means, an active immunity being acquired by the animal for itself by direct adaptation, a passive immunity being conferred by a body made in the blood-serum of another animal.

Former theories for explaining the varied picture in this rapidly widening study have been numerous. They may be classed under the *exhaustion theory* of Pasteur, which assumed that the bacteria used up the available food-supply and died; or, as the laity often express it, "the disease wore itself out." This theory has been thoroughly disproved. The *retention theory*—that the bacteria are killed by their own products—is also untenable. The *mechanical, humoral,* and *phagocytosis* theories, which teach that the bacteria are destroyed by the humors or cells of the body, are partly true, but do not convey the whole truth, which in fact may never be known. The most popular theories of the present time are chemical, and that known as Ehrlich's *side-chain theory* is uppermost in discussion. This theory is extremely elaborate, but its fundamental principle is that the blood-serum of man and other animals may be so modified, in whole or in part—experimentally played upon, as it were — that it can be made to overcome the effects of infections, of poisons, or of both. The development of the diphtheria antitoxin in the blood-serum of the horse, to counteract the effects of the toxin of the diphtheria bacillus in man, was the first important practical deduction of this great principle. It was the first illustration of the production of a successful passive immunity in human

pathology. In the discovery of the diphtheria antitoxin it was hoped that all the infectious diseases were conquered, but this hope was premature, as it was learned that other diseases involved other factors of a more elusive character than the simple toxin. The destruction not only of the bacteria within the body, but the neutralization of the poison as well, was found necessary, and hence the terms bacteriolytic immunity and antitoxic immunity. Ehrlich's side-chain theory tries to explain antitoxic immunity in chemical terms. He assumes that the cell-body has a number of side-chains upon it — receptors, as they are termed. These are capable of combining with food-products for the metabolism of the cell. There are certain receptors that can combine with toxic products as well, with damage to the cell. Antitoxins, according to Ehrlich, consist of surplus receptors made by the cell and cast off in the blood-serum. These unite with the toxin in the serum, and thus save the receptors of the cell for their normal food-taking properties. Any surplus of receptors over and above those combined with the toxin molecules floating in the blood are available as free antitoxins in the treatment of toxin-caused disease.

The other phase of the subject of immunity is concerned with the ability of bodies themselves to destroy bacteria — bacteriolytic immunity. It is known that if the blood-serum of certain animals is injected into an animal of a different species, the red blood-cells of the injected animal are destroyed. This process has been termed hæmolysis, and is observed under other conditions, as in poisoning by drugs, such as acetanilid, sulphonal, etc. A similar action of blood-serum on certain bacteria can be brought about by artificial means, thus manufacturing a *bacteriolytic* serum for use in destroying given bacteria in the human body. The various terms that are used in elaborating this hypothesis may best be expressed in the form of a chart, since in medical literature so many synonyms have been in vogue.

Table showing various forms of adaptation products with their relationships and synonyms. (From Prudden.)



As Prudden writes, "there seems to be abundant ground for the belief that the protective agencies which are evoked in both natural and artificial immunization are simply those which the body makes use of in its normal metabolism, exaggerated and diverted to different ends, it is true, in the face of emergencies, but giving evidence of the birth of no new physiological capacities." "The new methods of research and the far-reaching conceptions which they have stimulated and fostered seem likely to mark a new era in physiological chemistry, and to link more closely than any other extension of knowledge in our time some of the most subtle and urgent problems of medicine to the wider outlooks of general biology."

Consult: Welch, 'Recent Studies on Immunity' ('Medical News,' 18 Oct. 1902); Prudden ('Medical Record,' 14 Feb. 1903); Ritchie ('Journal of Hygiene,' Vol. II., Nos. 2, 3, 4. 1902); and for general works, Flügge, 'Die Mikroorganismen'; Muir and Ritchie, 'Manual of Bacteriology' (1903); Kolle and Wassermann, 'Bacteriology' (1903).

Smith Ely Jelliffe, M.D.,
Professor of Bacteriology, College of Pharmocy, City of New York.

Im'pact, the action which results on the coming together of two bodies, one or both of them in motion. If an ivory ball fall on a marble table which has a thin coating of oil, after impact the ball is found to have on its surface a patch of oil, which shows by its size that the ball must have been compressed at the moment of impact. When two bodies come into collision they compress each other at the points that touch until they have each the same velocity; during this time of compression each body acts upon the other with exactly the same impulse, the momentum lost by the one being gained by the other; if now the bodies are perfectly inelastic no further mutual rebound will take place; if the bodies are elastic they will regain their old shape, and the mutual impulsive forces of restitution will cause separation. The impulsive forces of restitution are found to be less than those of compression; that is (see Impulse), the momentum lost or gained by either of the bodies during the second or restitution part of the impact is less than the momentum lost or gained in the first or compression part of the impact in a certain ratio which is called the elasticity of the bodies. In a perfectly elastic body this ratio would be equal to 1, in a perfectly inelastic body it is 0.

Thus, when one ivory ball comes into direct collision with another of equal size at rest, the first comes to rest and the second moves in the direction of motion of the first before impact, but with a slightly diminished velocity. When two equal ivory balls come together with equal and opposite velocities each returns on its old path with a velocity slightly lessened. When one perfectly inelastic body overtakes or meets another directly the common velocity after impact is equal to the sum or difference of momenta of the bodies before impact divided by the sum of the masses.

In a collision of two balls not perfectly elastic it may be shown that the total energy of

motion (see ENERGY) of the two balls after collision is less than it was before, some of it having been converted into heat.

Impeach'ment, the accusation and prosecution of judicial and executive officers for misdemeanors involving an abuse of their official functions, or immediately connected with those functions. In Great Britain the tribunal before which impeachments are tried is the House of Lords, and the impeachment is made by the House of Commons. The person impeached may be either a peer or a commoner; but while a peer may be impeached for any crime whatever, a commoner cannot be impeached for a capital crime. The method of procedure is this. A member of the House of Commons charges the accused with high crimes and misdemeanors, and moves that he be impeached. If the motion is carried the member is ordered to go to the bar of the House of Lords, and lay the impeachment before that tribunal. The lord high-steward presides at the trial. After the charges have been laid, and the answers of the accused heard, the lord high-steward puts the question whether the accused be guilty or not guilty of the crimes charged in the first article of impeachment to each of the peers in succession, beginning with the junior baron, and each of the peers answers "guilty" or "not guilty," as the case may be, "upon my honor." The lord high-steward gives his own opinion after all the other peers. The same question is then put with regard to all the other articles of impeachment successively, and the result is declared by the lord high-steward. The question of guilty or not guilty is decided by a majority of votes.

By the Constitution of the United States the House of Representatives is given the sole power of impeachment; and the Senate has the sole power to try all impeachments, and provides that at the trial of a President the chief justice of the Supreme Court shall preside. Section 4 of Article II. provides that the President and Vice-President and all civil officers of the United States shall be removed from office on impeachment for and conviction of treason, bribery, or other high crimes or misdemeanors, and the trial of officers by impeachment has been attempted seven times in the history of the United States. First came the Blount case. William Blount, United States Senator from Tennessee, was in 1797 impeached for conspiring with British officers to steal part of Louisiana from Spain for England's benefit. The Senate expelled him, after putting him under bonds for trial, but his defense being that a Senator was not a civil officer liable to impeachment, on the question of jurisdiction he was acquitted. John Pickering, judge of the Federal district court for New Hampshire, being impeached in 1803, for drunkenness and profanity on the bench, was convicted and removed from his office. Samuel Chase of Maryland, a justice of the Supreme Court of the United States, in 1804 was charged with having indulged in "highly indecent and extra-judicial reflections upon the United States government," in the course of a charge to a Maryland grand jury, and with other improper conduct on the bench. The impeachment proceedings, instigated and managed by John Randolph of Virginia, were political in their origin and animus. Judge Chase was acquitted. The prosecution failed to obtain a two thirds vote against him on any one of the eight articles of impeachment and, resuming his seat on the bench, he held it as long as he lived. Judge West H. Humphreys of the Federal district court of Tennessee, joined the Confederacy at the opening of the Civil War, and accepted office under it, without previously sending his resignation to Washington. He was impeached, mainly in order to vacate the office, and convicted on 26 June 1862. Andrew Johnson was impeached on 4 March 1868. He was charged in 11 articles with violating of the Tenure of Office act, with violating of the Constitution, conspiring to prevent the execution of the Tenure of Office act, and with utterances tending "to bring the high office of President into contempt, ridicule, and disgrace." This memorable trial lasted for nearly three months, and the fiercest of political passions were excited by it. Thirty-six votes were needed to convict. No vote was ever taken except on the three strongest articles, the 2d, 3d, and 11th, and on each of these the Senate stood 35 for conviction to 19 for acquittal, impeachment failing by a single vote. The seventh impeachment recorded was that of William W. Belknap, secretary of war under President Grant. He was accused in 1876 of corruption in office, and the House voted unanimously to impeach him. He resigned before the passage of the resolution, but, although his resignation was accepted by the President, the trial proceeded. The impeachment proceedings failed by the lack of a two thirds majority in the Senate for conviction.

Imperative Mandate. See REFERENDUM.

Impe'rialism, the national policy which tends toward the expansion of national domination and national ideas over a geographical area wider than that of national boundaries. Thus ancient Rome extended her dominion and system of government, attended with her laws and language first over the whole of Italy, then over Sicily, Northern Africa, Spain, Gaul, Greece, and parts of Asia. Charlemagne's idea was to hold France, Germany and Spain under one imperial head. Napoleon wished his empire to comprise all Europe. English nationalism has been partly a wide scheme of colonization, and partly as in India a plan for subjugating and Anglicizing a cluster of Oriental races. In the United States the term imperialism has been used in a more or less factitious sense. The avowed object of the government at Washington in the Spanish War was the liberation of Cuba from the Spanish yoke. The term "imperialism" was employed as a political catchword in the presidential campaign of 1900, especially with regard to the purchase of the Philippines. Yet the United States cannot scientifically be styled an empire, or likely to develop into an empire. The Supreme Court on 2 Dec. 1901 has, however, decided on the constitutionality of expansion. The principles settled by the decision are thus to be stated: (1) The Constitution does not follow the flag till it is planted on new territory by special act of Congress. (2) The extension of the sovereignty of the United States to new territory guarantees the enjoyment of liberty, the right to property and the protection of the United States to the people thus affected in securing justice and public

order and promoting peaceful progress. (3) The islands acquired from Spain by the treaty of Paris are "property of the United States," and Congress can dispose of these islands in any way conducive to the interests of the people of the United States and of these islands.

A corollary of these propositions finds expression in the statement that the territory of the United States may be described under three heads: (1) The States. (2) Incorporated territories. (3) Unincorporated territory, belonging to the United States.

This gives to the nation three different classes of people dependent upon it: (1) Citizens vested with full political power, or the residents of the States. (2) Citizens of the incorporated territories, who are not vested with full political power as long as they are residents of the incorporated territories. (3) The people of the "territory belonging to the United States," as such, who cannot become citizens of the United States till Congress extends to such territory they occupy the privileges of the Constitution.

Impetigo, ĭm-pĕ-tī'gō, popularly known as Pustular Tetter, Honey Scab, and Honey Sickness, a skin disease found mostly in children, consisting in an eruption of itching pustules, appearing in clusters, and terminating in a yellow, thin, scaly crust. They appear chiefly on the head and face, and sometimes on the hands. Feverishness and sensations of chilliness accompany the disease. The treatment is both external and internal, the former consisting in the application of ointments, etc., and the latter in the administering of various medicines calculated to improve and maintain the health of the patient.

Impeyan (ĭm'pĭ an) **Pheasant,** a pheasant of the genus *Lophophorus* generally; specifically the species (*L. impeyanus*) of southern Kashmir, first brought to notice by Lord and Lady Impey. These are among the most splendidly clothed of birds, rivaling the humming-birds in the brilliance of their metallic hues. There are four or five species, each restricted to a particular region in southeastern Asia. The Himalayan species or Monal (*L. refulgens*) is the best known and is often exhibited in zoological gardens. The male is perhaps the most gorgeous of the *Phasianidæ*, presenting a wonderful combination of sparkling metallic purples, blues, browns and greens, with golden and coppery reflections and contrasting patches of snowy white and deep black; on the head is a crest composed of long racquet-shaped feathers. The female is plainly colored. High up in the mountains near the snow line the monal lives during the summer, breeding up to an elevation of 12,000 feet, but in the autumn, as the weather becomes cold, it gathers into flocks and descends to the deep woods or, in very severe weather, even to the cultivated lowlands. It both runs and flies swiftly, but is chiefly terrestrial, and feeds largely on roots and grubs dug from the ground. The impeyan pheasant has the black and white areas replaced by golden green.

Implements, Agricultural. See Agricultural Machinery and Implements.

Im'post, in architecture, the point at which an arch rests on the column, pier, or wall. It is often marked by horizontal moldings, though these may be absent. Imposts have received various names, according to their character. Thus, a continuous impost is one in which the moldings are carried perpendicularly down the pier, as in the later decorated Gothic; a discontinuous impost, one where the moldings abut, and are stopped on the pier; shafted imposts are those in which the arch moldings spring from a capital and differ from those of the pier.

Im'potency, a diseased condition of the male; in common law failure to consummate the marriage relation within three years is presumptive evidence, and constitutes a sufficient ground for divorce, or annulment of marriage.

Impress'ionism, the style of painting adopted by the Impressionists, a group of modern French painters, who held their first exhibition in Paris in 1877. This coterie included Claude Monet, Alfred Sisley, C. Pissarro, Auguste Pierre Renoir, and Berthe Morisot. These artists professed to have cut themselves free from all traditions of color, line or technique, and to paint things, not from what they had learned about things from other painters, but from what they saw in things. Their one immediate impression of a landscape, or a group of figures, they would transfer to the canvas without modifying one jot or tittle. "The Impressionist," says Theodore Duret, one of their earliest critical interpreters, "sits down on the bank of a river, and the water takes its tones, in accordance with the condition of the sky, the angle of vision, the hour of the day, the stillness or agitation of the air. Without hesitation he sets upon his canvas exactly all the tints and tones which he sees in the water. The sky is overcast, the weather showery, he paints the water steely gray, dull, opaque. The sky is clear, the sun brilliant, he paints the water sparkling, silvery, azure blue. The wind blows, he paints the myriad hues of the rippling surface. The sun sets and darts his last rays into the water. The Impressionist smears yellow and crimson on his canvas. The winter comes. The Impressionist paints the snow, and as he sees that shadows cast upon the snow are blue he unhesitatingly paints blue shadows. Certain clayey soils seem to clothe the plains in lilac. The Impressionist therefore paints lilac landscapes. In the summer sunlight under the dim-lit arcades of green foliage, skin and clothes take a violet tint. The Impressionist paints them violet." The French Impressionists claim Corot, Courbet and Manet for their fathers in art. It is certain that they owe much to Japanese masters. "Before our acquaintance with Japanese art," says the critic already quoted, "painting kept on its course of falsehood, and Impressionism was impossible."

Nevertheless, Impressionism is dying out, if it is not already dead in Paris, as Quilter some years ago stated. It has not taken any root in England, where the Pre-Raphaelite movement, with its idealism, linked to its freshness and originality of style, was the most recent dominating innovation. Among American artists it did, however, obtain some foothold, and Whistler, a great Anglo-American painter, began his

IMPEYAN PHEASANT (*Lophophorus impeyanus*).

career as an Impressionist, and though he did not continue on the extreme left of this radical school, he always was their friend and was willing to learn all they could teach him. In New York there are some survivors of the school, and Twachtner and Childe Hassam were for some years its exponents, and the death of the latter so early in life removed a really sincere and quickening influence in American art. It is certain that Twachtner never went to the extremes of the French Impressionists. He was one who felt their influence rather than a blind and literal follower of their theory. He was delicate and refined, as well as bold in color, and he cultivated to perfection what the French Impressionists sometimes seemed to neglect,—the sense of form as defined by the invisible line that divide the tones in a picture and in life, and which great painting defines with a magic and unerring accuracy that cannot be secured by daubing on the canvas a mass of tints in which color and value are everything and line nothing. Impressionism is chiefly notable as being a revolt from academic stiffness and conventionality, from slavery to certain pigments and methods of technique, long in use. It is a movement which has added fresh life to art by teaching the painter to use his eyes, and to trust them. Compare Sabrin, 'Science and Philosophy in Art' (1886); Duret, 'Les Peintres Impressionistes' (1878); 'French Impressionism' (in 'The International Monthly,' Vol. V. 1902); Duranty, 'La Nouvelle Peinture.'

Impress'ment, The right of changing one's natural allegiance (see CITIZEN; EMBARGO) was not acknowledged as a legal right in the 18th and early 19th century by any nation but the United States, which lacked power to enforce it against the world. Great Britain denied it, and Chancellor Kent early in the 19th century admitted that the denial was common law. During the Napoleonic wars, that country in its struggle for life especially on the seas, demanded the help of all its citizens; and not only refused to recognize any ceremonies of naturalization, but seized its alleged subjects wherever it found them, searching neutral vessels on the high seas and impressing into its service whoever were claimed as such. The naval officers were the reverse of particular whether they made mistakes and kidnaped born Americans, and many hundreds of the latter were impressed in this way. Not only this, but the right of search in itself, were rasping grievances which worked up the national temper to the pitch of explosion, resulting in the War of 1812; the right of search resulted in the bloody outrage of the Leopard on the Chesapeake (q.v.), which was one of the chief agencies in bringing about the Embargo.

Impris'onment is one of the three classes of punishment for crime, death and penal servitude being the other two. It has always been a power inherent in courts of justice to imprison for contempt of their authority, and under certain conditions for non-payment of debt. In criminal proceedings a person may, by a warrant of a justice of peace or magistrate, be imprisoned before trial, provided the justice considers it is not a proper case for allowing bail; and though in minor offenses an accused person may insist on being discharged on tendering sufficient bail, yet in more serious crimes it is in the discretion of the justice to accept or refuse the bail tendered, and on his refusal application may be made to judges of the common law courts to accept bail. Imprisonment may be with or without hard labor, or it may be solitary. Penal servitude may be inflicted for life, or any shorter term, but in the case both of imprisonment and penal servitude the convict can at any time apply for commutation or remission. In police and other petty offenses tried summarily at common law and under a variety of statutes, imprisonment is usually awarded with the option of a fine. The unlawful detention of the person by any one, or "false imprisonment," constitutes a personal injury, and may be treated as a criminal or as a civil offense. See DEBT.

Imprisonment for Debt is the restraint of the liberty of a debtor in a civil action. An arrest for debt is usually made by some mandate of a court having jurisdiction, after the nature and amount of the debt has been established by due process of law. But sometimes a debtor is restrained of his liberty on a preliminary proceeding, by order of a court, for the purpose of holding him to bail. In the United States, imprisonment for debt is made only by virtue of statutory regulations, several States having constitutional provisions prohibiting it under certain circumstances, and seven of them having absolutely prohibited restraint in any form of personal liberty on account of debt, by such provisions; namely, Alabama, Georgia, Maryland, Mississippi, Missouri, Tennessee, and Texas. Several of the States provide in their constitutions that there shall be no imprisonment for debt except in cases of fraud on the part of the debtor. In some of the States acts have been passed providing for imprisonment founded on contracts deliberately entered into, while others have provided that only absconding debtors shall be subject to imprisonment. The tendency of modern legislation is adverse to imprisonment for debt. Many of the States have provided in case of imprisonment that the restraint shall be made as free from indignity as is consistent with the safe-keeping of the debtor, and that his restraint shall be considered more in the nature of misfortune than as punishment for an offense.

Improved Order of Red Men, an American civic society, with benevolent and social characteristics, organized 14 Oct. 1833. Founded upon the manners, traditions and customs of the aborigines of the Western World, the Order adopted their unique figures of speech, which it transmits with historical accuracy. Knowing that some time the Indian race will become extinct it intends to occupy an original place in public interest as the repository of Indian customs, Indian traditions, and Indian nomenclature. The Order's motto is "Freedom, Friendship, and Charity." Its interpretation, as promulgated by official authority, may be concisely stated in these words: Freedom, in honor of that race to whom the forests, the plains, the hills, and the valleys of this land were as free as the air to the eagle, and in memory of the early struggles to wrest these United States from dependency to foreign rule. Friendship, to commemorate the unswerving loyalty with which an Indian maintained a noble and unselfish affection for him to whom it was plighted,

and which makes sweet and lasting the relations that one member bears to another. Charity, the love expressed to a brother by those who meet around the brightly burning council fire; the sympathy which is pleased at his success, and the fraternal affection that grieves over his sorrows and disappointments.

Government.— The Order is organized along the familiar lines of civic societies. Its supreme power is the Great Council of the United States, and from this body emanates all authority for the establishment of local branches in towns and cities; also Great Councils in States and Territories and in the Dominion of Canada. State and Provincial Great Councils, under restricted delegated authority, exercise governmental oversight,— within their respective jurisdiction,— similar to that of the Great Council of the United States. Local branches of the order are: Tribes, Degree Councils, and Councils of the Degree of Pocahontas. The Great Council of the United States has for its chiefs, or officers, the presiding and executive official, who is called the Great Incohonee; the Great Senior Sagamore, second in authority; Great Junior Sagamore, third officer; Great Prophet, who is often a Past Great Incohonee; the Great Chief of Records, or Grand Secretary; the Great Keeper of Wampum, or Grand Treasurer; Great Tocakon, the messenger of the presiding officer, or Grand Marshal; the Great Minewa, an officer in charge of the inner wicket; and the Great Guard of the Forest, guardian of the outer door. State Great Councils have chiefs whose duties correspond to the officers of the supreme body, as follows: Great Sachem, presiding chief; Great Senior Sagamore, Great Junior Sagamore, Great Prophet, Great Chief of Records, Great Keeper of Wampum, Great Sannap, Great Mishinewa, Great Guard of Wigwam, Great Guard of Forest. The chiefs of a tribe are: The Sachem, who presides; Senior Sagamore, Junior Sagamore, Prophet, Chief of Records, Keeper of Wampum, Collector of Wampum, First and Second Sannap, four Warriors, four Braves, the Guard of the Wigwam, and Guard of the Forest. In Degree Councils the chiefs governing them are similar to those of a tribe. The Councils of Pocahontas admit white women to membership, and those of the order who have attained to the Chief's Degree. The chiefs of the council,— whose duties are defined in an ornate ritual,— are: Pocahontas, presiding officer; Wenonah, Powhatan, Keeper of Records, Collector of Wampum, Keeper of Wampum, First and Second Scout, First and Second Runner, two Counselors, four Warriors, Guard of Wigwam, and Guard of the Forest. Provision has also been made for the establishment of State Great Councils of the Degree of Pocahontas, similar in authority to those of the Tribal Branch, the officers of which run parallel with local councils. The names of the chiefs have the prefix of "great," and these Great Councils are given jurisdiction over this degree, all under the sovereignty of the Great Council of the United States. After various attempts to organize a branch for the "display element," legislation created, in 1899, the Red Men's League, with a uniform resembling the "Continental," and a perfect military code. Into this organization were merged prior uniformed bodies and beneficial councils. The adoption of consistent laws at once secured a continued increase in this branch of the Improved Order of Red Men.

Ritual.— The ceremonies of the Order are purely American. The ritual stands, and must ever stand, unique, and distinct, growing more valuable as the only realistic demonstration of those mystic ceremonies of the aborigines, which otherwise might fade into oblivion. Founded, as has been stated, on the manners, traditions, and customs of the American Indian, it portrays an existence more fascinating the longer it is studied, and gives the keynote to those bursts of eloquence which were at once the wonder and the admiration of the early missionaries, and of which the renowned "Black Hawk" is a shining example. The work of the Order is divided into three sections or degrees— the Adoption, the Warrior's, and Chief's,— each of which illustrates a phase of the characteristics mentioned. The degrees of the auxiliary branches of the Order are written in harmony with the general theme of the original ritual.

Nomenclature.— The attention arrested by the recital of this Order's official life is greatly enhanced when its terminology is considered. The expressions used not only differentiate the Improved Order of Red Men from other civic societies, but these form links connecting it with prior organizations of Red Men. This is further outlined in the "history" following. Time is not computed as in the common era, but according to a phraseology that has a hidden meaning and significance to the "initiated." Up to 1865, the Jewish style, namely, the year of the world, was used in dating documents. This was superseded by a revised system and "G. S. D.," or Great Sun of Discovery, was adopted, the year 1492 being considered G. S. D. 1. For convenience the year begins with that of the common era, and the enumeration follows: A year, *Great Sun;* a month, *Moon;* January, *Cold Moon;* February, *Snow Moon;* March, *Worm Moon;* April, *Plant Moon;* May, *Flower Moon;* June, *Hot Moon;* July, *Buck Moon;* August, *Sturgeon Moon;* September, *Corn Moon;* October, *Traveling Moon;* November, *Beaver Moon;* December, *Hunting Moon;* a week, *seven suns;* a day is a *sun,* and a night is a *sleep.* Morning is called the *rising of the sun;* evening, *setting of the sun;* noon, *high sun;* midnight, *low sun;* an hour is a *run,* and a minute a *breath.* Examples: 30 July 1903 A.D. would be expressed as "30th Sun, Buck Moon, G. S. D. 412," 1903—1491 = 412. "Tribes . . . shall, within two seven suns after the last council sleep in Hot and Hunting moons, transmit," etc. Wampum Belt signifies treasury, and wampum or money is computed as follows: *Fathom,* one dollar; *foot,* a dime, and an *inch* is one cent. To illustrate: "In case the wampum shall at any time be reduced to a less amount than five feet for each member, or to less than 50 fathoms, the tribe," etc. Non-members are called *pale faces;* tribal jurisdictions are *hunting grounds;* Great Councils govern *reservations;* opening and closing meetings consist of *kindling* and *quenching council fires;* minutes are called *records;* addresses or reports, *talks* or *long talks;* attending to business is *following the hunt,* and wronging another, *crossing the path. Wigwam* and *tepee* signify the halls of meeting, and *council chamber,* a room therein. Voting is called *twigging.*

History.— An attempt has been made to establish a succession from the patriotic societies

of the American Revolution to the Improved Order of Red Men, but without much historical basis. That such organizations existed, there is no doubt. Moreover, the War of 1812, with England, served to foster the assembling and banding together of men fired with patriotic ardor. It is quite likely these associations may have led to the formation of the societies of Red Men,— possessing the terminology hereinbefore mentioned,— known to have flourished between the years 1813 and 1830, of which fragmentary records have been preserved. The impulse also may have come from the Tammany societies of the national period prior to 1812. A society of Red Men existed in Philadelphia, Pa., in 1824, and there were branches in other cities and States at earlier and later dates; but the movement, which began in Baltimore, Md., in 1833–4, really seems to be the authentic date of foundation. The Improved Order of Red Men was anti-convivial in its character, and was first brought into public prominence by the observance of Saint Tammany's Day (still on the calendar), 12 May 1837. The Order spread, and, on 20 May 1835, the Great Council of Maryland was instituted, and soon became an incorporated body. On 30 Jan. 1847 the Great Council of the United States was formed as the supreme government, and this, in turn, became a corporation, by special charter from the legislature of Pennsylvania, approved 30 March 1866. The policy of the Order has been to possess a legal standing in the State; and a brotherly hand extended early secured the adherence of the scattered bands of Red Men to the "improved" institution, so that unity of effort soon promised much for the future. The fortunes of the "Improved Order," however, were fluctuating at first, and, until 1881, when it began to assume its present proud proportions of 350,000 members, embracing the entire republic, and reservations in Canada.

Consult: 'Official History,' edited by Charles H. Litchman, revised by Charles C. Conly (1893–9), and 'Documentary History of New York'; 'Constitutions and Digest, I. O. R. M.'

H. L. Stillson,
Fraternity Historian.

Impulse. This is a term used in mechanics to designate the "time integral" of a force. If the force is constant, the impulse it produces in a given time is the product of the force and the time in question. If the force is variable, its time of action may be divided into an infinite number of equal intervals. Then the impulse will be the sum of the products of each variable value of the force by the common infinitesimal time interval just defined. Impulse is a quantity of the same kind as momentum; that is, it is the product of mass and linear velocity.

It should be observed that in the cases of impulses in nature the forces are never infinite and their times of action never infinitesimal, though it is sometimes convenient to adopt these fictions in analysis. For the theory of impulses see especially Thomson and Tait's 'Natural Philosophy,' part I.

Imputa'tion, as a term in Protestant theology, is used to signify three things, first the imputation of the sin of Adam to all of his posterity, second the reckoning of the sins of man to Christ, third the reckoning of the righteousness of Christ to believers. Thus, on the theory of imputation the sin of Adam is so attributed to each individual of the human race as to be considered in the Divine counsels as the act of that individual, who is thus rendered guilty of it. When sin is spoken of as imputed to Christ it is meant that the condition or state which was actually man's becomes by imputation judicially his, and thus in law Christ became fitted to be a sacrifice and sin-offering for man. Had he not been man's substitute by the imputation of sin he could not have become his substitute in the endurance of the penalty of sin. The two are inseparably connected. In the very same sense in which Christ was made sin men are made the righteousness of God in him. According to this view he was made sin, not actually and personally, but by imputation; and men are made righteousness, not actually and personally, but by imputation.

Imus, ē'moos, Philippines, pueblo of the province of Cavite, Luzon, eight miles southeast of Cavite, the provincial capital; it is an important road centre. In 1896 it was the stronghold of the insurrection, Aguinaldo and other chiefs having their headquarters in its principal building. Pop. 14,700.

In-breeding, Evils of. See Breeding.

In Cœna Domini, ĭn sē'nä dom'ĭ nĭ, a papal bull, so called from its first words, it being annually read "at the Lord's Supper" on Holy Thursday. Its earliest form was that promulgated in 1363 by Urban V. against all heretics and favorers of heretics. The bull was annually promulgated at Rome till the year 1770, when a much modified document took its place, this in its turn being withdrawn by Pius IX. in 1869.

In Personam, spoken of legal rights, means such as are maintainable only against a specific person, and not against the whole world (see *in rem*). Rights *in personam* arise out of a specific engagement between individuals, or out of domestic or fiduciary relations. But the majority of rights *in personam* spring from the violation of rights either *in rem*, or *in personam*. A right once violated, a right of action against the violator immediately arises. An action brought against the violator is also called an action *in personam*.

In Rem, spoken of legal rights, means such rights as are not only maintainable against a specific person (see *in personam*) but can be maintained against the whole world. Nor are rights *in rem* limited to property rights, but include all rights, such as freedom from personal assault, from causeless imprisonment, from trespass. The term includes the right not only of suing for damages but of seizing and detaining certain articles. In admiralty practice this is a common resort, though in ordinary processes for the recovery of land or goods, it is rarely made use of nowadays.

Inagua, ē-nä'gwä, Great and Little, two of the Bahama Islands in the West Indies, at the southern extremity of the group. Great Inagua has an area of 660 square miles, and Little Inagua 36 square miles. The latter has few inhabitants. There is a considerable town on Great Inagua called Matthew Town, pop. (1900) 1,500.

Inar'ching, a form of graftage (q.v.).

Inaugura'tion Day, the day set aside for the inauguration of the President of the United States every four years on 4 March. It is said that Benjamin Franklin selected this date because in the next two centuries it would fall less often on Sunday than any other day in the year. President Washington took the oath the first time on 30 April, and Taylor and Hayes were inaugurated on Monday, 5 March. The same is true of Monroe's second inauguration, but his first was on the regular day. The second Adams, Pierce and Garfield were inaugurated on Friday. Five inaugurations have been on Monday and five on Wednesday.

On 2 July 1788 the President of the Confederation Congress then in session at New York, notified that body that New Hampshire had ratified the Constitution on 21 June preceding, and as it was the ninth State to do so that instrument was now by its own terms to become the supreme law. After prolonged debate Congress on 13 Sept. 1788 passed the following:

> Resolved, That the first Wednesday of January next (1789) be the day for appointing electors in the several States which before the said day shall have ratified the said constitution; that the first Wednesday in February next be the day for the electors to assemble in their respective States and vote for president, and that the first Wednesday in March next be the time and the present seat of congress the place for commencing proceedings under the said constitution.

Incandes'cence. See ELECTRIC LIGHTING.

Incandescent Gas-light. See ILLUMINATING GAS.

Incarna'tion (from the Latin *in,* in, and *caro, carnis,* flesh), a word used to express the appearance on earth of the Deity, or his manifestation in the flesh under the human form; thus we speak of the incarnation of Christ. (See JESUS CHRIST; CHRISTIANITY.) The Hindus believe in innumerable incarnations of their deities. See AVATAR.

Inca or **Ynca,** the name of a tribe of Peruvian Indians — not exclusively that of a royal family or caste, as has been commonly asserted. The members of this tribe sometimes called their war-chief "Cuzco," meaning chief or lord of Cuzco (compare the 'True Account of the Province of Cuzco,' by Francisco Xeres, secretary to Francisco Pizarro, and himself one of the conquerors), but probably more often "the royal Inca," or simply "*the* Inca" (compare 'Royal Commentaries of the Yncas,' by Garcilasso de la Vega: Lisbon, 1609: Part I, chapters viii and xv). The latter usage was in the end adopted by Spanish chroniclers; and Garcilasso, half Spaniard, half Indian, in the 15th chapter of his commentaries, which were written, he tells us, 71 years after the conquest, uses both the longer and the abbreviated forms — "Yncas Kings" and "Yncas" — though feeling that he must explain that he means by the latter the "native kings of Peru." Throughout the tribe mother-right prevailed, and marriages were contracted between members of different clans: therefore offices could not descend from father to son; and especially the office of war-chief, or Inca *par eminence,* must usually have been filled by selection. The tribal dialect was called Quichua. See also PERU and SOUTH AMERICA.

MARRION WILCOX.

Inca Semi-Civilization, the state of advancement in arts and learning reached by the most progressive tribe of South American Indians, occupying a portion of the Andean Sierra, and exercising control, in the regions now known as Peru, Ecuador, and northwestern Bolivia, over many other tribes of the highlands and lowlands before the Spanish conquest.

In the articles INCA, CUZCO, and PERU, reference has been made to certain popular misconceptions touching Inca government, chronology, and the tribal name. It is necessary to add that the evidence at present available is entirely insufficient to warrant such assertions as the following, which occurs in one of the leading works of reference: "The Inca was the absolute but, in most cases, *kindly* ruler. . . . In many respects the Inca government will compare favorably with any which at that time existed in Europe"; or this, from a popular account published in December 1903: "The far-famed Inca race had developed in pre-Columbian times an astonishing and marvellous civilization." Far from lending itself to such conclusions, the evidence furnished by Spanish writers of the 16th and 17th centuries, when their works are tested and corrected by a comparison with the results of modern archæological research, points to social conditions which cannot be ranked above semi-civilization. Moreover the objects collected by archæologists to illustrate or represent industrial and artistic activity in ancient Peru (especially the important Bandelier collection which was put in order at the American Museum of Natural History in 1904) in point of fact illustrate and represent the activities of a race very slightly elevated above semi-barbarism. One may look in vain among thousands of rude, unpleasing, or at best rather coarsely grotesque designs by Inca artisans and artists, if his hope is to find out, by searching, even slight indications of potential, germinating refinement and enlightenment; certainly that striving after perfection which among races capable of genuine civilization has expressed itself in beautiful, symbolic and ideal forms is unrepresented here, the occasional achievements of a better sort appearing to be accidental, rather than truly characteristic or normal. In the customary treatment of their dead the same lack of higher symbolism made itself felt oppressively: the crouched position of the body, bound in a tawdry pack, and the commonplace offerings buried with it suggested nothing better than the petty comforts, or ig noble miseries, of a life forever limited to alter nating phases of servile toil, crouching rest, sensual indulgence, and childish diversions. The North American redskin had a freer and wider outlook in his "savage" state. The various tribes of the Sierra, from Quito to Lake Titicaca, were bound together by roads which ran from one highland village to another; the lowland Indians were held in subjection through fear alone, the Inca supremacy signifying to them simply a prolonged reign of terror. From time to time marauding bands of highlanders swept down upon the coast zone, despoiling the lowlanders, murdering or carrying them off into captivity, and threatening to divert from the natural courses streams which, rising in the Sierra, flowed westward to the Pacific, fertilizing narrow valleys in the arid littoral.

Some of the war-chiefs may have been "kindly rulers": we shall, in all probability, never know whether they were or not. Cristoval de Molina, who described the "Fables and Rites of the Yncas," and who, in order to gain the knowledge of those rites which he imparts, "assembled" as he says, "a number of aged persons who had seen and participated in them in the days of Huayna Ccapac," believed that some definite, if scanty, records existed. He says: "It is so that these people had no knowledge of writing. But in a house of the sun called Poquen Cancha, which is near Cuzco, they had the life of each one of the Yncas, with the lands they conquered, *painted with figures* on certain boards." Another chronicler, Juan de Santa Cruz, who wrote about 1620, says: "I affirm that I have heard, from a child, the most ancient traditions and histories, the fables and barbarism of the heathen times, which are as follows." Such as these are the sources of our knowledge of the story of the Inca rulers. Some of the events in the lives of the war-chiefs were depicted, as valuable records or as parts of an ornamental design, in a "house of the sun"; otherwise all rests upon the prattle of Indian dotards and of Indian nurses. Accounts written by the conquerors themselves (for example, Xeres) leave almost everything to the imagination. We may be certain, at least, that tradition retained most accurately the traits of the last two or three native chiefs, whom the "aged persons had seen"; and though we may not condemn the unknown by reason of the credibly reported misconduct of the known, we shall be obliged to suspend judgment, instead of accepting the easy platitudes now current with respect to the succession of war-chiefs from Manco down to Huayna. The shameless private life of Huayna Ccapac is set forth in the 'Antiquities of Peru' by Juan de Santa Cruz. As for that great war-chief's still more famous son, we read in Garcilasso de la Vega's 'Royal Commentaries of the Yncas' (Book 9, chapters 35–37) that Atahualpa summoned all Incas of the blood royal to assemble at Cuzco, and put them to death. "The cruelty of Atahuallpa," says this historian, himself half Inca, "was greater than that of the Turks, for, not content with the blood of his own 200 brothers, the sons of the great Huayna Ccapac, he passed on to drink that of his nephews, uncles, and other relations . . . so that none of the blood royal might escape, whether legitimate or bastard. They were all murdered in different ways." The same fate was meted out to all the loyal captains of his rival Huascar; furthermore "he ordered all the women and children [of royal blood] to be assembled, of whatever age and condition, reserving only those who were dedicated to the sun in the convent of Cuzco. He ordered that they should be killed outside the city, by little and little, and by various cruel tortures, so that they might be long in dying." The varieties of ingenious tortures mentioned by Garcilasso are similar to those inflicted by North American aborigines upon captive women and children; and "though the work could have been done in a shorter time, they prolonged it in order to enjoy their cruelties more fully."

It appears to be altogether improbable that the Inca semi-civilization, if it had not been interrupted by the coming of the Spaniards, would have reached the height of 16th or 17th century European civilization, or by native merit have kept abreast of the advancing nations of the Old World. That the tribe had neglected to provide itself with a written language, and failed to develop high ideals in art, we have already noticed. A third essential for progress was equally wanting: the Incas had no money, or any medium of exchange corresponding to the wampum of the Indians who lived near the North Atlantic coast. But it is impossible for any people deprived of trustworthy records of human experience to construct a convincing system of morality; and without some convenient medium of exchange an extensive and pacific commerce is equally impossible. Both deductive and inductive methods of reasoning must, therefore, lead an unbiased student of old Peruvian institutions to the conclusions that, at home, inveterate and fully sanctioned practices made for degeneration; while steady blackmail, varied by occasional slave-raids, took the place of mutually beneficial dealings with neighboring, subject or independent tribes.

Limitations of the race's genius or experience may be exemplified in the department of music. The Inca musicians used drums which "were made by stretching a skin over a hoop of wood or over one end of a short section of the trunk of a tree which had been hollowed out to a thin cylinder" (compare 'The Musical Instruments of the Incas,' by Charles W. Mead, assistant, Department of Archæology, American Museum of Natural History). Other musical instruments of percussion in common use were copper bells, in form resembling sleigh-bells; rattles, made of small shells, gourds, and nuts, often strung together and attached to the wrists, ankles, or other parts of the body, in dancing; also cymbals of rudimentary form. Wind instruments were the syrinx or pan-pipe, consisting of reeds of graduated lengths, held in position by a crosspiece of split cane lashed to the reeds with a cord made of llama wool — the reeds being sometimes closed at the lower end, sometimes open, and occasionally arranged in double rows, yielding octaves; flutes, made of cane or bone, "simply tubes, open throughout their length, and all belonging to the class known as 'end-blown'," not scientifically constructed and not attuned one to another; resonator whistles, emitting several different notes; trumpets, made either of terra cotta or of conch shells,— primitive instruments, producing only four or five distinct tones (as shown by actual test of specimens taken from the ancient tombs); a double musical water bottle, consisting of two pottery vessels connected near the bottom in such a way that water passes freely from one to the other, and in its passage (when the vessels are swung backward and forward) forces air through an opening near the top, producing a series of whistling sounds; and finally the "cornets" mentioned by Garcilasso ('Royal Commentaries') and Herrera — instruments formed like the oboe, rather than the cornet in the modern sense. With this enumeration the list is exhausted. Such evidence as we have at the present time disproves the existence in Peru of any form of stringed instrument before the coming of the Spaniards. In other words, the unaided genius of the Inca Indians, exerting itself in the field of music, stopped short of the

more complex instruments: ancient Peruvians were satisfied, as their Quichu and Aymara descendants are to-day, with the wild discords evoked from pan-pipes, flutes (or fifes), drums or clashing shells, all of rude construction.

And, as in music a great volume of sound — not harmony — was the desideratum, so in architecture they neglected beauty and strove to attain resistant mass, with walls as solid and homogeneous as possible — the prime essentials in a country shaken by destructive earthquakes; and their solicitude in this respect, which was less justified in Cuzco valley, suggests that the tribe, before the migration to which old legends refer, may have dwelt in the volcanic western part of the Sierra (see PERU). Hence the so-called "cyclopean" walls of the temples and palaces, structures built to endure, for which the builders utilized enormous stones of irregular shapes, fitted together so skilfully that mortar was not required.

It is safe to say that nearly all features of the ancient industrial life of the tribes inhabiting the Andean Sierra and Peruvian coast strip are either intimated or plainly shown by specimens in the Bandelier collection. With the utmost care products which are not properly to be classified as Incan have been separated from those showing the activities of the dominant race; and such care is obviously indispensable, for the Incan objects, though they may be discriminated by a trained archæologist, do not stand out from the rest quite unmistakably. One finds practically nothing to support the theory that there was ever a nearly unrelated, or a wholly distinct and marvellously superior, Inca civilization. Especially instructive are the examples of the potter's art which have been secured in great numbers — representing such different social classes as the warrior, musician, and water-carrier. Costumes, weapons, occupations, etc., are depicted faithfully, though without artistic charm. Fabrics of cotton, or woven from the wool of the llama, vicuña, and alpaca; looms, spindles, and colored threads, bear witness to the wide extension of the industry of weaving so often mentioned by early writers. Offerings made to the dead in the graves which have been explored (and, in the sacred cause of science, discreetly rifled) recall the fact that agriculture shared with warfare the distinction of being the chief occupation of able-bodied men. Inca women are shown to have been, like their Quichua descendants at the present time, eminently domestic in their tastes and employments, ruling supreme in the house, taking no part in public affairs, and perhaps never developing the characteristics of the Amazons who dwelt beyond the montaña in the region of tropical forests. Gold and silver appear to have been not less abundant — perhaps they were even more abundant — in the lowlands than in the highlands: at any rate vessels formed from the precious metals are found more commonly in the burial places near the coast. It is not to be supposed that the natives failed to appreciate the beauty and utility of silver, gold, and copper. An ingrained preference for the clumsy methods of barter — which the Quichuas have not even yet forsaken — prevented them from adopting any medium of exchange or setting apart one or more of the metals to be used as "money."

MARRION WILCOX.

In'cense, aromatic substances burned in religious rites on account of the sweet odor they emit. The custom of burning incense is ancient and widely spread. Among the Jews the practice was enjoined as part of the worship of the sanctuary (Ex. xxx. 27), the ingredients of the incense also being laid down, and it was to be burned on a special altar called the altar of incense. This altar was made of acacia (shittim) wood, and was overlaid with gold, hence it was called the golden altar, as distinguished from the altar of burnt-offering, which was made of brass. The incense was burned daily — morning and evening. Both the Greek and the Latin churches use incense in worship. Among Catholics it is used at every high mass, at consecration of churches, in processions, funerals, etc.

Inch, a lineal measure, the 12th part of a lineal foot, anciently said to consist of three barley corns. A statute of Edward II. (1324) makes "three barley corns round and dry" the definition of an inch. It is subdivided into halves for mechanical work, and for a scientific purpose decimally into thousandths, as in gunnery, and into ten thousandths by the makers of gauges. The English inch is equal to 2.54 centimetres. The old Scotch inch was slightly larger than the English.

Inch-worm. See MEASURING-WORMS.

Inch'bald, Elizabeth Simpson, English actress, dramatist, and novelist: b. Stanningfield, Suffolk, 15 Oct. 1753; d. London 1 Aug. 1821. In 1772 she was married to an actor named Inchbald, and the same year went upon the stage. She retired from this profession in 1789 and devoted herself to literature. Some of her plays, which belong to the class of high comedy, still keep the stage, but her greatest success was the novel 'A Simple Story' (1791), which was translated into several languages. She also wrote 'Nature and Art,' and among her plays may be cited: 'Such Things Are'; 'The Married Man'; 'The Wedding Day'; 'The Midnight Hour'; 'Every One Has His Fault'; and 'Lovers' Vows.'

Inclina'tion, Magnetic, or Magnetic Dip. See DIPPING NEEDLE.

Inclined Plane, one of the mechanical powers. When a body lies on an inclined plane part of its weight is supported; so that if a cord be fastened to it and pulled, a force less than the weight of the body, acting in a direction parallel to the plane, will prevent it from sliding, or will move it up the plane. Thus a heavy wagon is raised on an inclined road by a horse which would be quite unable to exert a pull equal to a quarter of the weight of the wagon. A body lifted by means of an inclined plane is moved through a greater distance than if it had been raised vertically, so that although the force employed may be smaller, it is exerted through a greater space. When the plane is smooth, so that friction may be neglected, the force parallel to the plane necessary to raise the body is equal to the weight of the body, multiplied by the vertical height through which it is lifted, divided by the distance it is moved along the plane. For instance, when a train moves up an incline which rises 3 feet for every 100 feet of rail, the engine exerts a pull equal to 3/100 of the weight (neglecting friction). Inclined plane

railroads are common in the United States, the best known being located in Pittsburg and Cincinnati.

Income Tax, a tax levied directly from income of every description, whether derived from land, capital, or industry; first imposed in Great Britain in January 1799, during the ministry of Pitt, after the failure of an attempt to raise a revenue adequate to the exigencies of the period by trebling the amount of the assessed taxes. In the Pitt act incomes under $200 were exempted; the tax rose by a series of gradations till it reached 10 per cent, at which rate it was charged on all higher incomes. This tax was repealed in 1802, but was again imposed in the following year, though with a change of name to property tax, and a difference of rate.

But one income tax has been imposed by the United States government, arising from the necessities incident to the Rebellion. In 1861 Congress authorized a tax of 3 per cent on all incomes over $800 per annum. In July 1862 an act was passed taxing all incomes under $5,000 5 per cent, with an exemption of $600 and house-rent actually paid. Incomes in excess of $5,000 and under $10,000 were taxed 2½ per cent additional, and incomes over $10,000 5 per cent additional with no exemptions. Further taxes of 5 per cent on incomes of Americans living abroad and of 1½ per cent on incomes from United States securities were laid, these expiring in 1865. In 1864 a special tax of 5 per cent was imposed on incomes above $600. A readjustment the same year imposed a 5 per cent tax on incomes between $600 and $5,000; 10 per cent on incomes above $5,000. During Cleveland's second administration a bill was passed imposing a tax upon all incomes above $4,000. The constitutionality of the law was tested before the Supreme Court, which after a protracted hearing decided adversely by a majority of one.

Inconnu, ĭn-kŏ-nū′, Fr. ăṅ-kŏ-nü′, the French-Canadian name of a fish of the rivers that enter the Arctic Ocean (*Stenodus mackenzii*), intermediate between a salmon and a whitefish in its characteristics, and of great value as food for the people of that region.

Inco-ordina'tion, a lack of control over muscular movements. In inco-ordination there may be (1) some interruption in the paths of the motor impulses as sent from the motor areas in the brain to the muscle-centres in the spinal cord; or inco-ordination may result from (2) deficiency in the incoming sensory paths, thus causing an interference with the sense of muscular localization. One of the most familiar illustrations of inco-ordination is seen in acute alcoholism. In this condition the lack of motor control is largely due to interference in the conduction-paths of motor impulses. The intoxicated person is unable to control the movements of his hands to make them perform in their wonted fashion ordinary acts. In locomotor ataxia, a disease in which inco-ordination of the movements is very striking, the inco-ordination seems to result from a loss of muscle and joint sense, whereby the patient's mind is rendered unable accurately to realize just where his limbs are. Inco-ordination is a symptom of a number of different forms of poisoning, and is extremely characteristic in diseases such as locomotor ataxia, multiple sclerosis, chorea, and paralysis agitans. It is also found in a number of infantile diseases.

Incubator, a machine employed for the artificial hatching of chickens from eggs. Such devices were known to mankind from early ages. Pliny says that the Egyptians thus hatched 100,000,000 chickens a year. While artificial incubation was introduced into France and England during the 18th century, the incubator was brought to greatest perfection in the United States in the 19th century. The first patented invention of the modern incubator was in 1847, but any practical success in such machines cannot be met with before 1877, when Rouillier and Arnoult exhibited their hydro-incubators at the Paris Exposition.

There are two general classes of incubators, those in which hot air is used for the maintenance of heat and the application of it to the eggs, the other in which hot water serves this purpose. An automatic incubator of first class make is equally efficient whichever of these two heating mediums is employed, but there are many different types of machine offered for sale, and the struggle between cheapness and efficiency sometimes leads to the sacrifice of the latter. There are certain essentials to an incubator which must be attained at any cost, and the machine that is deficient in anyone of these is a failure, which means that it cannot guarantee to yield of living chicks at least 80 per cent. The following may be enumerated as absolute requisites in a good incubator: (1) An egg chamber heated at a uniform temperature. It is best that the heat should come from above, when it is likely to be reverberated from the floor of the chamber, and to more evenly affect the eggs, and may at once strike the germinal vesicle which from its lightness always rises to the upper surface of the yolk. (2) A source of heat which is self-regulative. The thermo-regulator in general use is actuated by an arm thrust within the egg chamber, and must be sensitive to an atmosphere ½° or at most 1° above that which is desired. (3) Good ventilation within the egg chamber, with some provision by which a certain degree of moisture may be maintained in the air. (4) Added to this, is a good turning apparatus. There are very many devices for effecting this purpose; perhaps the best is that of a tray fitting exactly over the tray in which the eggs are laid, and by the turning of which the eggs may be replaced in a reversed position in the applied tray.

Of course the aim of a true incubator is to reproduce as accurately as possible by artificial means the conditions of natural hatching under a sitting hen. Thus the supply of heat and air must be conformable to a fixed standard. The temperature is to be kept unchanged at 100° F., or a little above that, by placing the incubator in a room not exposed to draughts. To make accident in this respect impossible, a cellar, or specially built chamber, should be used, where no access of colder air may cause a fall in temperature, and a sensitive thermo-regulator furnish automatic means of preventing excessive heat from destroying the vitality of the eggs. Moisture must be preserved in the air of the egg chamber that the eggs may not be shriveled by excessive evaporation. There must also be adequate ventilation, that no harmful gases

sicken or kill the hatching chick. The turning of the eggs is considered necessary, because the sitting fowl has the habit of so doing, but the eggs should not be disturbed after the 18th day, nor the incubator be opened after that date, until the hatch is completed. With regard to the moisture of the air, it has been considered proper, after studying the progress of evaporation, as reckoned from the loss of weight in a fertile egg during the process of hatching, that a humidity of 45 per cent is the safest degree of saturation.

Various ways have been resorted to of taking care of the chickens after they leave the incubator. They must at first be kept in an atmosphere of from 90° to 100°, at least for the first week, and heated places of shelter, known as brooders, must be prepared for them. There are many patterns and kinds of brooders, which are manufactured by the same firms as those which make incubators. The requisites for brooders are: (1) The temperature of the first week, as given above should be gradually lowered. (2) The greatest diligence should be applied to secure and maintain cleanliness, dryness, and good ventilation. (3) Their construction should be such that newly-hatched chickens may always be in view. As the chicks grow toward fledging, facilities should be afforded them to leave the brooder for exercise. See also Poultry. Consult: Watson, 'Farm Poultry' (1901); Stoddard, 'The New Egg Farm' (1900).

In'cubus (Lat. "one who lies upon"), a spirit to whom was ascribed the oppression known by the common name of nightmare, in Greek *ephialtes* (from *epi,* and *hallomai,* I leap upon). These demons play an important part in the superstitions of the Middle Ages, having been perhaps not unfrequently employed, like the older gods of Greece, to cloak the advances of earthly lovers. See Nightmare.

Incunab'ula, is a term applied by bibliographers to editions of books printed during the early period of the art, and is generally limited to works which appeared previous to 1500. The incunabula are divided into xylographic and typographic, the former those printed from engraved blocks, the latter from movable types. Among the most highly esteemed of the incunabula are those which are first editions of the ancient classics. See Bibliography.

In'daja Palm. See Attalea.

Indemnity Contract, a form of contract which, while not of recent origin, is becoming much more common than formerly. Such a contract is any form of written agreement between two parties whereby one party agrees to indemnify or save harmless the other party for loss or damage arising out of a particular transaction, or against some specified claim of a third party. It is an original contract and must be in writing in order to come within the statute of frauds. Such contracts are frequently made in the form of a mortgage. But the substance and not the form is important, and the courts have usually given them a liberal construction with the intent of furnishing the party to be indemnified with all of the protection that was manifestly in the minds of the contracting parties when the contract was signed. Indemnity contracts are not adverse to public policy; but they are not binding when they undertake to protect persons against the consequences of illegal acts. Like other contracts, they must be founded on a sufficient consideration, and furnish indemnity only to the party named as indemnitee, and do not extend to a person having only a contingent or collateral interest in the subject matter of the contract.

Indepen'dence, Iowa, city and county-seat of Buchanan County, on the Wapsipinicon River, 70 miles southwest of Dubuque, and on the Rock Island and the Illinois Central R.R.'s. It is the centre of an extensive horse-breeding, farming and dairying region. There is located here the well known Rush Park, with its kite-shaped race track, the State insane asylum for northern Iowa, public library and other buildings. The electric-light plant and waterworks are owned by the municipality. Pop. (1890) 3,163; (1900) 3,656.

Independence, Kan., city and county-seat of Montgomery County; on the Verdigris River, 85 miles southwest of Fort Scott, and on the Atchison, T. & S. Fe and the Missouri P. R.R.'s. It is the centre and distributing point for a large agricultural section, and has cotton-mills, paper-mills, window-glass factories, flour-mills, cracker factories, brick works, planing-mills, and creameries. It has a public library, court house and other large buildings. Natural gas and oil wells are numerous near the city. Pop. (1890) 3,127; (1900) 4,851.

Independence, Mo., city and county-seat of Jackson County, five miles from Kansas City, on the Kansas C. & I., Missouri P. and the Chicago & A. R.R.'s. The city is considered a residential suburb of Kansas City. The town was settled in 1827, and in 1838 the Mormons' rendezvous was located here, and from hence the Latter-day Saints pursued their journey to Utah. Under the charter of 1889 the city is governed by a mayor and city council elected every two years. The electric-light plant is owned by the municipality. Pop. (1890) 6,380; (1900) 6,974.

Independence, Declaration of. See Declaration of Independence.

Independence Hall, Philadelphia, a low plain brick building on Chestnut Street, begun in 1732 and completed in 1741, as a state-house for the colony of Pennsylvania, as closely connected with great national events as Faneuil Hall or the Old South in Boston. The architect was J. Kearsley, the builder E. Wooley. It was occupied as a state-house while unfinished, in 1735; the tower was added in 1750. Here the Continental Congress held its sessions; here Washington was appointed commander-in-chief of the Continental armies, on John Adams' motion; here the Declaration of Independence was adopted, and was read from its steps to the assembled crowds in front. The Convention of 1787 (q.v.), which framed the Constitution, was also held here. It is now kept as a museum of historical relics, especially of the Revolution.

Independent Catholic Church of the United States, a Polish religious body organized in Chicago, among disaffected Roman Catholics. Its founder, Rev. Anthony Kozlowski, attended one of the conferences of the Old Catholic Church in Europe and was there consecrated

a bishop. The church has acquired considerable property in Chicago and has established a hospital, dispensary, orphanage, home for the aged, primary, grammar, high, and industrial schools. The society had in 1902 over 45,000 members, and 33 ministers and 43 churches.

Independent Order of Odd Fellows. See Odd Fellow.

Independent Telephony. In 1901-2, the expiration of numerous fundamental telephone patents enabled individual and independent companies to extend the telephone service to small communities, rural districts and farms in the West and Northwest. Many co-operative telephone lines were established in 1902 by farmers in the Middle West, and in 1903 it was estimated that 500,000 farms were in close communication by telephone with neighboring cities and commercial centres. The farmer finds that with the telephone he can keep in touch with the market, selling his produce or live stock when quotations are the most favorable. It is a common practice for the country doctor to give directions by telephone for caring for the patient, both diagnosing and prescribing. In Illinois the speeches of a political convention in 1903 were listened to by the farmers on a rural system as they sat in their homes from 15 to 36 miles away. Being in speaking distance of his neighbor, not only does the farmer feel a new sense of personal security, but he knows that his belongings are safer from molestation than they ever were before. The telephone has been instrumental in causing the arrest of many horsethieves and outlaws, and in some districts the farmers have almost broken up chicken stealing and petty larceny by telephoning the police and commission merchants of their losses, and thus enabling prompt arrests to be made.

An innovation in the use of the telephone which promises to be the vogue is already very popular. The local grocer or butcher, realizing that time is money, pays for the monthly rent of the telephone of any of his customers who spend $25 at his store during the month, or makes a corresponding discount for a smaller expenditure. He finds that in the increased amount of business coming through the greater ease of transmitting orders, and the reduction in his staff of order men, he can well afford to throw in the telephone service, which furthermore becomes a splendid advertisement for his store.

In the early days of the rural telephone the farmers were content to utilize their fence wires for intercommunication, and in many districts, particularly in the Western States, this method so reduced the cost of installation as to enable many communities to have a tolerably effective service, which otherwise would have had to go without any. But the farmers becoming more fastidious, demanded a better service. The systems employed range from a single line, with from three or four to a dozen instruments connected, to comprehensive systems covering entire counties and having hundreds of patrons. For instance, in Geauga County, Ohio, near Cleveland, where there is a population of about 14,000, there are over 1,000 patrons, the number in each township ranging from 50 to nearly 400. Great attention is paid to toll service, and the best construction and apparatus are insisted upon, as being in the long run the most economical. An example of the village and rural exchange is New Augusta, Ind., with 75 subscribers, 50 of whom are farmers, the most distant being about seven miles. When a single neighborhood line with a few instruments attached is desired, a switchboard is not necessary. The subscribers signal each other direct by giving different combinations of rings.

So easy has the organization of rural telephone systems become that it is safe to predict that within a decade the majority of the 4,000,000 farmers said to be yet unprovided with telephone service will have followed the example of their more enterprising brethren and brought themselves within touch of civilization. If any community wishes to install a system, no matter how limited, it has only to communicate with a reputable installation firm to receive the fullest and the clearest instructions as to how to go about it. A favorite method of organizing is for the farmers to form partnerships or co-operative (mutual) companies for the furnishing of service only to the locality in which the subscribers live. Sometimes the service is furnished by nearby telephone exchanges running lines into the rural districts.

In some places service cannot be given by city companies. In such case, the farmers can form themselves into a company, subscribe for the stock on pro rata or other basis, and install the system, running a direct line from their switchboard to that of the nearest town or city exchange. This is called the community system, the heart of which is the small switchboard, from which radiate in different directions the lines to which the various telephones are attached. See also, Telephone System, Independent.

Independent Treasury, The United States. See Finance.

Independents. See Congregationalism.

In'dex Libro'rum Prohibito'rum ("list of prohibited books"), in the Roman Catholic Church, a title used to designate the catalogue or list of books prohibited by ecclesiastical authority, on account of heretical or immoral opinions supposed to be contained in them, or maintained by the authors or editors of them; when the list or catalogue is of books allowed to be read after correction or alteration, agreeably to the orders of the Papal authorities, it is termed *Index Expurgatorius.* Such prohibitory catalogues have been in use from a very early period in the history of the Church, commencing with a list of prohibited books drawn up by a council held at Rome in 494, or even earlier, with the proscription of the writings of Arius. These prohibitions, in fact, were often issued by other than the Papal authorities. In 1408 a synod at London prohibited the reading of the books of Wickliffe. In 1544 the Faculty of Theology in Paris published a catalogue of books censured by them, and in 1546 the University of Louvain published an index of books regarded as dangerous. The indexes of the Church were a subject of consideration at the Council of Trent, which referred the business of drawing up a complete index to a select committee under the Pope. Their Index was published in 1564, and besides the catalogue of prohibited books contains general rules relative to such books. In 1586 a special ecclesiastical board, the Congre-

gation of the Index, was formed, consisting of a cardinal-prefect, with other cardinals and examiners of books, with authority to judge of new works, to indicate those of which the reading is entirely prohibited, and those which are permitted after correction, and also to grant to learned and pious men the right of reading prohibited works. The most important editions are those of Alexander VII. in 1664, and of Benedict XIV. in 1744. An edition appeared in 1881, with a supplement in 1884. In 1607 the first volume of an 'Index Expurgatorius' was published at Rome, edited by the Dominican Brasichelli. In Spain the Inquisition maintained its right to issue its own index, the last edition of which, dated 1790, was reprinted, with a supplement in 1805. The Spanish indexes, which are mostly both prohibitorial and expurgatorial, contain most of the books found in the Roman index and many others besides. Pope Leo XIII. had a revision made of the Roman Index and the names of about 3,000 books were taken from the prohibited list.

Index of Refraction. See LIGHT.

India, also called **Hindustan** or **Indostan,** derived from the Persian form of the Sanskrit *sindhu,* a river, and signifying "the land beyond the Indus," is a name used both in ancient and modern times with great latitude of signification, and applied more or less comprehensively to the great central peninsula of southern Asia. British conquests having extended to and beyond the utmost limits of the central peninsula, India, in its widest sense, may now be taken to include all the territories in this region that are directly or indirectly under British rule, or at least under British control, and, as the Empire of India, are supervised under the government of which the viceroy of India is head. India, thus defined, excludes the island of Ceylon, which ranks as a separate colony, but includes a considerable portion (namely, Burma) of the eastern peninsula and some adjacent islands. Small portions of territory still owned by France and Portugal are also comprised in it. The mainland of India proper is bounded north by the main range of the Himalaya Mountains: east by mountain ranges which divide it from Burma; southeast by the Bay of Bengal; south by the Gulf of Manaar, which separates it from Ceylon; west by the mountain chains enclosing the valley of the Indus, which separates it from Afghanistan and Baluchistan, and by the Indian Ocean. Its length north to south is nearly 2,000 miles; its greatest breadth east to west about 1,800 miles. It extends between lat. 8° 5′ and 35° 15′ N., and lon. 65° 45′ and 97° E.

Political Divisions.— India as a whole is partly under direct British rule and partly under native rule subject to control by British political agents. The total area of British India is 1,560,160 square miles, of which 964,993 square miles are under direct British rule. Ajmir Merwara, Berar, and Kurg are under the immediate control of the governor-general or viceroy of India; Madras and Bombay (with Sind, Aden, and Perim), former presidencies, are each ruled by a governor; Bengal, the United Provinces of Agra and Oudh, Panjab, and Burma are each under a lieutenant-governor; and there are chief commissioners over Assam and the Central Provinces. In 1901 the Northwest Frontier Province was formed, consisting of the trans-Indus Panjab districts of Peshawar, Kohat, Bannu, and Dera Ismail Khan, with the tribal country beyond their limits and the existing agencies of Dir, Swat, Chitral, the Khaibar, etc. The following table gives the area of the British provinces and their populations in 1891 and 1901:

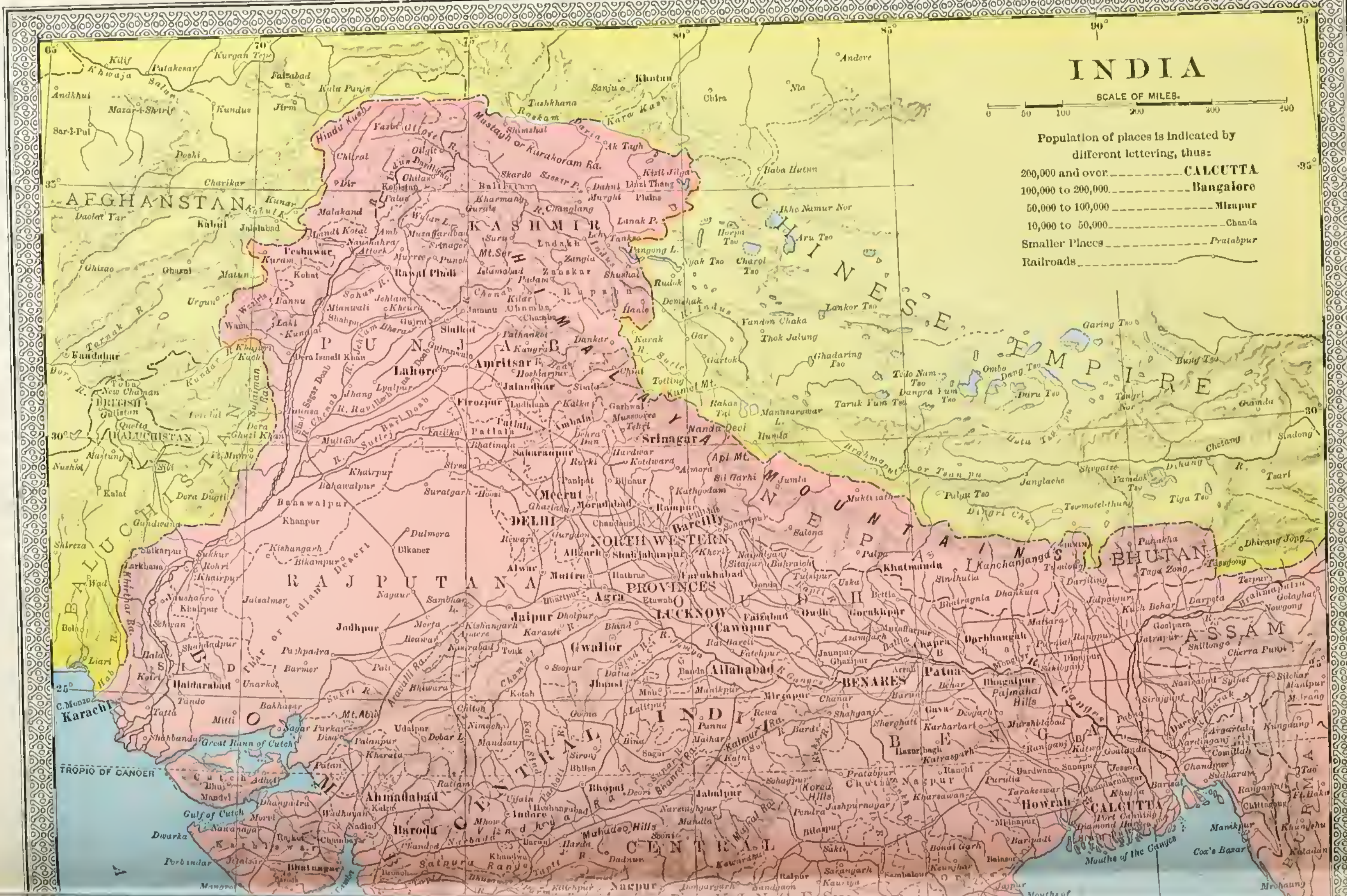
PROVINCES	Area sq. miles	Population 1891	Population 1901
Under Gov.-General —			
Ajmir-Merwara	2,711	542,358	476,330
Berar	17,718	2,897,491	2,752,418
Kurg	1,583	173,055	180,461
Under Governors —			
Bombay { with Sind / Aden, Perim	125,144	18,901,123	18,584,496
Madras	141,189	35,630,440	38,208,609
Under Lieut. Gov'rs —	151,543	71,346,987	74,713,020
Bengal	107,503	46,905,085	47,696,324
United Provinces of Agra and Oudh	110,667	20,866,847	22,449,484
Burma { Upper	83,473	2,946,933	3,849,833
Burma { Lower	87,957	4,658,627	5,371,328
Under Chief Comm'rs—			
Assam	49,004	5,476,833	6,122,201
Central Provinces	86,501	10,784,294	9,845,318
Other Parts —	.....	27,270	810,811
Baluchistan			
Andamans	.....	15,609	24,499
Total	964,993	221,172,952	231,085,132

In the case of Burma, Assam, Sind, Panjab, and Baluchistan the 1901 figures include certain areas not previously enumerated.

Seven of the eight large provinces have a number of native states attached to them. Attached to Bengal, with an area of 35,834 square miles, and a population in 1901 of 3,735,715, are the individual states of Orissa, Chota Nagpur, Kuch Behar, and Hill Tipperah; to the United Provinces of Agra and Oudh, with an area of 5,109 square miles, pop. 799,675, are Rampur and Garhwal; to the Panjab, with an area of 38,299 square miles, pop. 4,438,816 — the chief states are Patiala, Bahawalpur, Kapurthala, Jind, and Nabha; to Madras, area 9,609 square miles, pop. 4,190,322 — the chief states are Travancore and Cochin; to Bombay, area 69,045 square miles, pop. 6,891,691 — the chief states are the Kathiawar group, Kolhapur, Rewa Kantha, Palanpur, Mahi Kantha, Cutch, and Khairpur (Sind); to Central Provinces, 29,435 square miles, pop. 1,983,496 — the chief states are Patna, Kalchandi, Bastai, Bamra, and Raigarh.

The other native states and agencies are: the Rajputana Agency, including among others the states Jaipur, Jodhpur, Udaipur, Bikanir, Alwar, Bhartpur, and Jaisalmir, with a total area of 130,268 square miles and a pop. (1901) of 9,841,032; Central India Agency, including among others the states Gwalior, Rewa, Indore, and Bhopal, with a total area of 77,808 square miles and a pop. of 8,501,883; Baroda, area 8,226 square miles, pop. 1,950,927; Hyderabad, area 82,698 square miles, pop. 11,174,897; Mysore, area 27,936 square miles, pop. 5,538,482; and Kashmir, area 80,900 square miles, pop. 2,906,173. The total area of native states and agencies is thus 595,167 square miles, and their total population in 1891 66,050,479, in 1901 63,181,569.

Physical Features.— The natural boundaries of the peninsula of India, which forms a triangle washed on two sides by the sea, and having


INDIA
SCALE OF MILES.
0 50 100 200 300 400
Population of places is indicated by different lettering, thus:
200,000 and over CALCUTTA
100,000 to 200,000 Bangalore
50,000 to 100,000 Mirzapur
10,000 to 50,000 Chanda
Smaller Places Pratabpur
Railroads
AFGHANSTAN
BALUCHISTAN
CHINESE EMPIRE
KASHMIR
PUNJAB
HIMALAYA
NEPAL
BHUTAN
ASSAM
RAJPUTANA
NORTH WESTERN PROVINCES
OUDH
CENTRAL INDIA
BENGAL
SIND
BURMA
TROPIC OF CANCER
Kabul
Peshawur
Rawal Pindi
Lahore
Amritsar
Srinagar
Meerut
DELHI
Agra
Jaipur
Gwalior
LUCKNOW
Cawnpur
Allahabad
BENARES
Patna
Howrah
CALCUTTA
Karachi
Haidarabad
Ahmadabad
Baroda
Nagpur
Bareilly
Kandahar
Mouths of the Ganges


BAY OF BENGAL
ARABIAN SEA
INDIAN OCEAN
HAIDARABAD
MYSORE
CEYLON
BOMBAY
Poona
Sholapur
HAIDARABAD
Bellary
Hubli
Bangalore
Mysore
MADRAS
Pondicherri
Cuddalore
Trichinopoli
Madura
Tanjore
Negapatam
Calicut
Mangalore
Cannanore
Ongole
Nellore
Masulipatam
Cocanada
Vizagapatam
Goa
TO PORTUGAL
Colombo
Jaffna
Trinkomali
Kandy
Galle
Dondra Head
C. Comorin
Gulf of Manar
Palk Strait
Adams Bridge
Andaman Islands
Nicobar Islands
Ten Degree Channel
Duncan Passage
Little Andaman
Great Nicobar
CALCUTTA and Vicinity.
SCALE OF MILES
0 1 2 3 4 5
CALCUTTA
Howrah
Barrackpur
Serampur
Khardah
South Barrackpur
Hugli River
Ft. William
Alipur
Kidarpur
Tolignaj
Baliaghata Canal
Longitude East from Greenwich
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its base in the great mountain chain which separates it from Tibet on the north, are completed by its three great rivers, the Indus, the Ganges, and the Brahmaputra. These all rise in the Tibetan Mountains beyond the Himalayas, and the first flowing west, the two latter east, descend in a southern direction toward the sea; the Indus discharging itself into the Indian Ocean; the Ganges and the Brahmaputra, after watering in their separate course a large part of Northern India, uniting to pour their waters together by numerous mouths into the Bay of Bengal. The mountains enclosing the basins of these rivers form the east and west boundaries of the northern part of the peninsula. The Himalayas, the loftiest mountain range in the world, with heights of upward of five miles above the level of the sea, descend by successive slopes to the elevated plain of Northern India. (See INDUS, GANGES, BRAHMAPUTRA, HIMALAYA.) The entire peninsula is sometimes distinguished by three natural divisions. The Vindhya Mountains, a range of about 3,000 feet in height, which extends irregularly across the peninsula, from Gujarat to the basin of the Ganges, forms an anciently-recognized division into two parts under the names of Hindustan and the Deccan (Southern Land). The name Hindustan, given in this restricted sense to the northern part of the peninsula, is frequently applied to the whole. The ancient division of the Deccan is again subdivided into two, the name Deccan being restricted to the northern part, the southern from the river Krishna or Kistnah, which flows from west to east almost across the whole peninsula, being called Southern India or India south of the Krishna. The portion of India watered by the Ganges and its tributaries is by far the most fertile and populous of the whole. At no great distance from the opposite extremities of the Vindhya Mountains two great ranges proceed southward along the line of the coast. The Western Ghâts, which attain a height of 5,000 to 6,000 feet, though at some parts much lower, proceed along the west coast to Cape Comorin, the southernmost point of India. They do not generally recede more than 40 miles from the sea, and rarely more than 70. On the sea side their descent is generally precipitous, forming a regular sea-wall. On the land side they descend gradually, and sometimes almost imperceptibly, to the elevated plains of the interior. The Eastern Ghâts recede farther from the east coast, are less elevated and precipitous. Before reaching as far in their southern course as Madras, they trend inward, and unite with the transverse range of the Nilgiri Hills, which connects them with the Western Ghâts. This mountain-formed triangle encloses an elevated table-land with a gradual slope eastward from the Western Ghâts, and which is continued beyond the Eastern Ghâts to the sea. The elevation of the plain of Southern India also increases toward the south. In the Deccan it is about 3,000 feet above the level of the sea. In the neighborhood of the Nilgiri Hills, which rise 3,000 feet above it, it reaches 7,000 feet.

Hydrography.— The chief rivers of India besides the Indus, Ganges, and Brahmaputra, already named, are the Jamna, Ramganga, Gumti, Gogra, Gandak, Kusi, etc., tributaries of the Ganges; the five rivers of the Panjab, Satlej, Bias, Ravi, Chenab, and Jhilam, tributaries of the Indus; the Nerbudda, enclosed on its northern bank by the Vindhya Mountains, and the Tapti, which flow west into the Gulf of Cambay, the Mahánadi, the Godávari, the Kistna, North and South Pennar, Vellar, Kaveri, etc., all flowing eastward into the Bay of Bengal. The uniform direction of the great rivers south of the Tapti is explained by the inclination of the land already described. The coasts of India have very few indentations, and consequently very few good natural harbors. The western coast is known by the name of the Malabar, the eastern by that of the Coromandel coast. There are no lakes of any extent in India — Chilka and Kolair near the east coast being the largest.

Geology.— All the great mountain ranges are chiefly composed of granite and of granitic rocks, which form also the base of the plateau of the Deccan. Both in the peninsula and in the Himalayas gneiss predominates, associated with mica-schist, hornblende-schist, chlorite slate, and primitive limestone. Syenite prevails in the southeast of the peninsula. In the southern portion of the Western Ghâts the granitic rocks are overlaid by an iron clay, which is continuous to the end of the peninsula, and reappears in the island of Ceylon. In the upper portion of the Western Ghâts and adjoining ramifications of the Vindhya range, basaltic trap in various forms overlies the granite to an extent unparalleled elsewhere in the world. It entirely covers a large portion of the table-land of the Deccan. In this district trap and granite frequently pierce the surface in isolated masses, forming flat-topped hills nearly perpendicular, and which can only be ascended by steps, or winding, dangerous paths. These have been converted into strongholds from a remote antiquity. They are frequently crowned with forts, and form a peculiar feature of the landscape. On the lower sides of the Himalayas regular strata of the Secondary and Tertiary periods are largely developed. Many of the sandstones and shales of the Secondary period belong to the coal-measures. The Indian Tertiary formations attain their greatest breadth toward Sind and the Panjab, where fossil remains, including many of singular forms and gigantic dimensions, are abundant.

Mineral Resources.— The principal coal fields in India are found in the region bounded north by the Ganges, south by the Godávari, and stretching east and west from the neighborhood of Calcutta to the middle of the valley of the Narbada. Indian coal is distinguished by its excessive lamination. The annual production in India was 6,635,727 tons in 1901, from 427 collieries worked throughout Bengal, Hyderabad, Assam, Rewah, the Central Provinces, Panjab, Baluchistan, and Burma. The most important mines are those of the East Indian Railway Company near Giridhi (Bengal) and the Singareni mine in Hyderabad. Of the coal used on the railways 95 per cent is Indian coal. Iron ore is abundant in many parts of India, but the amount produced is still small. The only large iron-work in India is at Barrakur in Bengal, but iron is manufactured locally on a small scale in other parts of Bengal and in the central provinces. The chief obstacle to the successful development of the iron industry of India is the difficulty of finding the ore, fuel, and flux sufficiently near to one another to

make it profitable, but it is believed that iron-works near Calcutta, using Madras ore and Bengal coal, would succeed. Gold is worked to some extent, more especially in Mysore, the total production in 1900 being 513,266 ounces. Copper, lead, antimony, and other metals are fairly abundant. Burma yields a large amount of petroleum annually, and smaller quantities are obtained from Assam and the Panjab. The total output for 1900 was over 37,500,000 gallons, but much is still imported. There are valuable ruby mines in Upper Burma, and a few diamonds are still obtained in Central India. Salt is an important manufacture and source of revenue: its production is treated under the head of *Finance*.

Soils.— The alluvial deposits along the mountain valleys and in the plains, and the soil composed of disintegrated rock masses on the plateaus, are especially rich and of great productivity. Their fertility is greatly enhanced and maintained by an elaborate system of irrigation. See paragraph in this article on *Canals and Irrigation*.

Climate.— India extends 15½° within north tropical latitudes, and 12½° within the temperate zone. Owing to modifying circumstances, the climates contained within this range are not only extremely various, but distributed with great irregularity. One of the chief modifying circumstances is the distribution of moisture, the great regulators of which are the monsoons. The northeast monsoon blows from October to March, the southwest from April to September. The latter surcharged with vapor from the Indian Ocean condenses in torrents on the heights of the western Ghâts, and forms the rivers which flow to the east. Before it reaches the Coromandel coast, it becomes a dry wind which scorches up vegetation. In Hindustan, on the contrary, this wind passes over the low plains in the lower valley of the Indus, is arrested by the Himalayas, and fills the tributaries of the Ganges. The northeast monsoon runs a similar course in the opposite direction, but deriving less moisture from the Bay of Bengal, which is of less extent than the Indian Ocean, it has less influence on the climate, and its season is in general the dry one. The great plain of Southern India being exposed to greater heat than that of Hindustan, and not being watered by the snow-fed streams of the Himalayas, is naturally much less fertile. The seasons in India are divided into rainy, cool, and hot. The periods of these different seasons vary according to latitude and modifying circumstances. On the Malabar coast the rain begins earliest to the south. At Calcutta rain falls from June to October; the cool season begins about November, the hot season in February, the heat increasing gradually till May. In Calcutta where the mean annual temperature is about 79°, the range is from 50° to 85° F. In Bombay the mean annual temperature is about 82°, the range about 10°; in Madras mean about 84°, range 7° to 8°. The annual rainfall in India is much greater than that of England; but it is distributed with great irregularity. The basin of the Indus, including all Sind and the half of the Panjab, is an arid region with an annual rainfall under 15 inches. The high plateau in the interior of South India has an annual rainfall generally under 30 inches. On the whole Malabar coast the rainfall is over 75 inches; at Kananor it reaches 128 inches. On the Coromandel coast it is very much lower, being 45 inches at Vizagapatam, 50 inches at Madras, while farther south it falls below 30 inches. Between the arid region of the Indus and the Ganges runs a dry zone of 100 to 200 miles wide, including Lahore, Delhi, and Agra, with a rainfall between 15 and 30 inches. The valleys of the Tapti, the Nerbudda, the lower part of the Jamna, the Ganges, and the Brahmaputra, are generally over 30. Along the slopes of the Himalayas from Cashmere east to the boundaries of India, and southeast to the mouths of the Mahánadi runs a belt of country with a rainfall over 60 inches, within which is included the lower course of the Ganges. Within this is another belt, including a lower slope of the Himalayas, and the lower course of the Brahmaputra before its junction with the Ganges, in which the rainfall rises above 75 inches.

Forests.— The three most valuable timber trees of India are the teak (*Tectona grandis*), the sál or saul (*Shorea robusta*), and the deodar (*Cedrus Deodara*). The teak grows most luxuriantly along the Bombay coast, in Travancore and Cochin, and in Burma, but it is also abundant throughout much of Central India and elsewhere. The sál is the chief forest tree of the Himalayan slopes, from the Satlej eastward to Assam, and it grows also in the forests of Central India and the Eastern Ghâts. The home of the deodar is the northwestern Himalayas. Among the most valuable trees of the densely forested Western Ghâts from Kanara to Travancore and Mysore are teak, blackwood, bamboos, sandal-wood, a kind of ebony, and *Calophyllum inophyllum*, whose wood is prized for the spars of ships. In the United Provinces and neighboring districts the leading species are sál and several varieties of pines, and in the extensive jungles of the Ganges delta the most useful wood is that of the sundari (*Heretiera littoralis*). The forests of Assam yield sál. *Pinus Kasya*, caoutchouc (*Ficus elastica*), and other useful species, and plantations of teak, tun or toon (*Cedrela toona*), and sissoo (*Dalbergia sissoo*) have been laid out. Beside teak the Burmese forests contain ironwood and the cutch-tree (catechu). Before the formation of the Indian Forest Department the forests were recklessly destroyed by timber-cutters, nomadic cultivators, and others, but large forest areas in all the provinces have now been marked off as reserved forests under the immediate care of the forest officers, and other forest areas have been brought under partial conservancy. Timber-cutting and grazing have been either prohibited or restricted; and plantations of the more useful trees have been formed in many parts of the country. In every province a few of the most valuable timber trees are declared to be reserved trees, and can only be felled under special license. Forest revenue is raised by royalties on, or by the sale of, timber or other produce, and by the issue at specified fees of permits to graze cattle, or to extract for sale timber, firewood, charcoal, bamboos, canes, and other minor forest produce. The reserved forests now cover an area of more than 80,000 square miles, and the protected or partially conserved forests occupy other 30,000 square miles. Some of the native states, such

as Mysore, Travancore, Baroda, and Kashmir, have followed the example of the British government.

Flora.— Where moisture is plentiful, as in the valley of the Ganges, vegetation is superabundant. The delta of the Ganges, in particular, called the Sunderbunds, is covered with dense jungle full of the largest wild animals, and the excessive vegetation renders most of the mouths unnavigable. There are many other similar tracts of extensive forest and jungle. On the Coromandel coast, on the other hand, the heat, which reaches 100° or 120° F., destroys vegetation, and the delta of the Indus from the southeast of the Panjab to the Ran, or great salt marsh of Kach (Cutch), forms a great sandy desert, continuous across the river with the desert of Baluchistan, and with a wide band stretching across the whole continent of Asia to Central Africa. In the various altitudes of the Himalayas forms of vegetable and animal life belonging to all the various climates from tropical to polar are to be found. These as well as the Western Ghâts are magnificently wooded. Orchids, rhododendrons, and other valuable flowers are common. Among the staple natural products of India are rice, maize, wheat, barley, cotton, flax, hemp, jute, rhea, indigo, tea, coffee, sugarcane, opium, tobacco, ginger, pepper, cardamoms, palms bearing nuts which are extensively consumed, anise, dye-woods, etc. European fruits abound, and among indigenous fruits may be mentioned the mango, plantain, pomegranate, citron, date, almond, grape, pineapple, and tamarind. Palms, including the date, cocoanut, palmyra, betel-nut, and other species, the banyan, and bamboo, are common features of the vegetation.

Fauna.— The elephant, the rhinoceros, the camel, the tiger, a few lions in the northwest, the leopard, bears, hyena, jackal, wolf, and numerous smaller carnivora, the boar, antelopes, deer, wild ox, ass, sheep, and goat, monkeys in great variety, and the greater number of European quadrupeds are found. There are several large species of ox, such as the gaur or "bison" and the arnee or wild buffalo. Crocodiles, snakes (including the dreaded cobra), and reptiles in all varieties are very numerous; of birds, the eagle, vulture, falcons, peacock, parrots, kingfishers, mina-bird, partridge, quail, heron, stork, are characteristic species, and other varieties, both indigenous and common to other regions, are numerous. Fish are plentiful and in great variety both on the coasts and in the rivers.

Land Tenure and Revenue.— In India the state, or the monarch, has always enjoyed a share in the rent or profits from the land. Before the advent of the Mohammedans and the establishment of the Mogul Empire the almost universal unit for the purposes of revenue collection was the village community. In a village community land was held, not by private owners, but by cultivators occupying it under the village corporation, and the land revenue was collected from the head-man as representing the community. With the Mohammedan conquest new methods of revenue collection were introduced. The state claimed one third of the gross produce of the soil as its share, and entrusted its collection to persons who each agreed to pay a definite amount from the district assigned to him. These revenue farmers, known as *zamindars*, were often local magnates under the old Hindu system. Under British rule the aim has been to substitute private property in the soil, wherever practicable, for the older communal systems, and in consequence the zamindars, who were in no sense proprietors, have become so in several parts of British India, while in others the cultivating *rayots* (or *ryots*) have been raised to the status of peasant proprietors. The village community, however, in some form still exists both in British and in native territory.

The term "settlement" is applied in Indian revenue affairs to the process of assessing the land revenue demand. Occasionally, in newly acquired or specially backward tracts, the land revenue is assessed for a short term of years on a general review of the circumstances and capabilities of the land and people concerned; such a process is called a summary settlement. But a regular settlement is a more complicated affair, and consists of many stages. In the first place, every separate estate or holding is demarkated by permanent marks on the ground; and disputes between neighboring right-holders are investigated and decided. Every estate or holding is then surveyed and mapped, all boundary-marks, wells, and buildings being shown on the field or cadastral maps. After the field maps are prepared, the next process is to classify or record each field according to its productive value, as evidenced by its soil, the amount of its produce, or by the rent it pays. A record is at the same time drawn up of all rents paid, and of all rights, whether landlord rights, or tenant rights, or rights of user, over all the ground, buildings, wells, and trees shown in the map. Then the assessing officer (or settlement officer, as he is often called) compiles the information obtained for all the lands in a circle of villages; and on a review of all these data, of the past fiscal history of the tract, of the range of prices, of the accessibility of markets, and of other general considerations, he proposes rent rates or revenue rates for the several classes of lands in the circle. The rent rates or revenue rates proposed by the settlement officer, and the grounds on which they were based, are then investigated by a superior officer, and are not adopted until they have been accepted or modified by the latter.

In provinces where the zamindari tenure prevails, that is, where single proprietors or proprietary brotherhoods possess large estates of several hundreds or thousands of acres, the state revenue is assessed at an aliquot part (usually about one-half) of the ascertained or assumed rental. The revenue, though it is fixed with reference to acreage rates on the land actually cultivated, is assessed on, and is payable by, each estate as a whole; the assessment remains unchanged for the 30 years, or other period of the settlement; the proprietor can bring as much as he likes of his waste and fallow land under the plough; and it is only on re-assessment at the end of the term of the settlement that the state obtains any increase of revenue on account of the extensions of cultivation during the settlement period. In provinces where the rayatwari tenure prevails, that is, where each petty proprietor holds directly from the state, generally cultivates his own land, and has no landlord between himself and the government, the revenue is separately assessed at an acreage rate on each petty holding, and land revenue becomes payable at once, or

after a short term of grace in the case of uncleared lands, on all extensions of cultivation. The rayatwari proprietor is at liberty to throw up his holding, or any portion of it, at the beginning of any year, after reasonable notice; the zamindar, or large proprietor, engages to pay the revenue assessed upon him for the term of the settlement.

The land revenue assessment was fixed permanently more than 100 years ago on the greater part of Bengal, about a third of Madras, and certain southern tracts of the Northwest now the United Provinces, paying in all about $14,250,000 a year. In the temporarily settled tracts, comprising the rest of India, it is fixed periodically for terms of 12 to 30 years. In the nine chief provinces (Bengal, Bombay and Sind, Madras, the United Provinces of Agra and Oudh, Central Provinces, Panjab, Burma, Assam, Berar) the number of rayatwari holders is about 273,000, of whom none belong to Bengal, Panjab, and the United Provinces and Oudh. The total number of zamindars and village communities is about 318,500, of which only Sind and Berar have none. The total number of holdings is thus about 591,500. In the greater part of Bengal land is held by zamindars under a permanent settlement, but the tenants are protected by recent legislation. The rayatwari system is the prevalent one in Madras, and in Bombay a similar system has been established. In the latter province the cultivators are now protected by law against the extortions of the money-lenders. The village community is still common in the United Provinces and the Panjab. In Oudh much of the land is held by talukdars, who have been granted certain privileges which are denied to the zamindars.

Agriculture.— The total area accounted for in the agricultural returns for 1901 is 546,000,000 acres, of which 66½ millions are under forest, 135½ million not available for cultivation, and 147½ million culturable waste and current fallows. The net crop-yielding area is thus 198½ million acres, or, taking account of land cropped several times in a year, 223½ million acres. The three chief food-grains of India are rice, millet, and wheat. Rice is the staple food of about a third of the population, and is grown on 75 million acres, but it is nevertheless essentially a local crop, which can be cultivated with profit only under exceptional circumstances. Of the total rice area 40 million acres belong to Bengal, where it is the staple crop, and about 7 million each to Madras and Burma. Over 90 per cent of the cultivated area of Lower Burma is under rice, and it is grown on nearly three quarters of the area of Assam, about one third of that of the Central Provinces, a quarter of that of Oudh, while it is of importance also in the United Provinces and Sind. It is grown to a less extent in the Panjab and Bombay. Rice is also cultivated by hill tribes in all parts of India. In Bengal there are two chief rice harvests in the year, the *áus* or early crop, chiefly for local consumption, and the *áman* or winter crop, chiefly for export; but in Lower Burma, whence most of the exported Indian rice comes, there is but one harvest, corresponding to the Bengal winter crop. The total area under wheat is 24 million acres, mainly in the Panjab (7½ million), where it is the leading crop, the United Provinces of Agra and Oudh, the Central Provinces, Bombay, Central India, and Bengal. Taking India as a whole, it may be broadly affirmed that the staple food-grain is neither rice nor wheat, but millet. The area under the various kinds of millet and maize is 43 million acres, chiefly in Bombay (13½ million), where these are the chief food crops; Madras, where also, though to a less extent, millets are the chief food-grains; Panjab, United Provinces, Berar, in which millets are by far the most important food crops; Central Provinces, Sind, Oudh, Bengal, and Upper Burma. The chief varieties of millet grown in India are *joár*, or *jawárí*, or *cholam*, great millet (*Sorghum vulgare*); *bájra*, or *kambu*, spiked millet (*Pennisetum typhoideum*); and *ragí*, or *náchani* (*Eleusine corocona*), grown chiefly in Southern India. About 8 million acres are sown with barley, chiefly in the upper Ganges valley, the Himalayan valleys, and the Panjab. Gram crops or pulses, especially chick-pea, green-gram, horse-gram, lentil, and pigeon-pea, occupy 10 million acres, mainly in the United Provinces of Agra and Oudh, the Panjab, and Bengal. The large native demand for oil has been reinforced in recent times by a rapidly-increasing foreign demand, and in consequence the cultivation of oil-seeds has greatly developed. They are grown in many parts as a second crop on ground from which rice or some other food crop has already been taken. The chief varieties cultivated are linseed, rape-seed, sesamum (*til* or gingelly), and castor-oil, and the total area occupied by them is 22 million acres, chiefly in Bengal, Bombay, and Sind, Madras, Central Provinces, and Panjab. The area under ground-nuts in Bombay and Madras is about 170,000 acres. The cultivation of vegetables for household use is general, and near some of the towns it is carried on more extensively. Potatoes thrive best in the more elevated tracts. Among cultivated fruits are the mango, guava, orange, melon, citron, lime, fig, plantain, pineapple, pomegranate, tamarind, shaddock, jack, papaw, and custard-apple. The area under sugar-cane is about 2,800,000 acres in Bengal (especially Orissa), United Provinces, Panjab, Oudh, Madras, and Bombay. Jaggery sugar is made from the bastard date-palm, which is grown for this purpose in the neighborhood of Calcutta and in northeastern Madras. The tea crop is one of great and increasing importance, and occupies about half a million acres, of which 330,000 are in Assam, the rest being in Bengal, Panjab, United Provinces, Madras, Burma, and native states. With the exception of a few hundred acres in Burma, Assam, etc., the whole of the coffee-growing area, amounting to about 280,000 acres, is in Southern India, in Mysore, Kurg, Madras, Travancore, and Cochin. The chief cinchona plantations are the government ones at Darjiling and in the Nilgiris. The tree was introduced by the Indian government.

Cotton is one of the most valuable vegetable productions of India. The total area under the cotton-plant is 14,000,000 acres, distributed thus: Bombay and Sind (3,900,000), Berar (2,500,000), Hyderabad (1,700,000), Madras (1,400,000), United Provinces of Agra and Oudh (1,250,000), Panjab (1,200,000), Central Provinces (1,000,000), and smaller areas in Central India, Rajputana, Burma, and Bengal. Next in importance to cotton among Indian fibres comes jute, which is cultivated in eastern Bengal along the valleys of the Ganges and the Brah-

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maputra, occupying fully two million acres. The cultivation of the mulberry, for the rearing of the silk-worm, is chiefly carried on in eastern and northern Bengal, with Murshidabad as a centre. The indigo industry is one of the oldest in India, but it is at present in a languishing condition. The area under the plant is about 964,000 acres, chiefly in Bengal (360,000), United Provinces of Agra and Oudh, Madras, and Panjab. The opium poppy is cultivated in certain parts of western Bengal and the United Provinces of Agra and Oudh, in the Panjab, and in the native states of Rajputana and Central India, occupying in all about 600,000 acres. (See below under *Finance*.) Tobacco is grown in every district for local consumption. Among the numerous minor cultivated vegetable products of India are turmeric, chillies, ginger, coriander, aniseed, black cummin, fenugreek, pepper, cardamoms, betel-pepper, areca or betel-nut palm, cocoanut palm, palmyra palm, and date-palm. Experimental cultivation of rhea, rubber, sisal-hemp, and other valuable economic plants has been carried out on the experimental farms maintained by government in various parts of the country.

Stockraising.— Horned cattle are used in agricultural operations throughout all India, except Sind and the Panjab, where camels generally take their place. The total number of cattle in India is over 100 millions, of sheep and goats 40 millions, of horses, ponies, mules, and donkeys, 2½ millions, and of camels about a quarter of a million. There are large numbers of buffaloes in all parts of the country. A public veterinary department has been organized to attend to the improvement of the breeds of horses, ponies, mules, and cattle, the prevention of disease among domestic animals, and the provision of veterinary instruction. Its operations are mainly confined to Northern India, where the conditions are most favorable for the breeding of horses for military purposes.

Commerce.— From a very early period down till comparatively recent times Western traders visited India in order to obtain the gold and silver, jewels, spices, and other costly products for which India was then celebrated, but the present foreign trade of India has developed under British rule and rests on an entirely different basis. In the year 1700 the total value of the exports from India was under $5,000,000, in 1834 the value had risen to $50,000,000, and now goods and treasure to the value of about $400,000,000 are exported every year. In 1899–1900 the total value of private imports by sea (excluding treasure) was $235,706,200, of government imports of stores, $15,308,725; total of all imports other than treasure, $251,014,925. The total value of private exports of Indian merchandise was $352,379,510, of foreign merchandise re-exported $10,975,525, of government exports of stores $357,115; total of all exports other than treasure, $363,712,150. Treasure was imported to the value of $69,912,285 and exported to the value of $26,521,295. Thus, including treasure, the total exports by sea amounted to $390,233,445, and the total imports to $320,927,210, the total sea-borne trade being $711,160,655. The exports by land in the same year were valued at $18,800,925, and the imports by land at $23,529,025. Thus, the total trade of India by land and sea amounted in 1899–1900 to $753,490,605. The chief articles of import were: cotton woven goods, metals and hardware, oils, chiefly petroleum, sugar, railway material, machinery and mill-work, cotton yarns, chemicals, medicines, dyes, woolen goods, silk, raw and manufactured, provisions, liquors, and apparel. The chief exports were: jute, raw and woven, husked rice, hides and skins, oil-seeds, raw cotton, tea, opium, cotton yarns, wheat, indigo, coffee, raw wool, and cotton woven goods. The proportion of trade directly with European countries is about 63½ per cent, omitting the trade with Egypt, much of which really goes to Europe. The trade with the United Kingdom is over 70 per cent of the trade with Europe and nearly 45 per cent of the total trade. Next to the United Kingdom, the chief countries trading with India are China, Germany, United States, Straits Settlements, France, Japan, Belgium, Ceylon, Austria-Hungary, Italy, and Russia. The figures for 1900–1 show that, while Indian imports of American goods were valued at only some $49,000, Indian exports to America amounted to $241,640. The chief articles of export appear to be gunny bags and cloth, of which latter America takes more than all other countries. The trade of India with America, however, is only of short standing, but, wisely organized, is capable of being greatly expanded. At present Germany supplies many things this country should furnish, particularly in the electrical and chemical lines, in which it at present holds the market. Other important articles of Indian export are tea, jute and jute manufactures, wheat, oil-seeds, rice, leather, wool, indigo, coffee, teak-wood, cotton, and lac. The share of the five chief seaports of India in the total foreign trade (excluding treasure and government stores) in 1899–1900 was as follows: Calcutta, $264,130,000; Bombay, $188,230,000; Rangoon, $40,590,000; Karáchi, $35,170,000; Madras, $32,180,000. India has many other seaports of minor importance. The value of merchandise and treasure carried in coasting vessels during 1899–1900 was $135,470,000. The trade across the land frontiers is steadily increasing, the chief item among imports being food grains, and among exports cotton goods. Much greater than her trade with foreign countries is the internal trade of India, but no returns of its amount are available. It is mostly in the hands of natives, and to a large extent in those of particular groups or castes. It is still carried on, as it has long been, at village markets, town bazaars, religious fairs, and similar gatherings, but the development of railway and canal communication and the transformation in the system of agriculture have greatly altered its character in many ways.

Manufactures.— The domestic industries of India, such as weaving and spinning, pottery, brass-work, iron-work, and art work of many kinds, continue to be practised after ancient methods all over the continent of India. But Indian fabrics and products, made on a small scale by workers at their homes, have for years past been giving way before the cheaper, less artistic, and often less durable cotton yarn and fabrics, and the iron or steel products of British factories. Meanwhile an important manufacturing industry has been growing up, and steam-power factories are at work, among which those for spinning and weaving cotton, for spinning and weaving jute, for making paper, for husking and cleaning rice, for sawing tim-

ber, and for brewing beer, are the most important. Steam power is also largely employed in factories, on tea gardens, and indigo estates. In 1900 the number of cotton-mills in British India and native states was 186, containing 38,420 looms and 4,728,000 spindles, and giving employment to 163,000 persons. Of these mills 136 were in Bombay Province (80 in Bombay City), the rest being in Madras, Bengal, Central Provinces, United Provinces, Burma, Panjab, and Berar, besides some of the native states. The number of jute-mills was 33 in 1899–1900, containing 14,021 looms and 293,218 spindles, and employing over 100,000 persons. All the jute-mills are in Bengal, except one in Cawnpore, which is the chief manufacturing centre of the United Provinces. Four woolen mills produce blankets, serges, and cloths worn by the army and the police. The largest brewery is at Murree, in the Panjab Himalayas. Among other industrial works of importance are silk-mills, soap-factories, tanneries, iron and brass foundries, sugar-factories, coffee-works, cotton-presses and ginning-factories, jute-presses, rope-factories, oil-mills, cutch and lac factories, flour-mills, ice-factories, pottery and tile factories, bone-crushing works, tobacco and cigar factories, silk filatures, glass-factories, dye-works, indigo-factories (over 5,000), printing-presses, and dairy farms. The total number of persons employed in all these manufacturing industries is about 700,000. The present Indian Factory Act came into force at the beginning of 1892. The daily wages of a man employed in a factory vary, according to locality, from 2 to 4 annas (4 to 8 cents).

Shipping and Navigation.— In 1897–8, 9,759 vessels of 7,784,630 tons burden entered and cleared the ports in British India, as against 8,613 vessels of 9,625,317 tons in 1901–2. Of these in the latter period 3,988 were of British nationality, 2,003 native, 1,289 British Indian, and 1,333 foreign; included in these numbers were 1,644 steam vessels of 4,299,948 tons entering and clearing via the Suez Canal. In 1901–2 115 vessels of 4,833 tonnage, were built in Indian ports, 81 in Bombay, 13 in Madras, and 10 in Sind.

Railways and Roads.—The first Indian railway, from Bombay to Thana, was opened in 1853. The main trunk lines constructed from that time till about 1875 were built and managed by private companies on whose capital the Indian government guaranteed a fixed rate of interest, generally 5 per cent. The government in return for this assistance, exercised a general control over the companies, and reserved the right of buying the undertakings at specified dates on stated terms. In 1870 Lord Mayo initiated the policy of railway construction by direct state agency, but in more recent times several lines have been constructed by "assisted companies." Several of these latter lines have been taken over by government. There are also native state railways constructed from capital raised in native states, but generally worked by a staff employed by the government of India or by the trunk railway companies to whose lines they serve as feeders.

The importance of railroads in India is largely increased, in a governmental sense, by reason of their forming strategical links between the various military cantonments through which the vast Indian population is held in check by a comparatively small army of British soldiers. This, more than any other incentive, has hastened the development of railways in India.

The main lines are two in number, and are known as the Bombay-Calcutta and the Bombay-Madras lines. The former crosses the great northern plain, the latter the great southern plain of India, and are both connected by means of branch lines with all the large cities of the empire — the capitals of the rajahs, maharajahs and nabobs. These two great trunk lines have also been extended to the farthest limits of India, and even into adjoining territories, as where the line which crosses the Indus at Sukkur enters Afghanistan, the terminus being not more than 60 miles from Kandahar. There is also the Burman line, which passes up the valley of the Irawaddy in the direction of the Chinese frontier. These three main lines, with their several offshoots, may be roughly sketched as follows: In the north, a direct line from Bombay on the west coast to Calcutta on the east coast; a line to Benares from Bombay; a direct line from Calcutta to Peshawar, on the Afghanistan border, by way of Benares, Delhi and Lahore; a line from Lahore to Karachi, with the branch line between these two cities to Kandahar. In the south, the main line between Bombay and Madras through Hyderabad; the line from Bombay to Goa, and from Goa to Madras, with lines connecting with Calicut and with the line from Madras to Tuticorin in the south. In Indo-China, the main line from Rangoon to the Chinese frontier, by way of Mandalay, and with an extension to Bhamo and another to Meaday. (It is proposed to extend the Bhamo line to Bishi and the main line to Yun-nan in China with offshoots to Tching-tou and Hai-pong.)

The total mileage of railways in India on 31 December was distributed as follows: State lines worked by the state, 5,884; state lines worked by companies, 11,654; total state lines, 17,538. Lines owned by native states and worked by state railway agency or by the states themselves, 1,314; native state lines worked by companies, 1,560; total native state lines, 2,874. Total of lines owned by government and native state, 20,412. Lines worked by guaranteed companies, 2,663; lines worked by assisted companies, 1,518; total private lines, 4,181. The total capital outlay of these railways till the end of 1900 was slightly over $1,000,000,000; the total number of passengers carried in 1900 was 117,613,218; and the total weight of goods carried slightly over 43,000,000 tons. The chief highways are well metalled with a kind of limestone called *kankar*, but in Lower Bengal and similar districts, where there is no available stone, roughly-made bricks are used for road-metal. Many of the roads are planted with avenues of trees. The total length of roads in India maintained by public authorities is over 152,000 miles, of which over 36,000 miles are metalled.

Posts, Telegraphs, and Telephones.— The number of post-offices in India in 1899–1900 was 10,823, and the length of postal lines 91,534 miles. The total number of letters and post-cards carried was 448,868,998; of packets of every kind, 509,006,476. Adding the district post lines and the political and military lines administered by the Imperial post-office, the total length of the lines over which mails were carried was 127,934 miles. The Indian telegraph system now consists (1900) of 52,909 miles of line, 170,766 miles

FEASTING THE IDOLS.

of wire, and 283 miles of cable. The number of telegraph offices is about 5,000, and the annual number of messages over 6,000,000. There are telephone companies at important towns, such as Bombay, Calcutta, Karáchi, Madras, Madmain, Rangoon, and Ahmadabad. India is now in direct telegraphic communication with the Straits Settlements and the Australian colonies, with Europe via Suez, via Teheran, and via Turkey, with the East Coast of Africa, and with China via Bhamo.

Canals and Irrigation.— In some parts of India, such as Sind, cultivation is impossible without irrigation, while in others, such as much of Lower Bengal, irrigation may be regarded as quite unnecessary; but in the greater part of all the provinces the rainfall is either insufficient for the proper cultivation of the soil, or so uncertain as to expose the agriculturists to the constant risk of scarcity and even of actual famine. Hitherto irrigation has had only a secondary place in the governmental development of India, the attention of the administration having run more to railways. The profit on the railways is, on an average, 5 per cent, while on the expenditure on irrigation works on which only $125,000,000 have been spent, the profit has averaged 7⅓ per cent; on the Eastern Jumna canals the profits rise to 25 per cent. The annual irrigation expenditure under the present Indian budget comes to only $7,500,000 for major and minor works together.

In 1903 it was proposed by a special commission that the sum of $150,000,000 be devoted to irrigation works, the expenditure to be spread over 25 years. This period is regarded by some as too long, and they think it should be curtailed by one-half, as the question is urgent from both the political and economic point of view. While not considering the expenditure on railways excessive, seeing their military importance, it is felt that they have more than sufficient capacity for draining away all the produce of the country, to which it is time to cry a halt, and to devote more money and attention to works that will extend and stimulate production. The larger irrigation works have been found unprofitable in four districts only, and in those the loss has been very small.

Many of the irrigation works now administered by the Public Works Department are simply old native works restored, and in some cases extended or improved. The total irrigated area of India is about 37 million acres. Tank irrigation is common in some districts, especially in Southern India, and the tanks are mostly of native origin. Many old tanks, however, have been repaired or improved by the British government, and new ones have been constructed in Madras (where there are now 60,000 tanks), the Bombay Deccan, and Ajmir Merwara: In parts of Baluchistan, where the rainfall is scanty and capricious, water for irrigation purposes is drawn from underground springs by means of tunnels driven into the hill-sides. The most common method of irrigation in India, however, is that by wells, which prevails over large areas in all the provinces. Canal irrigation was practised to some extent by the native rulers, but all the important canals have been constructed since the British occupation. Irrigation canals are of two kinds, inundation and perennial. The latter are furnished with permanent headworks and weirs, and are capable of irrigating large areas throughout the year, independently of the local rainfall; while the latter, which are peculiar to Sind and the Panjab, are simply earthen channels supplied with water by the annual rise in May of the Indus and its affluents. Many of the perennial canals are, either in whole or in part, used for navigation, and there are, besides, a few canals used for navigation alone. The total length of irrigation canals in operation was 42,352 miles, of which 12,497 miles were main canals and the rest distributaries. The total mileage of navigable canals in Bengal, Panjab, United Provinces of Agra and Oudh, and Madras is fully 4,000 miles, of which about 1,600 miles are for navigation only.

The total area irrigated by canals in Bengal exceeds 720,000 acres, and the length of irrigation canals is 3,381 miles, of which 747 miles are main canals. Of these canals 495 miles are open to navigation, and there are besides 1,339 miles of canals used for navigation only, thus giving a total length of 1,834 miles of navigable canals. The area in the United Provinces of Agra and Oudh irrigated by canals exceeds 2,800,000 acres, over 1½ million acres being irrigated by the Upper and Lower Ganges Canals (q.v.), and the total length of irrigation canals is 12,534 miles, 1,554 miles being main canals. Of these canals 537 miles are open to navigation. Over 5,000,000 acres in the Panjab are irrigated by canals, the total length of these being 12,069 miles, of which 3,478 are main canals, 432 miles of the latter being utilized for navigation also. Three million acres are irrigated by canals in Madras, and rather more by tanks and in other ways. The total length of irrigation canals in the province is 10,522 miles, of which 3,474 are main canals. The total length of canals used for navigation is 1,252 miles, of which 262 miles are for navigation only. In Bombay proper the canals are generally small, and they are usually associated with storage reservoirs. Taking Bombay and Sind together, the total irrigated area is 1,700,000 acres; the length of irrigation canals 3,801 miles, of which 3,240 miles are main canals. There are no large irrigation works in Lower Burma, but a considerable amount has been expended on river embankment and drainage works, and on making navigable channels. The chief work in Upper Burma is the Mandalay Canal.

Money, Weights, and Measures.— By an act passed in 1835 a uniform monetary system was established throughout India, with the Madras silver rupee of 180 grains, $\frac{11}{12}$ fine, as the monetary unit. The rupee was subdivided into 16 annas, and each anna into 12 pies (or four pice). Silver was made the universal standard of value, and the silver rupee and half-rupee were declared to be legal tender to any amount. The other smaller coins were made legal tender up to the value of one rupee; 100,000 rupees are called a lakh or lac, and 100 lakhs a crore. Under this system large sums are punctuated differently from the usual European method. For instance, the Indian Post-Office Savings banks' statistics show that in 1900–1 816,651 depositors had to their credit 100,432,569 rupees, or, according to the Indian method, crores 10, lakhs 04, rupees 32,569.

The coins under this system are: Silver — Rupee, half-rupee, quarter-rupee; Bronze or Copper — Three pies (or a pice), six pies, one pie. There are also gold coins called mohurs,

but they are not a legal tender, and there is no fixed ratio between them and the silver coins. Small payments in the bazaars are made in cowries, of which from 2,500 to 5,000 are equivalent to one rupee. The rupee was formerly valued at 48 cents, but it has fluctuated greatly, mainly downwards. In January 1895 it was nearly as low as 24 cents; at present it is about 32 cents. In view of the steady depreciation of silver, and the consequent financial embarrassments and burdens to which the government of India was subjected in its dealings with gold-standard countries, an act was passed by the Governor-general's Legislative Council in 1893 under which the Indian mints were closed to the free coinage of silver. On 15 Sept. 1899 a further act was passed, by which gold coins issued from the Royal Mint in England, or any branch of the Royal Mint, were made legal tender at the rate of 15 rupees to the sovereign. Arrangements are being made for the coinage of gold in India. By an act of 1861 and some subsequent acts, promissory notes for amounts varying from 5 to 10,000 rupees have been emitted under the authority of a public issue department. Currency circles have been established from time to time, and these notes are legal tender only within the circle of issue. They are payable at the place of issue and also at the capital city of the presidency in which the place of issue is situated.

By the Measures of Length Act of 1889 the British imperial yard of 3 feet or 36 inches was made the standard of length for the whole of British India. The most important of the old native measures of length was the *guz* of Bengal, which was practically equal to a yard. An act was passed in 1871 to prepare the way for the adoption of a uniform system of weights and measures of capacity throughout British India. The unit and standard of weight established by the act is the *ser*, which is equal to a kilogram or 2 1-5 lbs. The unit of capacity was declared to be a measure containing one ser of water, at its maximum density, weighed in a vacuum, and is thus equal to a litre or 1¾ pint. Among native weights the most important are the tola (Bengal) of 180 grains, and the imperial or Indian maund of 40 seers, equal to 82 2-7 lbs.

Government.— The government of the Indian empire is regulated by an act passed in 1858, by which all the territories formerly possessed by the East India Company are transferred to the crown, and all the powers of the said Company exercised in name of the sovereign, all taxes being received and disposed of for the purposes of the government of India alone. His majesty's secretary of state for India is invested with the powers formerly exercised by the Company or the board of control, and he must countersign all orders and warrants under his majesty's sign-manual. He is assisted by a council of from 10 to 15 members, the greater number of whom must be persons who have resided 10 years in India, and have not left it more than 10 years previous to their appointment. The secretary for India fills up vacancies in the council. The members receive a salary of $6,000 a year payable out of the revenues of India, and they hold their office for 10 years. All orders sent to India must be signed by the secretary, and all dispatches from the Indian government must be addressed to him. The executive authority in India is vested in the governor-general or viceroy appointed by the crown, and acting under the direction of the secretary of state for India. He has a salary of 250,000 rupees, or about $83,500. The governor-general in council has power to make laws for all persons, whether British or native, within the dominions subject to the British crown, and for all British subjects residing in allied native states. His council consists of five ordinary members and one extraordinary member, namely, the commander-in-chief. The ordinary members preside over the departments of home affairs, foreign affairs, finances, revenue and agriculture, military administration, legislation, and public works, and together with a certain number (not less than 10 nor more than 16, by the act of 1892) of "additional members for making laws and regulations," appointed by the viceroy, form a legislative council. The meetings of the legislative council are open to the public, and the governor of the province in which a meeting is held is a member for the time being. The members may discuss the annual financial statement, and ask questions about it, but they are not allowed to propose resolutions or to divide the council. The whole of India is now divided into a number of separate provinces, each with a separate administration of its own, but all subordinate to the supreme government at Calcutta, the capital. These are not all on exactly the same footing nor ruled by officials having the same title. Two of them, Bombay and Madras, are each under the rule of a governor, appointed by the crown, and assisted by a separate executive council. Bengal, the United Provinces of Agra and Oudh, the Panjab, and Burma are each under a lieutenant-governor, appointed by the governor-general with the approval of the crown, and the lieutenant-governor of the United Provinces is also chief commissioner of Oudh. The head of the government in Assam and the Central Provinces is a chief commissioner, appointed by the governor-general in council. The two governors and the four lieutenant-governors are each assisted by a legislative council similar to that of the governor-general. Ajmir Merwara, Berar, and Kurg are under the more immediate control of the central government.

Finance.— The gross revenue of India in 1899–1900 was $343,185,820, and the gross expenditure charged against revenue $329,312,705. In addition, there is a capital outlay on railways and irrigation not charged against revenue, amounting in 1899–1900 to over $20,000,000. The total public debt of India on 31 March 1900, was $995,637,675, of which $374,915,670 represented the debt in India, and the rest the debt in England. The largest item in the revenue is that derived from land, which amounted in the year under review to $89,376,150. (See paragraph on *Land Tenure and Revenue.*) The revenue from forests was $6,177,125, and the total amount of tribute received from native states was $2,933,015. The revenue from opium amounted to $22,009,610, but the net revenue is less than that amount by about $8,500,000. The opium revenue is raised partly by a monopoly in Bengal, and partly by the levy of a duty on all opium exported from native states. The cultivation of the opium poppy is absolutely prohibited in British territory, except in certain parts of Bengal and the United Provinces of Agra and Oudh, but a few thousand acres in the Panjab grow it for local consumption. The opium

HALL IN TEMPLE, MADURA.

grower in the monopoly districts receives advances from government to enable him to prepare the land for the crop, and he is required to deliver the whole of his produce to government agents at the fixed price of 6 rupees per seer. The manufacture for the foreign market is carried on only in the government factories at Patna and Ghazipur, and the chests of manufactured opium are sold by auction at monthly sales in Calcutta. Outside of British territory opium (known as Malwa opium) is cultivated in the native states of Rajputana and Central India, and some of these states have agreed to control the manufacture and sale of opium in much the same way as the Indian government does in British territory. They levy heavy duties on opium exported from their territories for the China market, and the Indian treasury imposes on all such opium a duty now fixed at $166.66 per chest. The revenue from taxation is $201,000,000, the chief item in it being the salt revenue, $29,252,315. The salt revenue is raised by a duty on all salt imported into, or manufactured in India, the duty being now 2½ rupees (80 cents) per maund, except in Burma, where it is 1 rupee (32 cents) per maund. The native sources of salt supply are the coast, especially the Rann of Cutch (Baragra salt) and Mauripur (Sind), the salt lakes and pits (especially Sambhar Lake) of Rajputana, and the salt mines (especially the Mayo mine) of the Panjab. Bengal and most of Burma import their salt by sea, much of it coming from England. Several native chiefs have entrusted the management of their salt sources to the British authorities in return for certain payments. The excise accounts for $19,299,710 of the revenue from taxation. The only excisable articles are intoxicating liquors (including toddy, palm-wines, and rice-beer), and certain drugs (opium, ganja, bhang, charas), and the aim of the government in taxing these has been as much to reduce consumption as to raise revenue. The government treats the right to manufacture and the right to sell spirits at state monopolies, which are granted to individuals on special terms. Throughout Bombay and the Panjab, the most populous tracts of Madras, the United Provinces, Oudh, and Burma, and in some parts of Bengal and the Central Provinces, the central distillery system in some form prevails, and a still-head duty is levied on all spirits manufactured at the recognized distilleries. Except in Madras and some other parts, these central distilleries are government establishments at which private persons distil spirits. In other districts the spirit revenue is raised by farming out the spirit monopoly to the highest bidder, or by licensing the establishment of private stills, the latter method being called the out-still system. The Indian government is replacing the farming and out-still systems as far as possible by the central distillery system. The customs revenue amounted in 1899–1900 to $15,353,140. Import duties were abolished in India in 1882, but in 1894 they were reimposed, and now all goods, with the exception of railway material and industrial machinery, food grains, coal, jute, wool, and other raw materials, gold and unset precious stones, and some other commodities, are subject to import duty. The amount of the duty is generally 5 per cent, but petroleum is charged at the rate of 1 anna per gallon, and iron and steel are subject to a duty of only 1 per cent. Since 1896 all cotton yarns imported into or manufactured in India have been duty-free, while all woven cotton goods imported from abroad, or manufactured at power-mills in India, pay an *ad valorem* duty of 3½ per cent. There is an export duty on rice and rice-flour of 3 annas per maund of unhusked rice. A countervailing duty on bounty-fed sugar came into force in March 1899. The revenue from stamps was $16,327,385. The provincial rates, amounting to $12,493,925, are levied mostly on the land to meet local charges for roads, schools, etc., and are generally collected with the land revenue. The income tax, which yielded $6,501,425 in 1899–1900, is levied at the rate of four or five pie per rupee, certain incomes being exempted. Other important heads of revenue are: Post-office, telegraphs, and mint, $11,680,890; civil departments, $5,876,500; railways, $82,939,225; irrigation, $13,087,880; buildings and roads, $2,209,000. The chief elements in the expenditure are: Railways, $82,535,430; army, $74,250,000; civil salaries, etc., $47,987,720; charges of collection, $22,244,195; buildings and roads, civil and military, $20,673,260; miscellaneous civil charges (furlough and superannuation allowances, pensions paid in England, etc.), $17,565,690; irrigation, $12,208,825; famine relief and insurance, $10,494,240; post-office, telegraphs, and mint, $8,427,935; interest on public debt, etc., $6,711,415; refundings, compensations, drawbacks, etc., $7,295,000.

Army and Navy.— The army in India is under a commander-in-chief, who is under the control of the Indian government, and has directly under him four lieutenant-generals commanding respectively the forces in Bengal, the Panjab, Madras, and Bombay. The Indian army numbers usually from 215,000 to 220,000 in all, the native soldiers being twice as many as the Europeans. The native troops are officered by Englishmen. Wherever European troops are stationed there is always a larger native force, and in many of the smaller and less important posts there is a native force only. Much money has been spent in recent years on defensive works and military establishments, strategic roads, etc. India has also a certain number of vessels for coast defense.

Ethnology— India is inhabited by numerous peoples belonging to several distinct groups or families. Previous to the Mohammedan ascendency the dominant race were the Hindus, who, however, were not the aboriginal inhabitants nor even the first invaders. From the northwest of India, through Kashmir and down the valley of the Indus, and from Tibet through the passes of the Himalayas, the inhabitants of Northern Asia from a very early period migrated southward to the milder and more fertile plains of India. Two great successions of these invasions are recognized as having taken place before the period of authentic history. The first immigrants, of dubious ethnological connections, but commonly known as the Tamil races, appear to have overspread the entire peninsula. Following them the Sanskrit-speaking peoples, called the Hindus, of Aryan speech, dispossessed the Tamil races, and superseded their language in the whole of India north of the Nerbudda. The Hindus subsequently descended into the peninsula and penetrated as far as Cape Comorin; but though their influence on the languages of Southern India was considerable in the way of introducing

new terms, the grammar and construction of the Tamil languages maintained their place in the districts south of the Nerbudda. The native tribes were not exterminated by these invasions, but are still to be found under various names, as Bhils, Catties, Coolies, Gonds, etc., inhabiting the fastnesses of the mountain-ranges in Bengal, the Vindhya and Satpura Mountains, the Ghâts, etc. The hill tribes and other aborigines in all India are estimated at 70,000,000.

Population.— The first census of all India was taken in 1871–2, but it was not till that of 1891 was taken that a really reliable and comprehensive statistical account of the people of India was available. In 1871–2 the total population of India was returned at 240,931,521, in 1881 at 253,793,514, in 1891 at 287,223,431, in 1901 at 294,266,701, of which, as shown under *Political Divisions,* 231,085,132 were under immediate British authority. The total number of Europeans was only 168,000.

France still possesses in India Pondicherry, Karikal, and Yanaon, on the east coast of Madras; Mahé, on the west coast of Madras, and Chandarnagar on the Hugli, north of Calcutta. To Portugal belong Goa, Damão, and the small island of Diu, on the coast of Bombay. These French and Portuguese possessions have a total area of 1,754 square miles and a population of 852,752.

Education.— A system of education for India was inaugurated in 1854 in conformity with the instructions of the home government, and the despatch of Sir Charles Wood (afterward Lord Halifax) of 19 July 1854 is the basis on which the educational system still rests. The fundamental principle of the despatch was that the native languages should be made the medium of communicating European knowledge. Examining universities with affiliated colleges were to be founded, and English and vernacular elementary schools were to be established. The despatch enumerated five government colleges in Bengal; the Sanskrit College and Mohammedan Madrasa at Calcutta; five colleges in the United Provinces; the Elphinstone Institution, Puna College, and Grant Medical College in Bombay; the High School at Madras, and several missionary schools, as proper to be at once affiliated to the universities. In 1857 the three universities of Calcutta, Madras, and Bombay were formally incorporated by law as examining bodies based on the model of the University of London as then constituted. A somewhat different university, with teaching powers, was established in 1882 at Lahore in the Panjab, and in 1887 a fifth university was founded at Allahabad for the Northwest Provinces. The Education Commission of 1882–3 extended the system of Wood's despatch by placing education on a more popular basis and giving greater recognition to indigenous schools, and the first proposals for extending education to Indian women were made by this commission. Educational institutions in India are officially divided into two classes: (1) Public Schools, in which the course of study conforms to the standards prescribed by the Department of Public Instruction or by the University, and which either undergo inspection by the Department, or else regularly present pupils at the public examinations held by the Department or by the University. These institutions may be under either public or private management, and among them are many schools receiving grants-in-aid. (2) Private Schools, comprising all which do not fulfil the above conditions. The three main grades of institutions through which the system of education operates are: (1) Primary schools, which aim at the teaching of reading, writing, and such elementary knowledge as will enable a peasant to look after his own interests; (2) Secondary Schools, either English or vernacular; and (3) Colleges, the students in which, having passed the matriculation examination of a university, are reading for the further examinations required for a degree. There are also many other colleges teaching special branches of knowledge, such as medicine, law, and engineering, and special colleges for sons of native chiefs and noblemen. In Burma primary education is still very largely in the hands of Buddhist monks. Outside of a few exceptional districts female education is exceedingly backward in India, but slow progress is being made. There are schools of art in Madras, Calcutta, and Bombay, and many of the chief towns have good museums. Many normal schools have been established for the training of teachers.

The total number of colleges in India in 1899 was 169, of which only 5 were for females. The number of pupils in these colleges was 21,006. Secondary schools numbered 5,396, with 569,271 pupils, 43,403 of the latter being females. The number of primary schools was 100,858, with 2,824,257 male and 313,289 female pupils, or 3,137,546 in all. The total number of training and other special schools was 720, with 28,158 pupils, 2,371 of them being females. Beside all these, there were 42,805 private institutions, with 558,914 male and 42,926 female scholars, in all, 601,840. The total number of educational institutions of all kinds was thus 149,948, of which 7,454 were for females, and the total number of persons under instruction, 4,357,821, of whom 402,153 were females. Of these institutions 22,804 are under public management, 61,494 are state-aided, and 65,650 are unaided private schools. It has been estimated that 22.2 per cent of the boys of school-going age attend school, but for girls the percentage is only 2.3. In nearly all branches of education in India the missionaries have been the pioneers, and their work is still important.

Languages, Literature, and the Press.— All the Hindu languages are cognate dialects founded upon the Sanskrit, a language of the Aryan or Indo-European family, which has been extinct as a spoken language for more than 2,000 years, and bears a similar relation to the spoken languages of India with that of Latin to the modern European tongues. See SANSKRIT LANGUAGE AND LITERATURE, and VEDAS. In the time of Alexander the Great, Sanskrit had already been superseded by a vulgar tongue, the Prakrit, founded on it. In ancient Hindu dramas persons of rank are represented as speaking Sanskrit, common people Prakrit. Pali, a dialect of Prakrit, became the sacred language of the Buddhists, their scriptures being compiled in it. It was spread by them into Ceylon and India-beyond-the-Ganges. It is still used for works, chiefly religious, for which a wider circulation is desired. Hindi, the prevailing literary language of the non-Mohammedan population, is a modernized form of an older dialect, Hindui, which flourished during the middle ages, having grown out of the Prakrit dialects

GREAT HALL IN TEMPLE OF RAMISSERAM, ISLAND OF PAUMBEN.

about the 10th century. Both Hindui and Hindi are rich in poetical chronicles. Hindustani or Urdu, a kind of Hindi mixed with Persian and Arabic, is the language of the Mohammedan conquerors, and grew up after the conquest of Delhi at the close of the 12th century. It is also rich in literature, particularly in translations from the Persian, Arabic, and Sanskrit. It is the language which has been favored by the British government for purposes of administration and diplomacy. The Dakhni, a mixture of similar elements, grew up from the same cause in the Deccan. Among the numerous other descendants of the Sanskrit the most important are the Bengâli, the Orissa, Uriya, or Utkala, the Marâthi, the Gujarâti, the Sindhi, and the Panjabi. The languages of Southern India form a distinct group called the Dravidian, differing in structure from those of the north. The most important of them are Tamil, or Malabarese, spoken on the Coromandel and Malabar coasts, Telugu or Telinga, in the middle of the Deccan, Kanarese in the Carnatic and neighborhood of Mysore, Malayâlam on the Malabar coast from Mount Dilli to Cape Comorin. From all these Burmese stands apart.

The chief vernacular languages in which books are published are: Urdu (Bengal, N. W. Provinces, Panjab, Bombay), Bengali (Bengal), Hindi (Bengal, N. W. Provinces, Panjab, Bombay, and Central Provinces), Panjabi (Panjab), Marathi (Bombay and Central Provinces), Gujarathi (Bombay), Tamil and Telugu (Madras), and Burmese (Burma), and the bilingual works are mostly either in English and another language, or in a classical and a vernacular language. Many works are also published in English alone, or in one of the three classical languages, Arabic, Sanskrit, and Persian. The greater number of these publications belong to the departments of poetry, religion, philosophy, and philology, but Urdu and Hindi fiction has developed greatly in recent years. Till about 1850 newspapers were prevailingly religious, but since then the native press has become more and more a medium for the discussion of social and political questions.

Religions.—The religions of India like the races are numerous. The most important is the Hindu or Brahmanical, which is very ancient. The earliest period of the Hindu religion is called the Vedic, from the Vedas (q.v.) or sacred books in which its records are preserved. These exhibit several marked phases of transition. The earliest date of the Vedic literature cannot be satisfactorily determined, either from philological or internal evidence. Its latest writings are not more recent than the 2d century B.C. Each Veda consists of two parts, the Sanhitâ, a collection of mantras or hymns, and the Brâhmana, which contains the doctrinal and ceremonial development of the religion. The worship represented in the greater number of the hymns is that of natural objects: Indra, the cloudless firmament; the Maruts, the winds; Ushas, the dawn; Vishnu, Surya, Agni, and other deities, to whom various attributes of the sun were attributed. These deities were invoked for assistance in the common affairs of life, and were reminded by the suppliants of their former glorious deeds. In the earlier Vedas no attempt is made to classify the gods and assign them particular ranks. In the Upanishads, a species of commentary on the Vedas, a systematic attempt is made to solve the problems of creation, of the nature of the supreme being, and of his relations with the human soul. Some of the Upanishads are legendary in form, others doctrinal or exegetical. These commentaries, though not in form philosophical, being professedly founded on the Vedas, contain the germs of the great systems of Hindu philosophy which were afterwards developed.

A new era in the history of Hinduism begins about the time of the Christian era with the composition of the two great epics, the Râmâyana and the Mahâbhârata, the latter of which was the product of successive ages. The vulgar creed had by this time experienced the influence of the theological and metaphysical speculations of the Upanishads, and had assumed a mystical unity. Brahmâ, Vishnu, and Siva, the three emanations of the great soul Brahma, representing respectively the creative, preserving, and destroying principles, had become the leading objects of worship.

The third or Purânic period of Hinduism corresponds with the period of the Middle Ages in Europe. The Purânas are discussions upon religion and philosophy, in the form of dialogues conducted by sages. They are designed for popular instruction, and mark a rapid and extensive corruption of the Hindu religion. The epic legends are amplified and distorted. The Vedânta philosophy, which had become the basis of the educated creed, still exercises a favorable influence on the popular worship. The creed of the Purânas is that of the masses in India.

Buddhism arose in India in the 6th century B.C. It prevailed there extensively, and spread itself through the adjoining regions of Asia. It became extinct in India before the 12th century, but still flourishes in China, Japan, and in the southeastern regions of Asia, as well as in Nepal and Ceylon. (See BUDDHA.) The Jainas or Jains, whose religion is a mixture of the Buddhist and the Brahmanical creeds, are still numerous in Hindustan, and particularly in Gujerat. There are two sects of this creed, called Digambaras and Swetâmbaras. Sikhism is another heretical form of Brahamanism prevalent in the Panjab. There are numerous other minor sects of Hinduism and worshippers of particular gods in the Hindu mythology. The Brahmo-Somaj (q.v.) is a modern Hindu theistic sect. The Hindu Fakirs are devotees, who give themselves up to penance, filth, and self-torture. The Parsees or fire-worshippers are descendants of the Persian followers of that religion, who took refuge from Mohammedan persecution on the western coast of India. Their principal emigration was to Surat, and is supposed to have taken place about the end of the 8th century. They were well received in Gujarat. They are now to be found mostly in the mercantile towns in India, and are most numerous in Bombay. The Mohammedans of India are chiefly descendants of its Asiatic conquerors from Afghanistan, Persia, Baluchistan, and Arabia. They are said to be more liberal-minded than the Mohammedans of Western Asia. There is among them a sect of Fakirs like those of the Hindus. There are also numerous Jews in India. On Christianity in India see below under *Christian Missions.* Hinduism recognizes four castes — the Brahmans, or sacerdotal class; the Kshatriyas, or military class;

the Vaisyas, or mercantile and agricultural class; and the Sûdras, or servile class. These casts are hereditary (see CASTE). Closely connected with the Hindu religion is the collection of laws commonly known as the Institutes of Manu. (See MANU.) In the Indian census table of religions (1901) 8,584,349 people are returned as heathens or aboriginals, that is, devotees of some form of animism. Practically, for the purposes of the Indian census, all are classed as animistic who are not locally acknowledged to be Hindu, Mohammedan, Christian, Buddhist, Jew, Parsee, etc., but every stratum of Indian society is in reality more or less saturated with animistic conceptions. Of the total population of British and Native India in 1901, 207,146,422 were registered as Hindus, the greater number of these being in Bengal, the United Provinces of Agra and Oudh, Madras, Bombay, Hyderabad and Rajputana. There were 62,458,061 Mohammedans chiefly in Bengal and the Panjab, 9,476,750 Buddhists almost all in Burma; 2,923,241 Christians of whom two thirds are in Madras and in the Madras States; 2,195,268 Sikhs, chiefly in the Panjab; 1,334,148 Jains, chiefly in Rajputana and in Bombay; 94,190 Parsees, and 18,228 Jews mostly in Bombay.

Christianity and Christian Missions in India. — The introduction of Christianity into India is variously ascribed by tradition to St. Thomas the Apostle, Thomas the Manichæan of the 3d century, and Thomas, an Armenian merchant of the 8th century. The earliest Christian church in India of which we have any definite knowledge was Nestorian, but after the Portuguese occupation these Nestorians came into the Roman obedience. In 1663, after the arrival of the Dutch, some of these renounced their allegiance to Rome. In 1665 these latter received from the Patriarch of Antioch a Jacobite bishop known as Mar Gregory, and to this day they have remained faithful to his Jacobite tenets. Thus, the ancient Nestorian Church of southwest India is represented now by two bodies, namely: (1) Catholics of the Syrian Rite, owning the supremacy of the pope, but retaining the Syrian language and ritual in their services; and (2) the Jacobite Catholics, rejecting the errors of Arius and Nestorius, and following the Nicene creed, though not acknowledging papal supremacy. The spread of the Roman Catholic faith in India was mainly the work of Jesuits from the 16th century onwards, the first of these being the celebrated St. Francis Xavier, who reached India in 1542. The Jesuits were suppressed in the 18th century, but since the re-establishment of the order in 1814 they have made great progress. The Roman Catholics of India are at present organized in seven archbishoprics (Goa, Agra, Bombay, Calcutta, Madras, Pondicherry, and Verapoly), and 16 bishoprics (Daman, Cochin, Mailapur, Allahabad, Lahore, Poona, Dacca, Krishnagar, Hyderbad, Nagpur, Vizagapatam, Coimbatore, Mangalore, Mysore, Trichinopoly, and Quilon), and there are also several vicars and prefectures apostolic. The earliest Protestant missionaries in India were the Lutherans Ziegenbalg and Plutschau, who arrived in the country in 1705 and began work at the Danish settlement of Tranquebar. The Lutheran missions were supported from the first by the Society for Promoting Christian Knowledge, and from 1719 till 1844 they were entirely maintained by that body. The celebrated Christian Friedrich Schwarz worked under the auspices of this society from 1750 till his death in 1798. Kiernander, a Dane, was the pioneer of Protestant missionary enterprise in Bengal. He was allowed by the East India Company to settle at Calcutta in 1758, but soon afterwards the Company changed its policy, and began to prevent missionaries from landing in the country controlled by it. When William Carey, the great Baptist missionary, arrived in 1793, he had to settle on Danish territory at Serampore, 15 miles from Calcutta, and it was not till 20 years later that the Company's opposition to missions was withdrawn. Carey was followed at Serampore by Marshman and Ward, whose names will always be associated with his and with the wonderful literary activity begun by him. Other celebrated Indian Protestant missionaries are Henry Martyn and Bishop Heber of the Anglican Church, and Dr. Alexander Duff, at first of the Church of Scotland, afterwards of the Free Church of Scotland. The head of the Anglican Church in India is the bishop of Calcutta, and under him are the seven bishops of Madras, Bombay, Lahore, Rangoon, Lucknow, Chutia Nagpur, and Travancore. Many American missionaries also work in India.

Judiciary.— The law administered by the courts of India is chiefly based on the enactments of the Indian legislative councils, the statutes of the British parliament relating to India, the Hindu and Mohammedan laws of inheritance and their domestic law in cases affecting Hindus and Mohammedans, and the customary law affecting particular castes and races. Bengal, Bombay, Madras, and the United Provinces have each a High Court supreme in civil and criminal cases (but with an ultimate appeal to the Privy Council in England), and somewhat similar tribunals exist in the other proinces. There are numerous courts of different grades throughout the country, and many of the judges are natives of India. Various enactments have been passed for the establishment of local government, and there are now upwards of 760 cities and towns with municipal government in the different provinces under these acts, and local taxation for police and local improvements has been enforced.

Local Government.— All the provinces, except Madras, are divided into divisions, each under an official called a commissioner, and all, including Madras, are divided into sections distinctively designated districts, the district forming the unit of administration. At the head of each district is an officer called a collector-magistrate or deputy commissioner, the former name implying the twofold nature of his duties, since he is not only a fiscal officer charged with the collection of the revenue from the land and other sources, but is also a revenue and criminal judge, both of first instance and of appeal. Police, jails, education, municipalities, roads, sanitation, etc., all come under his supervision; and he is expected to be familiar with the social life of the natives in all its phases. The districts are sub-divided into lesser tracts, known in Bengal as sub-divisions, in Madras and Bombay as *taluks*, in northern India generally as *tahsils*. The unit of police administration is the *thana* or police circle. An important portion of the

administrative staff consists of persons who have received appointments in the Indian civil service, after being successful in competitive examinations held in England: these form what is called the *covenanted* civil service. A certain section of the civil service, known as "the statutory civil service," consists of natives specially selected. The native states are generally governed by hereditary princes, who exercise sovereign power within their own dominions. They are more or less controlled, however, by British influence, a British resident, agent, or commissioner being stationed at their courts. They have no power to make war or peace, to send ambassadors to each other or to non-Indian states; they can only keep up a certain specified military force, and they may be dethroned for misgovernment.

History.— Little is known of the political history of India previous to the expedition of Alexander to the Indus, 326 B.C. The 20th satrapy of the Persians comprehended, as Herodotus states, part of the northwest of India. Alexander did not penetrate beyond the tributaries of the Indus, and between his invasion and the Mohammedan conquest there is no authentic political history of India, although the territory was divided among a number of rulers of whom Asoka (q.v.), the founder of Buddhism, was one of the chief. At the time of the Mohammedan invasion a Hindu monarchy was the dominant power in India. The conquest of Persia (632–651) brought the successors of Mohammed to the Indus, and they subsequently acquired a temporary hold of some parts of India, as Sind, which they conquered in 710 and lost in 750. The foundation of a more durable Mohammedan empire in India was laid some centuries later. The Kingdom of Ghazna, in Afghanistan, founded, according to Ferishta, by Alpetegin, an ex-governor of Khorassan, in 962, was declared independent by Mahmud in 999. This monarch, of whom as many as 12 expeditions into India are recorded, penetrated in one direction beyond the Jamna; in another he occupied Gujarat and captured Somnauth. He annexed the territory of Lahore to his kingdom, and nominally extended his dominion to the Ganges on the west, and to Gujarat on the south. His last expedition was to Gujarat in 1024. About the middle of the 12th century the Kingdom of Ghazna was divided, and Lahore became the capital of the Indian portion. The Ghaznavid Kingdom of India was overthrown in 1186 by Mohammed Ghori. On his assassination in 1206 Kutb-u-din, his governor in India, established the Afghan or Pathan dynasty at Delhi, and conquered Behar and Bengal. His successor Altamsh conquered Sind (1225), and completed the subjugation of Hindustan. About this time Genghis Khan overthrew the western empire of Ghazna, and founded a great Mongolian empire, which began to extend eastward, and came into collision with the monarchs of Delhi while these were still pushing their conquests to the south and east of India. The Delhi kingdom was, moreover, exposed to frequent commotions, both from the revolts of its own rajahs and from the predatory excursions of the hill tribes. A revolt of the rajahs was suppressed in 1250, and in 1265, after an extensive slaughter of the predatory tribes, a line of forts was constructed to check their incursions. But though frequently defeated the Mongols continued their incursions into all parts of India. In 1240 they reached Lahore, in 1244 they invaded Bengal; Gujarat, the Deccan, and the Carnatic were assailed in turn; the Panjab was subject to frequent invasions; in 1298 they were defeated at Delhi. A new dynasty, the Khilgi dynasty, arose under the usurper Jelal-u-din in 1288, which was succeeded by a fresh dynasty in 1321, the house of Toghlak. The invasions of the Mongols still continued with greater or less success. During the reign of the last Toghlak king the celebrated Tamerlane invaded India at the head of a great host, took and sacked Delhi in 1398, leaving behind him his deputy Khizr Khan, who now assumed the government. A period of anarchy ensued, which terminated in the conquest of India by the Mogul emperors. Ibrahim, the last of the dynasty of Lodi, the third in order from that of Toghlak, was defeated in 1526 by Baber, who established the Mogul dynasty in Hindustan. His grandson Akbar succeeded his father at the age of 14 (1556), and during a long reign of about 50 years, terminating in 1605, subdued nearly the whole of India, which, by introducing religious toleration, he succeeded in consolidating into an empire. At the death of Akbar his empire was divided into 15 subahs or vice-royalties, which indicate its extent, namely, Allahabad, Agra, Oudh, Ajmir, Gujarat, Behar, Bengal, Delhi, Cabul, Lahore, Multan, Malwa, Berar, Khandesh, Ahmadnagar. His son Selim succeeded him under the title of Jehanghir. The Portuguese, as will be seen in another section, had already established their territorial dominion in India. In 1615 an English ambassador appeared for the first time at the court of the Mogul emperor in Hindustan. He died in 1623, and was succeeded by his son Shah Jehan, who had disturbed his father's reign by rebellions, and during his own reign the country was filled with civil wars. He quarreled with the Portuguese, and expelled them from their settlement at Hugli. During his reign the Mahrattas or Marathas, under their chief Sivaji, began to be an important power in the Deccan. He was deposed in 1658 by his youngest son Aurengzebe, who also murdered his brothers. His reign was passed amid continual contests, both for extending his dominion, and subduing the revolts of the numerous peoples under his sway, both within the limits of India and beyond the Indus. He made war successfully with the Afghans, the Rajputana tribes, and the rising power of the Mahrattas. The Sikhs, a Hindu sect which had been persecuted by the Mohammedans, formed a religious and military commonwealth in the Panjab in 1675. Aurengzebe died at Ahmadnagar, in the Deccan, in 1707. On his death the Mogul empire began to decline. The succession was disputed by his four sons. Bahadur Shah, who succeeded, died in 1712, and was succeeded by his son Jehundar Shah, who, in the following year, was put to death by Farokshir, a great-grandson of Aurengzebe, who usurped the crown. He was deposed and put to death in 1718 by Hosen Ali. Mohammed Shah, grandson of Bahadur, was raised to the throne in 1718. His reign was disturbed by the insubordinate spirit of his viceroys, and through the defection of one of them the Mahrattas succeeded in subduing the Deccan. In revenge for an insult Nadir Shah of Persia invaded Hindustan in 1738, took possession of

Delhi, and gave it up to be sacked and plundered by his soldiers. The country west of the Indus was ceded to Nadir Shah in 1739. Mohammed died in 1748, and was succeeded by his son Nadir Shah. The empire was now tending to dissolution. The new emperor called in the Mahrattas in 1751 to aid him against the Rohillas, who, in 1749, had defeated the last imperial army ever called into existence. The various states were seized by the former viceroys or by independent chiefs. The Mahrattas, now the most powerful people of India, possessed, besides the Deccan, part of Malwa, and the greater part of Gujarat, Berar, and Orissa. The whole empire was at this time in extreme agitation and disorder, every government fearing the attacks and intrigues of its neighbors. Ahmed Shah was deposed in 1754 by Ghazi-u-din, a former vizier of the empire, who set up Alamgir II. In 1757 Delhi was captured by the Afghans, against whom Ghazi-u-din called in the Mahrattas. In 1759 the vizier assassinated the emperor. His successor, Shah Alum, without the shadow of power, escaped from Delhi, and finally took refuge with the British. The rival powers of the Afghans and the Mahrattas, which had been brought into collision by the feebleness of the empire, now engaged in a fierce struggle for the mastery over its ruins. This terminated at the decisive battle of Paniput, fought 6 Jan. 1761, in the complete overthrow of the Mahrattas. The victor, Ahmed Shah, recognized the grandson of Alamgir as emperor by the title of Shah Alum II.; but the empire was now only a shadow, and the native states, which had divided its power, were destined soon to give way to the superior European commercial organizations which the pursuit of gain had brought to their shores. See Colonies and East India Companies. Henceforth the history of India follows the course of these European colonies, until it is merged in the Indian empire of Great Britain.

The doubling of the Cape of Good Hope opened up the way by sea to India, and led the Portuguese to the possession of a kingdom in Asia. A few years after Vasco da Gama had landed on the coast of India they were already the most favored merchants upon the whole coast, and in spite of the active jealousy of the Mohammedans, who had hitherto monopolized the lucrative commerce of India, they formed settlements, and made commercial treaties with some Indian princes, in which the latter acknowledged the King of Portugal for their lord. By 1542 the Portuguese ruled from the Arabian to the Persian Gulf; nearly all the ports and islands on the coasts of Persia and India fell into their power; they possessed the whole coast of Malabar to Cape Comorin, and had settlements on the coast of Coromandel and the Bay of Bengal; Ceylon was tributary to them; they had factories in China; and the ports of Japan, to which a tempest had shown them the way, were open to their merchant ships. For 60 years they carried on their lucrative commerce without any considerable rivals. Portugal owed this power to a few able men, among others Francis of Almeida, and Alfonso de Albuquerque (qq.v.). But the successors of the men were not endowed with the same talents, and a revolting abuse of power excited the resistance of the natives, who became united by the sight of their common danger. The union of Portugal with Spain, under Philip II., in 1580, decided the fall of their commercial power in India. The Portuguese, satisfied with bringing the commerce of India to Lisbon, had allowed the Dutch to become the carriers between that port and the markets of Europe. But Philip II. closed the harbor of the Portuguese capital to the Dutch ships on account of the revolt of the United Provinces, and thus obliged that enterprising people to go to the sources of this commerce. Cornelius Houtmann in 1595 was sent with four ships to India to explore the coasts and gain information concerning the inhabitants and the commercial relations in that region. He returned with favorable accounts, for in this very first voyage treaties of commerce were made with the princes of the island of Java. The hatred of the natives against the Portuguese, who had at times landed here, assisted in the accomplishment of the enterprise. After the Dutch East India Company had formed settlements at Java and upon other points, and had made commercial treaties with several princes of Bengal, there began the long struggle with the rival Portuguese. The stronger and better-served navy of the Dutch enabled them to take one place after another from the Portuguese. In 1607 the latter were stripped by their victorious rivals of the Moluccas; in 1641 of Malacca; in 1658 of Ceylon; in 1660 of Celebes, where the Portuguese had settled after the loss of the Moluccas, to retain by smuggling some part of the spice trade; and after 1663 the most important places on the coast of Malabar, where they had longest maintained themselves, fell into the power of the Dutch. The Dutch made Batavia the capital of their eastern dominions. Their power in India began to decline from the time of their wars with Louis XIV. The English began to form commercial settlements in India about the same time as the Dutch. A settlement was formed at Surat in 1613, which became the chief station of the Company on the west coast in 1615, and in 1657 the seat of a presidency. A grant of a small territory around Madras was received from the Rajah of Bijnagar in 1639, on which was erected the fort of St. George. Madras became a presidency in 1654, and till the rise of Calcutta commanded the Company's possessions in Bengal. Calcutta, the third presidency, and ultimately the seat of government in India, was settled in 1690, and became a presidency in 1707. The English had to defend themselves against the Mahrattas in Surat in 1664, and early came into collision with the Portuguese and Dutch in the Indian seas. It was, however, the struggle with the French, who followed them, and who had acquired considerable territorial possessions in India, and the alliances of both parties with the native princes, coinciding with the decay of the Mogul empire, which brought about that long succession of almost unbroken successes by which this great empire was established. The claims of rival candidates for the governments of the Deccan and the Carnatic brought the two parties into collision at various points, and after a succession of maneuvers Dupleix, the French commander, succeeded in compelling the English to take refuge in Trichinopoly. Here Clive, who had already distinguished himself in an unsuccessful attack upon Pondicherry, proposed to carry the war into the enemy's country. In 1751 he besieged and took Arcot, Tinnevelly, Conjeveram, and Arani. On his return

to Fort St. David he was despatched by Major Lawrence on another expedition, which he again conducted successfully. Lawrence at the same time gained other successes against the French and their allies. These successes led to the Treaty of Pondicherry in December, 1754, in which the French and English agreed to divide their territorial possessions on a footing of equality, and abstain from interference in native affairs. This treaty procured for the English the cession from the French of the Four Circars; nevertheless, they treated it as a dead letter, and immediately began to reduce Madura and Tinnevelly. The French, after vainly remonstrating, followed their example in disregarding the treaty. About this time important events took place in Bengal. Suraj-ud-Dowla, nabob of Bengal, in 1756 besieged Calcutta with a large army, when it was evacuated so suddenly by the English that a considerable part of the garrison was left behind. These had no alternative but to surrender (20 June 1756). To secure the prisoners taken in the capitulation, 146 of them were thrust, apparently more from mere recklessness than intentional cruelty, into the common prison of the garrison, a room 18 feet square, with two small windows barred with iron, since famous as the Black Hole of Calcutta. After a night of unparalleled suffering only 23 were found alive in the morning. Clive, who was sent from Madras with an armament to Bengal, recovered Calcutta on 2 Jan. 1757. War had again broken out between France and England, but the French refused the alliance of Suraj-ud-Dowla, and maintained their neutrality. Suraj again invested Calcutta, but Clive, though he failed in a night attack, inspired him with so much respect for his means of resistance that he restored the English factories and made peace. Regardless of the benefit he had received from the neutrality of the French, Clive, in spite of the opposition of the nabob, determined to attack their settlement at Chandernagor, which he succeeded in taking. The nabob supported the French till he was attacked by the Afghans, when he became desirous of peace with the English. Clive, however, had determined to dethrone him and replace him by Mir Jaffier, his aunt's husband. In the battle of Plassey, 23 June 1757, the nabob was overthrown, and afterward assassinated by the son of his rival. Mir Jaffier bound himself to pay for his elevation a sum of over £2,500,000 sterling. This plunder was partitioned among the Company and the Company's servants, with the exception of a small share assigned to the native allies.

While the English in the Carnatic were engaged as collectors for Mohammed Ali in reducing the districts of Madura and Tinnevelly, the French recommenced hostilities. An attack upon Trichinopoly failed (May 1757), but Bussy reduced Vizagapatam, and established the French superiority throughout the Deccan. Count Lally, who had arrived with a formidable armament in April 1757, besieged and took Fort St. David, 1 June 1758. He afterward besieged Tanjor and Arcot, the latter of which he took. The want of funds, which crippled his operations, compelled him to engage with inadequate forces in the siege of Madras, which, after lasting two months, entirely failed in February 1759. The English took Conjeveram, to which the French retired, by assault. In the following campaign the French, after some successes, were totally defeated by Col. Coote near Wandewash on 22 Jan. 1760. Their power was now completely broken, their fortresses one after another fell into the hands of the English, and the English fleet, which had the command of the seas, co-operated in the reduction of those on the coast. Pondicherry, their last stronghold, surrendered on 15 Jan. 1765. The English had now established themselves, as a formidable if not altogether a ruling power, both in West and South India; but in both they committed the mistake of greatly over-estimating the resources of the country, and their rapacity and extortion, though they ultimately led to the extension of their power, were the cause of serious and protracted troubles. Mir Jaffier was deposed in favor of his son-in-law, Mir Cossim, who rebelled against English extortions, but, notwithstanding his skilful and vigorous preparations for a war he had anticipated, was worsted in successive engagements, particularly at Gheriah, 2 Aug. 1763, and forced to flee. In revenge he massacred his English prisoners. Sujah Dowlah, the nabob of Oudh, who received him, was defeated and deprived of his dominions, with the exception of Corah and Allahabad, which were given to the Mogul Emperor, who formally invested the Company in the dewanee or collectorship of revenues and virtual sovereignty of Bengal, Bahar, and Orissa, by a firman dated 12 Aug. 1765. The English came to terms with Nizam Ali, subahdar of the Deccan, who opposed their occupation of them, by agreeing to pay him a rent for the territory, and assist him with their forces, but this agreement brought them in 1766 into collision with Hyder Ali, the powerful sovereign of Mysore. Nizam Ali afterward joined Hyder against the English, and both invaded the Carnatic, and, in spite of several defeats, laid waste the country to the gates of Madras. Finally, Nizam Ali deserted Hyder, and the latter concluded a treaty with the English, April 1769, by which their conquests were mutually to be restored.

Notwithstanding the protests and prohibitions of the directors, the administration of the Company's affairs left much to be desired even during Clive's governorship, and during the administration of Verelst, who succeeded Clive in 1767, the Company's affairs were in extreme embarrassment. Parliament took advantage of the discontent and clamor raised against the Company's servants, and in 1773 remodeled the constitution of the Company, and appointed Warren Hastings (q.v.) governor-general of India, with a salary of $125,000, and a council of four members, each of whom had $50,000.

His administration was marked by firmness and resourcefulness in upholding British interests, and also by his unscrupulous methods in raising money to carry out his projects. In 1778 war again broke out between France and England. The English captured Pondicherry and Mahé, the last port of the French on the Malabar coast. This place was considered by Hyder Ali as one of his dependencies. In revenge for its capture he seized the passes of the Eastern Ghâts, invaded the Carnatic with an army of 120,000 men and laid waste the country. Sir Eyre Coote was sent into the Carnatic to conduct the war against him. Hyder Ali died in 1782, but the war was continued with his son Tippoo Saib, till 11 March 1784, when it was

concluded by a treaty of mutual restitution. In 1784 Pitt's India Bill was passed. In 1786 Lord Cornwallis succeeded Hastings as governor-general. Cornwallis made various administrative reforms for the relief of the people from former exactions, but Tippoo Saib diverted his attention from these peaceful measures by attacking the Rajah of Travancor, now an ally of the British. Having made an alliance with the Mahrattas and the Nizam, Cornwallis invaded Mysore, besieged Tippoo in his capital, compelled him on 9 March 1792 to conclude a treaty, by which he ceded half his territory and undertook to pay the expenses of the war. On the death of Mohammed Ali in 1795, Lord Hobart, governor of Madras, determined to assume the government of the Carnatic, but the plan was opposed by the supreme government and was not carried out. In 1798 Lord Mornington arrived in India as governor-general, when Tippoo Saib was making arrangements to renew his enterprises against the British and soliciting the alliance of France and of Cabul. Early in 1799 Lord Mornington invaded Mysore. On 4 May he stormed Seringapatam. Tippoo was killed in defending his capital, and Mysore was divided among the British, the Mahrattas, and the Nizam. Some time before this (1775) Oudh had agreed to receive and subsidize auxiliary troops for the defense of their territory, and the fortress of Allahabad was ceded to the British, who undertook to defend Oudh against all enemies. Subsequently in 1801 the subsidy was commuted for the cession of Southern Doab, Allahabad, and other territories. During the war with Tippoo, Lord Mornington, whose policy was to induce the native powers to accept British protection and mediation in their disputes, endeavored to induce his allies the Mahrattas and Nizam Ali to come under similar arrangements. The Nizam in 1798 agreed to dismiss his French troops and receive British auxiliaries. The Peshwa, the nominal head of the Mahratta Confederacy, forced by the contentions of the chiefs Holkar and Scindia, accepted the policy of the governor-general. Under the Treaty of Bassein, signed 31 Dec. 1802, Sir Arthur Wellesley restored the Peshwa, driven from his capital by Holkar. Scindia and the Rajah of Berar now entered into an alliance against the British. After a campaign in 1803 distinguished by the successes of Generals Wellesley and Lake, the former defeating the allies at Assaye, 23 September, the latter at Laswaree, 1 November, Scindia was compelled to make peace. He ceded to the British Baroach, Ahmadnagar, and the forts in the Doab (29 December); the Rajah of Berar ceded Cuttack (17 December). Scindia, thus weakened, accepted the British alliance, and received an auxiliary force to defend him against Holkar, 27 Feb. 1804. A war with Holkar immediately followed, which the skill of that chief in predatory warfare enabled him to sustain with some dexterity, and in 1805 he was joined by Scindia, but the British arms finally prevailed and he was forced to flee. The Marquis of Cornwallis succeeded Wellesley on 30 July 1805. He disapproved of the ensnaring alliances into which the former statesmen had drawn the native powers, and although he died before being able to carry out his views (5 Oct. 1805), Sir George Barlow, who succeeded him, adopted his policy. New treaties were made with Scindia, 23 November, and Holkar, 24 December, restoring their territories and their independence. The new policy was even carried so far as to abandon the petty princes who had trusted to the British alliance. Lord Minto succeeded to the governor-generalship in 1807. During his administration the chief enterprises of the English were directed against the insular possessions of the French and Dutch in the Indian seas. The Moluccas, Java, and other islands were taken; many of which were restored at the peace. Some disturbances took place during this period at Travancore, and among the British troops at Madras and elsewhere, which threatened at one time serious consequences. Travancore and Cochin were placed under British management. The Earl of Moira (Marquis of Hastings) succeeded to the governor-generalship in 1813. In 1814 a war broke out with Nepal, which was at first attended with some serious repulses, but was brought to a successful close by Sir D. Ochterlony in 1815, and resulted in the cession of Kumaon. Hastings was also called upon to suppress the Pindaris predatory bands of the former troops of Holkar and Scindia; and the Peshwa of Indore rebelling against a treaty his capital was seized, he himself deposed, and the Mahratta Confederacy dissolved. His ally the Rajah of Nágpur, Scindia, who submitted, and Holkar, who was defeated, were compelled to accept alliances virtually placing them under British protection. This pacification was completed in 1818, and greatly improved the revenues of the districts effected by it. The Marquis of Hastings was succeeded in 1823 by Lord Amherst, under whom the first Burmese war was concluded in 1826 by a treaty ceding to the British the Aracan and Tenasserim provinces together with a large pecuniary indemnity. During the governor-generalship of Lord William Bentinck (1828–35) various administrative reforms were effected, but no great political events took place. Lord Auckland assumed the governor-generalship in 1836. The Afghan war broke out in 1838, in consequence of long and complicated intrigues arising from the advance of Russia in the East, and the mutual jealousy of that power and Great Britain. War was declared on 1 October, the object of the British was to dethrone Dost Mohammed and restore Shah Sujah, a former ruler. It was at first attended by great disasters, particularly the famous massacre of the Khoord Cabul Pass. It was terminated in 1842, under the governor-generalship of Lord Ellenborough, by the evacuation of Afghanistan by the British, after they had relieved their captives and vindicated the superiority of their arms by the capture of Cabul. Sind was annexed to British India after a war conducted by Sir Charles Napier in 1843. After a brief war, arising out of a disputed succession, the dominions of Scindia lay at the mercy of the British, and were disposed of by a treaty dictated by the governor-general at Gwalior in January 1844. While he was thus engaged Lord Ellenborough was recalled and superseded by Sir Henry Hardinge (May 1844), who was soon engaged in one of the most formidable wars the British had yet had to encounter in India. The Sikhs, a politico-religious sect already mentioned, had, under their leader, Runjeet Singh, conquered the Panjab about the beginning of the century. Runjeet Singh, who had always maintained friendly relations with the British, died in 1839, and the government fell into a

chaotic state; the army, being without a head, began to commit disorders and threaten encroachments on the British territory. In December 1845 the Sikh army crossed the Sutlej in great force, and in the short war which followed the Sikhs were defeated by Sir Hugh Gough and Sir Henry Hardinge at Moodkee, Ferozeshah, Aliwal, and Sobraon. Peace was made at Lahore, by the surrender of the Sikh territories on the left of the Sutlej, and between the Sutlej and the Bias (Jalindar Doab), and the payment of an indemnity. During the governor-generalship of the Marquis Dalhousie, 1848–56, a new war broke out with the Sikhs, and after their final defeat by Gen. Gough at Gujerat, 21 Feb. 1849, the Panjab was annexed to the British dominions. This was immediately followed by the second Burmese war, ending in the annexation of Pegu, 20 June 1853. Sattara, Jhansi, Nágpur, and Oudh were, on the failure of the native succession, also annexed to the British possessions, 1852–6. During Lord Dalhousie's administration the extensive scheme of Indian railways and telegraphs was planned and inaugurated, the Ganges Canal opened, and the Panjab Canal begun. His last important act as governor-general was the annexation of Oudh, 7 Feb. 1856. The administration of Viscount Canning was distinguished by a short war with Persia, by the great Sepoy rebellion (see INDIAN MUTINY) and by the British assumption of the direct sovereignty of India, and of the powers of government hitherto vested in the East India Company by the crown. After the mutiny had been suppressed Lord Canning pursued with energy those schemes for the development of the resources of the country, adverted to elsewhere, which had already been inaugurated by his predecessors, and which have chiefly occupied the attention of his successors. He returned to England early in 1862, and was succeeded by the Earl of Elgin, who died at Dhurumsalla, 20 Nov. 1863, while similarly engaged. Sir John (afterward Lord Lawrence) was governor-general from 1863 to 1868, when he was succeeded by the Earl of Mayo, who earned a high character for the ability of his administration. He was assassinated by a Mohammedan fanatic at Port Blair, in the Andaman Islands, 8 Feb. 1872.

Famines.— India has suffered severely from famine on many occasions, and not seldom the scourge of famine has been accompanied by that of plague. The chief famines which have occurred under British rule are the following: That of 1769–70 in the lower Ganges Valley, in which one third of the population of Bengal perished; that of 1780–3 in the Karnatik; the Madras famine of 1790–2; that in the Northwest Provinces in 1838; that of 1860–1 in the same district, when the first serious attempts at relief were made; the terrible Orissa famine of 1865–6, in which one fourth of the population perished; the great famine of Southern India in 1876–8; that of 1896–7; and that of 1899–1900, in Bombay, Berar, Central Provinces, Central India, Rajputana, Southeast Panjab, and other parts, at one period of which about 6½ million persons were in receipt of relief. The problem of famine is not really a problem of scarcity at all, taking India as a whole, but it is partly a financial problem, partly one of irrigation, and partly one of inland communication.

Recent Events.— The other chief events since 1870 are: The proclamation of Queen Victoria as Empress of India at Delhi and elsewhere, 1876; the Afghan war of 1878–80; the rendition of Mysore to its native dynasty, 1881; the annexation of Upper Burma after a short war, 1886; the passing of the Indian Councils Act of 1892; closing of the Mints, 1893; Chitral campaign, 1895; the war against the Afridis and other frontier tribes, chiefly remembered by the action at Dargai, 1897; the creation of a gold standard, 1899; and the accession and proclamation of King Edward VII., as Emperor, at the grand durbar at Delhi in 1902. The governors-general since Lord Mayo's assassination have been: Lord Northbrook (1872–6); Lord Lytton (1876–80); Marquis of Ripon (1880–4); Marquis of Dufferin and Ava (1884–8); Marquis of Lansdowne (1888–94); Earl of Elgin (1894–9); and Viscount Curzon of Kedleston, whose rule began in 1899.

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C. L. STUART,
Editorial Staff 'Encyclopedia Americana.'

India, Farther, or Further. See INDO-CHINA.

India, French. See EAST INDIA COMPANIES, and INDIA under *History.*

India Ink. See INK.

India, Native States of. See INDIA under *Political Divisions, Local Government,* and *History.*

India, Portuguese. See EAST INDIA COMPANIES, and INDIA under *History.*

India Rubber, the manufactured products of caoutchouc, or gum-elastic. Some of the properties of india rubber must have been known in America at a very early period, because balls made by the Haytians of the gum of a tree, bouncing better than the wind-balls of Castile, are mentioned by Herrera in his account of Columbus' second voyage. In a book published in 1615 Juan de Torquemada mentions the tree which yields it in Mexico, describes the mode of collecting the gum, and states that it is made into shoes; also that the Spaniards use it for waxing their canvas cloaks to make them resist water. More exact information was furnished by M. de la Condamine in 1735. India rubber

was at first known as Elastic Gum, and received its present name from the discovery (about 1770) of its use for rubbing out black-lead pencil marks, for which purpose it began to be imported into Britain in small quantities about the end of the 18th century. Its application to the manufacture of waterproof cloth first gave it commercial importance. About the same time a method was discovered of fabricating articles of various kinds by casting india rubber in molds. The india rubber of commerce is obtained most largely from South America, but considerable quantities are also procured from British India, the Indian Archipelago, the west coast of Africa, and the Mauritius.

Pure India rubber is now used only to a limited extent in the arts, but it is applied in the vulcanized state to a very large extent. In the process of vulcanizing, the rubber, as a preliminary step, is either torn into shreds or crushed into thin pieces by machinery, and afterward washed. There are two principal kinds of vulcanized rubber, one hard and horny in its texture, the other soft and elastic. In the case of the former the caoutchouc is mixed with about one third of its weight of sulphur, and heated for several hours, the temperature finally rising to fully 300° F. For the soft kind of vulcanized rubber, on the other hand, a much smaller proportion of sulphur is required — viz. from 2½ to 10 per cent, and the heat to which it is subjected in the vulcanizing chamber is considerably less. Usually, too, with this latter kind, the articles are made before the rubber is heated. The sulphur is commonly added in the ground state, but sometimes the rubber is treated with some solution containing this element, such as the bisulphide of carbon.

Hard vulcanized rubber, termed vulcanite, and sometimes ebonite, is made into a great many small articles, such as combs, chains, bracelets, boxes, penholders, paper-knives, knife-handles, buttons, etc., as a substitute for materials like horn, bone, ivory, and jet. Like these substances themselves, it is formed into various objects by molding, cutting, carving, polishing, and other processes. Vast numbers of these articles are now sold. The black color of vulcanite ornaments has still a tendency to turn gray, but the brittleness which was a fault of combs made of it a few years ago seems to be overcome.

More than 50,000,000 pounds of india rubber, valued at more than $30,000,000, was imported into the United States in 1902. In 1890 the quantity was only 33,000,000 pounds; in 1880, 16,000,000; in 1870, 9,000,000, and in 1862, the earliest date at which it was separately shown in the import statements, was only 2,125,561 pounds.

Over $100,000,000 worth of manufactures from india rubber are now turned out from the factories of the country every year, and about half of this total is in the form of boots and shoes. So great is the demand for india rubber for use in manufacturing that not only has the importation grown from 2,000,000 pounds in 1862 to over 50,000,000 annually at the present period, but in addition to this the forests of the East Indies are called upon for several million pounds annually of a new substitute for gutta-percha, known as "gutta-joolatong," while at the same time the highways and byways of Europe and other countries are ransacked for cast-off rubber manufactures from which the rubber is "reclaimed" and re-used in conjunction with the new rubber from the forests of Brazil, Africa, and the East Indies.

The industry of importing and "reclaiming" india rubber for re-use in manufacturing is a comparatively new one, and while it utilizes large quantities of worn-out rubber boots and shoes and other articles of this character from the scrap heaps of the United States, it has only extended to other parts of the world in recent years.

Gutta-joolatong is another comparatively new material which may be used as a substitute for or in conjunction with India rubber. It is a product of the East Indies, chiefly the island of Borneo, located not far from our Philippines.

The tables which follow show the quantity and value of crude India rubber imported into the United States from 1893 to 1903, also the scrap and old India rubber for use in remanufacturing, also for gutta-joolatong from 1899, the date at which it was first separately stated, to 1903:

IMPORTATION OF CRUDE INDIA RUBBER, 1893 TO 1903.

Year Ending June 30	Pounds	Value
1893	41,547,680	$17,809,239
1894	33,757,783	15,077,993
1895	39,741,607	18,353,121
1896	36,774,460	16,603,020
1897	35,574,449	17,457,976
1898	46,055,497	25,386,010
1899	51,063,066	31,707,680
1900	49,377,138	31,376,867
1901	55,275,529	28,455,383
1902	50,413,481	24,899,230
1903	55,010,571	30,436,710

IMPORTATION OF OLD AND SCRAP RUBBER, FIT ONLY FOR REMANUFACTURE, 1893 TO 1903.

Year Ending June 30	Pounds	Value
1893	910,543	$25,633
1894	1,774,008	55,803
1895	2,032,563	63,112
1896	3,874,677	123,068
1897	3,653,945	113,722
1898	9,488,327	339,374
1899	10,513,604	462,044
1900	19,093,547	1,249,231
1901	15,235,236	988,316
1902	22,894,900	1,437,960
1903	24,659,394	1,516,137

IMPORTATION OF GUTTA-JOOLATONG, 1899 TO 1903.

Year Ending June 30	Pounds	Value
1899	6,473,882	$166,419
1900	8,701,753	237,214
1901	9,371,087	248,838
1902	16,850,821	501,418
1903	13,984,817	345,431

IMPORTATION OF GUTTA-PERCHA, 1893 TO 1903.

Year Ending June 30	Pounds	Value
1893	582,378	$155,428
1894	498,763	84,340
1895	1,326,794	122,261
1896	3,843,854	178,513
1897	1,117,665	100,187
1898	636,477	159,381
1899	518,939	167,577
1900	427,678	178,616
1901	280,560	130,957
1902	525,767	252,329
1903	316,290	22,400

See also CAOUTCHOUC; RUBBER MANUFACTURES, AMERICAN.

Indian. See INDIANS, AMERICAN.

Indian, Catholic Education of the. Upon the discovery of America in 1492, the various religious orders of the Roman Catholic Church hastened to send missionaries to the new field. A small school for the education of the natives was an accompanying feature of each mission station, and after Cortes had conquered Mexico, Franciscans, Dominicans, and Jesuits, in course of time educated and converted the natives to Christianity, and founded missions and schools which exist there to-day, and in California, now an integral portion of the United States, but formerly part of Mexico. North and south the missions and schools were established and as germs of diocesan organizations bore fruit in the foundation of the see of Caracas in Venezuela in 1531; that of Lima, Peru, in 1539; of Chiquisaca, Bolivia, in 1551; and of Santiago, Chile, in 1561. Brazil was entered in 1500 by Franciscans who were followed half-a-century later by Jesuits. The first Brazilian see was founded at Bahai in 1561; in La Plata, now the Argentine Republic, the see of Cordova was founded in 1570, and there in course of time the Jesuits built up a magnificient college. In Central America, Franciscans began their work of education and conversion in Costa Rica in 1560, and during the last 30 years of the century friars labored successfully in Guatemala, teaching the arts of civilized life along with the doctrines of salvation. Early in the 17th century, Jesuit fathers entered Acadia (Nova Scotia), and Canada, and in 1659 the first episcopal diocese in the region was organized at Montreal. Torture and martyrdom did not deter these brave champions and pioneers of Christianity and civilization, and the development of the United States followed the pioneer growth of Catholic congregations and schools among the native Indians. In the first half of the 19th century, the Indian nations of the Rocky Mountains and Northwest Territories (American and Canadian) were pagan. The Jesuit father De Smet made the long and dangerous journey from St. Louis, Mo., to the headquarters of the Flathead nation in Montana, inaugurated the introduction of Christianity, and prepared the way for the advent of younger members of the order. See CATHOLIC INDIAN MISSIONS IN THE UNITED STATES.

Indian, Education of the. Indian education as at present conducted in the United States is in no way the outcome of any deliberate plan on the part of the Federal government, but is directly descended from the first attempts to teach the Indians of Virginia, and particularly from like beginnings in Massachusetts, where the remarkable results of John Eliot (q.v.) were achieved.

Eliot's Work.— Eliot was actuated by high motives, and his simple measures were chosen with consummate wisdom. Having familiarized himself with the language, disposition, and character of his Indians, he secured their confidence and respect. Those who would follow him he gathered in towns, where he taught them the liberties and responsibilities of township government and the devices and institutions of civilized life, among which the Church and the school naturally occupied places of honor. A number of "choice Indian youths" he induced to attend English schools that they might prepare themselves for missionary work among their own people. He was warmly supported by "the corporation for the propagation of the Gospel in foreign parts," by the General Court of Massachusetts, and particularly by Daniel Gookins, the official superintendent of the Indians in Massachusetts. Eliot began his work in 1646. In 1674 there were 14 towns of "praying Indians," whose schools and churches, in the majority of instances, were administered by educated natives, and an Indian college had been founded at Cambridge. Yet in due time this success was swept away by the fears and prejudices which developed under the baneful influences of the Indian wars. Similar successful work under the direction of John Cotton and Richard Bourne in Plymouth colony shared the same fate.

Other Endeavors.— Followers of Eliot in the 18th century were John Sergeant at Stockbridge, Mass., and Eleazer Wheelock in Connecticut and New Hampshire. The work of Sergeant, which involved the establishment of day schools, of a boarding-school, and an experimental "outing system," was almost ideal in conception, but ended with the deportation of his Indians to the West. Dr. Wheelock's labors led to the establishment of an effective training school and, indirectly, to the creation of Dartmouth College "for the education and instruction of youths of the Indian tribes in this land in reading, writing, and all parts of learning which shall appear necessary and expedient for civilizing and christianizing the children of pagans, as well as in all liberal arts and sciences, and also of English youths and any others." Only the last purpose was destined to achievement.

Surviving Influences.— But in spite of external failure, the spirit and much of the form of these early enterprises persisted. Their impress is observable to-day in almost every prominent feature of the Indian-school organization of the United States, notably in the establishment of day schools in or near Indian villages as a means of domestic and industrial uplifting of Indian family and village life; of industrial boarding-schools in territory occupied by Indians, to introduce among the young a taste for the refinements, duties, and responsibilities of civilization; of advanced training-schools in civilized English-speaking communities for the fuller equipment of "choice Indian youths" for full citizenship in such communities, or for missionary work in the ideals, institutions, and arts of civilization among their own people. It is seen in the universal stress in all schools upon instruction in husbandry, certain trades and domestic arts; in the "outing system," which places partially educated Indian girls and boys as paid helpers in suitable English-speaking families, and affords them instruction in the ordinary public schools; and in the importance attached to religious and ethical training.

Wrong Departures.— On the other hand, it is to be deplored that a number of valuable features of the early schools have been abandoned, and even supplanted by opposite tendencies — the unintelligent warfare against the Indian idiom; the introduction of certain brutalities of military discipline; an equally mistaken effort to wean Indian youth from Indian association by throwing contempt upon the Indian and by stimulating a feeling akin to hatred

of Indian family ties; and in general a policy of compulsion and repression, rather than a spirit of development and benevolent helpfulness. Serious harm came to government schools because patronage entered as a factor in the appointment of officers and employees. Thanks to the Indian Rights Association, the Mohonk Conference, and a number of other societies, in 1893 civil-service rules were applied to employees of the Indian schools.

History of Organization.— The successive steps in the organization of Indian schools have been as follows: After the Revolution little heed was paid to Indian education for 30 years. Only minor appropriations are recorded on the basis of treaties with a few tribes. But in the first quarter of the 19th century a religious revival directed attention to Indian education as a Christian and national duty. Congress responded in 1819 with an appropriation of $10,000 in addition to certain treaty obligations. In 1820 the President was authorized to apply this sum annually in aid of societies and individuals engaged in the education of Indians. In 1823 $80,000 was expended in 21 schools maintained by missionary bodies, $12,000 having been granted by the government. In 1825 the number of such schools had risen to 38, their entire expenditure to $202,000, of which the government, directly and indirectly, had contributed $25,000. In 1848 there were reported in operation 16 manual-training schools, 87 boarding-schools and other schools. These schools continued to increase in number and efficiency up to 1873, under the control of missionary bodies, with scanty aid from the government, which had established only a few small day schools directly under treaty provisions. After 1873, however, the government entered upon an era of great activity in the establishment of strictly government schools. In 1877 Congress appropriated for schools outside of treaty provisions, $20,000; in 1880, $75,000; in 1885, $992,800; in 1890, $1,364,568; in 1895, $2,060,695; in 1899, $2,638,390; in 1900, $2,936,080; 1901, $3,083,403.65; 1902, $3,251,254; 1903, $3,531,220. The expenditures have doubled within the decade, and trebled within 15 years. During the quarter century the average attendance rose in more than like ratio. Increased appropriations naturally stimulated a desire on the part of the government to control expenditures. Moreover, the Constitution, by implication, at least, forbids the appropriation of public funds for denominational purposes. Conclusions unfavorable to government support of missionary schools were further strengthened by the fact that the Roman Catholic Church had gradually outstripped the Protestant missionary bodies and was absorbing the lion's share of government support. In 1893 the Methodist Episcopal Church withdrew from participation in government aid, but without abandoning its schools. In 1895 this example was followed by the Presbyterians and Congregationalists; in 1896 by the Friends; and in 1897 by the remaining Protestant denominations. This left only the Catholics in the field with an appropriation, and in 1901 it was withdrawn from them also. In 1894 Congress had declared its policy of abandoning all support of denominational schools, and this policy has gradually been followed out.

The Schools of To-day.— The present Indian schools under government control are day schools, reservation boarding-schools, non-reservation boarding-schools, and industrial and normal training-schools. These in 1902 numbered 249, with an enrollment of 24,434 pupils; 323 other pupils were maintained by contract at Hampton and in white public schools.

Day Schools.—Day schools in Indian villages, or near Indian camps or settlements, are, as a rule in charge of a male teacher and his wife, or, as in the pueblos of New Mexico and in the Indian villages of southern California, of a white woman teacher and an Indian housekeeper. These teachers are employed for 10 months in the year; the male teacher's wife acts as housekeeper. The children spend 5 to 8 hours during the 5 days of the week under the care of these employees, and return to their homes in the evening. The instruction is of the simplest character. The children are taught to speak, read, and write English within narrow limits, to cipher, to draw, and to sing. They get some rudimentary notions of geography, of natural history, and of United States history. The methods are borrowed largely from the kindergarten and from object-teaching, and much stress is laid upon habits of cleanliness and order, mutual kindliness, and prompt obedience. The boys receive some instruction in the use of tools, in gardening, and in some instances in the care of cows. The girls are taught sewing, cooking, and other arts of housekeeping. In the poorer Indian communities a noon-day lunch of a few simple articles is furnished. While these day schools accomplish comparatively little in conventional school-room work, they serve as concrete illustrations of a civilized Christian home which the Indians learn to respect and, in an appreciable degree, to emulate. Moreover, they reconcile the Indian with the idea of sending his children to school, and render him more willing in due time to entrust them to the care of boarding-schools, as well as more ready to appreciate and to accept the lessons of civilization. The most successful of 134 such schools in 1902, were located in Wisconsin, North Dakota, and South Dakota; the least successful, probably, among the pueblos of New Mexico, where the Indians live in a state of half-civilization which they owe to their Mexican and Spanish antecedents, and which fully satisfies their ideals.

Reservation Boarding-Schools.—There were 90 of these in 1902, averaging 125 pupils. They are in charge of a superintendent, assisted by a matron and such teachers, industrial and domestice helpers as the capacity and character of the school may require. In addition to regular teachers, the school is provided with a cook, a seamstress, and a laundress, whose office it is not only to supervise their respective departments, but also to instruct the girls in these arts. For instruction of the boys there is a farmer, an industrial teacher, and, at larger schools, a tailor, a shoe and harness maker, a carpenter, and a blacksmith. An experiment to provide for more methodical instruction in the use of tools, by expert manual-training teachers, failed because the Indian office would not afford a salary for this position sufficient to attract competent men. In 1894 the experiment of connecting kindergartens with these schools was tried, and proved eminently successful. At the present time there are 40 kindergartens connected with boarding-schools, and the use of kindergarten

methods and material has entered the primary classes in practically all these schools with similar good results. In the kindergarten the children spend from 1½ to 2 hours each half-day. In most of the other schools children spend half a day in the school-room, and the other half-day in domestic or industrial work of a character suited to their age. Experience has proved that half-day instruction, at first forced upon the schools as an expedient, is commended by its good results.

The aim of the school-room work is to teach reading and writing within the usual limits of primary work; arithmetic for the needs of ordinary daily life; rudimentary geography and United States history; drawing and singing; the laws of hygienic living; garden and orchard work; and familiarity with the simpler requirements of agricultural and domestic industries suited to the locality. Moreover, in a few of the larger schools, the older boys have much opportunity to acquire skill in carpentry, blacksmithing, tailoring, and shoemaking. These institutions are to the children not only school, but home and community. The institution gives them shelter, food and clothing; it accustoms them to habits of cleanliness and decency; it cultivates their æsthetic tastes; it labors to secure right moral attitude, and in its Sunday-school seeks to stimulate the religious life of the children. The superintendent of the reservation boarding-school is subject in his work to the control of the Indian agent, who as representative of the government, administers the reservation's affairs. Inasmuch as these agents are selected on partisan grounds, usually at the suggestion of local politicians, this arrangement is fraught with danger to these schools.

In 1893, under civil-service regulations, there came some improvement. Still with reference to minor employees the superintendents, and even the Indian office, were powerless, and frequently good superintendents were forced out of service by combinations against them among the appointees of the agent, or through the aid and influence of unscrupulous partisan inspectors or supervisors. But in 1896 all employees of the school service were placed under civil-service protection, and since that time there has been marked improvement in the conditions and work of these schools. To a certain degree these evils still persisted, however, because of the power and political bias of the agents; but of late the government has adopted the policy of replacing the agents with bonded school superintendents, 22 agencies now being under such control. There has been decided gain in the equipment, in the sanitary condition, in the general character of employees, and in the conduct of the schools. For the Indian office, relieved of attention to office-seekers and their patrons, has been enabled to pay increased attention to the schools themselves. In the reservation boarding-schools instruction continues through 40 weeks; but often some children are kept at the school throughout the year.

Non-Reservation Boarding-Schools. — Of these there are 25. Seven of them are industrial training-schools, and three others are industrial and normal training-schools. The remaining 15, in their original scope of work, differed little from the reservation boarding-schools. But the superintendents of these schools are bonded and directly responsible to the Indian office. There is no intervening Indian agency, and the consequent sense of responsibility and self-respect in the head of the school finds its reflection in the attitude of his subordinates, as well as in that of the pupils. These schools are, as a rule, located at a distance from the Indian country, and in the vicinity of American towns which afford contact with the amenities of civilized life. Members of many different tribes are also brought together, and tribal antagonisms are broken down. The pupils are older than those at reservation schools, and some have had previous training in day schools or reservation boarding-schools. Because far away from their Indian homes, and near to English-speaking communities, they gain a better control of English; class-room work reaches far into the advanced grammar-school courses of study, with special stress upon language practice, arithmetic, geometry, geography, history, nature study, drawing, and civil government. Instruction in domestic and industrial arts is made effective by frequent opportunities directly to observe their practical applicability and value. The superintendents are paid from $1,200 to $1,500 per annum. Other employees are paid on the same scale as in reservation schools. The most noted and successful of these schools are located at Flandreau, S. D.; Pipestone, Minn.; Mount Pleasant, Mich.; Fort Mojave, Ariz.; Carson, Nev.; Perris, Cal.; Tomah, Wis.; Wittenberg, Wis.; Fort Lewis, Colo.; and Pierre, S. D.

Industrial Training-Schools. — There are schools of this class at Carlisle, Pa.; Chemawa, near Salem, Ore.; Chilocco, Okla.; Genoa, Neb.; Albuquerque, N. M.; Lawrence, Kan.; (the Haskell Institute), Grand Junction, Colo.; Sante Fe, N. M.; Phœnix, Ariz.; Fort Shaw, Mont. The most strenuous effort is now carried on at Chilocco; organized 1884; a large plant with a capacity of over 500 pupils, and a fine farm of about 9,000 acres. In organization these schools are similar to the schools just described, but in the scope of their work and in equipment they excel in a high degree. The government in 1894 added normal departments at Carlisle, at the Haskell Institute, and at Santa Fé. The experiment proved fairly successful with Carlisle and the Haskell Institute, at Santa Fé slightly so for a time, but of late it has shown better results there.

Contract Schools. — In addition to maintaining these strictly government schools, the Indian office up to 1901, as before said, paid by contract for the education of many hundreds of Indian pupils distributed in Catholic mission boarding-schools, in Catholic day schools; at Lincoln Institute, Philadelphia, and at Hampton Institute, Hampton, Va. In the appropriation for that year, the aid was withdrawn from all but the last-named, where 120 pupils were contracted for. Besides these, the government since 1891 has endeavored to place Indians in white public schools where there are many whites and few Indians, as the most rapid means of civilization. The antagonism of local or State authorities to this coeducation has made this plan a failure in some places; in others there has been some success. Rising from 8 to 45 between 1891 and 1896, the number of such schools has gradually sunk to 16 in 1902, with 110 pupils contracted for out of 189 enrolled, and average attendance of 98.

Supervision.— Direction of the Indian schools rests with the Indian office, which is under the supervision of the secretary of the interior. In the Indian office the details of the work are entrusted to the education division, to which all reports are made, and by which all directions and orders are drafted and issued. The education division is aided in its work by the superintendent of Indian schools and by 5 supervisors, assigned in their work to 5 districts respectively. These officials constitute a branch of the Indian-school service which occupies a very uncertain position. They have duties, but no rights. A similarly anomalous relation exists between the commissioner and the secretary of the interior with regard to all matters which the latter may wish to control directly. For this purpose the secretary has established under his direct control an Indian division, independent of the Indian office, to which all orders and directions the secretary may designate must be referred by the Indian office for approval. The power of this Indian division is further reinforced by a corps of inspectors in the field, appointed on partisan grounds, and responsible to him alone. Technically the superintendent of Indian schools may appeal from the commissioner to the secretary of the interior, and the commissioner from the decision of the secretary to the President. In view, however, of the hopelessly autocratic relation that runs through the chain, that is practically out of the question. Under these conditions, the fact that Indian education has prospered reflects credit upon all concerned.

Schools of Indian Territory.— The schools of the so-called "five civilized tribes" of Indian Territory are not included in the above sketch. The 5 tribes in 1900 included 25,639 Cherokees, 10,321 Choctaws, 7,963 Creeks, 5,872 Chickasaws, and 1,662 Seminoles. In addition there were in the Territory 36,853 freedmen and 302,680 whites. Missionary zeal availed itself promptly of this field for its efforts. Substantial boarding-schools were erected, more particularly by the Presbyterians, Methodists, and Baptists. In due time, however, the Indian authorities began to make appropriations for these schools. Ultimately they took entire charge of them. Unfortunately, administrative affairs were largely in the hands of whites, who, by intermarriage or bribery, had been adopted into the tribes, and there came over the schools, as well as over all other public interests, the blight of extreme partisanship and nepotism, which rapidly degraded them in character and efficiency. In 1898 the government at Washington assumed supervisory control over the affairs of all these tribes except the Seminoles. The conduct of the schools and orphan asylums in the 4 tribes involved was placed under the direction of a superintendent of schools in Indian Territory, appointed by the secretary of the interior. Under him there is for each of the tribes or nations a supervisor of schools, whose duty it is to inspect the educational institutions in his district, and to assist in their organization and conduct. The superintendent reports to the commissioner of Indian affairs at Washington through the United States inspector for the Indian Territory, who is his immediate superior. The initial report of this superintendent showed in the 4 tribes 24 boarding-schools, with an enrollment of 1,758 pupils, and an average attendance of 1,480, taught and cared for by 234 employees at an annual expense of $236,824. This does not include 363 neighborhood schools, in which more than 10,000 children are taught at an annual expense of $113,380, which, in character and equipment, show great inferiority.

WILLIAM N. HAILMANN,
Ex-Supt. Indian Schools.

Indian Affairs. The prevalent idea that the national government has always striven to dispossess the Indians from the lands they occupied, or has sympathized with such efforts, is the exact reverse of the truth. From its foundation until now, its history presents an unbroken record of quarrels between Indians and bordering or interdwelling white settlers, in which the government has been slowly and reluctantly pushed on to interfere; sympathizing with and justifying the Indians against its own citizens, its commissioners usually reporting in their favor, and even its generals in later days blaming the whites for the troubles; its courts deciding in their favor; attempting pacification amid local outcries against them, rebuffing appeals for aid, and only using its armies to reduce the Indians and its administrative power to remove them when it was no longer politically possible to leave them in possession. Even then, it has meant to deal righteously by them; but the complexity of the problem — one may say its insolubility till the country was very strong and the Indians very weak — along with the universal curse of "spoils" in the administration — has hindered success. While until 1887 there was no consistently formulated plan, there has been a sequence of government panaceas in a steadily descending line. First, there was to be one vast Indian reservation, large enough to give them all the hunting-room they needed, and so far from the United States that our growth would never reach to them and create more troubles; then three great reservations, to prevent so formidable an Indian district and internecine Indian wars; then a number of small ones, to segregate hopelessly hostile tribes, enable better training into civilized existence, and protect them from depredations; lastly, no reservations, but severalty ownership and individual citizenship. These changes of policy have been due not to fickleness or visionary causes, but to broadening experience and varying conditions.

The policy of removing the Indians west of the Mississippi was first formulated by Jefferson, who in a proposed constitutional amendment (1803) set off the Louisiana Purchase north of the Arkansas as a pure Indian country, in which no land was to be sold to whites. This was carried out, on a much reduced scale, in the formation of Indian Territory (q.v.) by act of 30 June 1834; by another act of same date a superintendent of Indian affairs was appointed, no one to trade or settle in the Indian country without permission from him or his agents. Previous to this the Indian matters had been under the War Department; in 1849 they were transferred to the new Department of the Interior, of which they still form a bureau. Under the commissioner of Indian affairs are eight inspectors and a large variety of subordinate officials and employees. The Indian agents, though under his control, are appointed by the President, for four years, with bonds; on their

action depends often peace or war to great white populations, but in too many cases they have been the football of politics, and sometimes scandalously unfit for their places.

The legal theory, until a recent date, was that each tribe was a nation, but not a foreign nor independent one; a "domestic dependent nation," but with which, nevertheless, all intercourse was to be conducted through special commissioners appointed by the President. In 1871 Congress abolished this method of procedure, and substituted immediate Congressional control, but the fiction of Indian nations remained; nor, indeed, could any other system well be applied so long as the Indians were recognized as national wards, and could not be made a part of the regular republican system or thrown into the current of unrestricted competition. It was the general plan to let the larger and better advanced ones, as the five "nations" of the Indian Territory, govern themselves and thus develop political life, including a full judiciary system. But the smaller ones could not be thus left, even in leading-strings; and in all, the government has recognized its duty to watch over their ignorance, improvidence, and savage instability of will and emotion from either violence or cunning on the part of the whites. Traders with them must have certificates of good character and be licensed by the Indian commissioner, and the goods they sell are subject to regulation; no one can hunt, cut timber, or pasture cattle on Indian lands without the agent's permission; intoxicating liquors may not be sold to them. Still more important and beneficial is the educational work, which has not only been carried on by churches, missionary societies, and private individuals from early times, but has been actively forwarded by the government. The five civilized nations of Indian Territory had their own school system, of considerable extent; but for others, and even for those where needed, the President was empowered in 1865 to appoint instructors of Indian children in reading, writing, arithmetic, and agriculture, and in 1882 to appoint an inspector of Indian schools. (See INDIAN, EDUCATION OF THE.)

From 1877, when a $20,000 appropriation was made for Indian schooling, to 1900, when over $3,000,000 was appropriated, over $35,000,000 had been thus expended by the government. It has spent since its foundation nearly $400,000,000 on the Indians, outside of the cost of wars against them; and the present expenditure is about $10,000,000 a year. In 1900 it was maintaining over 45,000 wholly by rations, and 12,500 partly, at a cost of about $1,250,000 per annum; and paying annuitants (partly from trust funds derived from sales of their lands) over $1,500,000.

On 8 Feb. 1887, however, an act was passed, amended in 1890, to sweep away as soon as feasible all this system of tutelage and pauperization, in the belief that abolition was best for Indians and whites alike. All reservations were to be surveyed; all Indians who wished to take up lands in severalty to a certain amount might do so — and by the act become citizens, as well as all who had previously done so under treaties and Congressional enactments, over 10,000 in number. Up to 30 Oct. 1900 6,736,514 acres had been so allotted, to 56,996 Indians; about 2,000 a year comply with the permission; and a few years will see an end of Indian tribes except as historical reminiscences. Many of these new citizens are made voters by their States: there are over 20,000 such in the United States at present. See CHEROKEE; CHEROKEE NATION V. GEORGIA.

Indian Art. In none of the fine arts except architecture have the Hindus attained much eminence. Their paintings are of very little merit, though the walls of temples, of palaces, and of the better class of private dwellings are often ornamented at great cost with pictures illustrating the characters and events of their mythology. More attention has been paid to sculpture than to painting, and in the temples cut from the living rock great numbers of statues are contained, some single figures and others large groups. Many of these are bold and spirited in design, though the human form is not exhibited in good proportion nor with its parts well developed.

Indian Architecture, however, comprehends a great variety of styles, among which we may distinguish, as the most important, the Buddhist, the Jaina, the Dravidian or Southern Indian, the Chalukyan, and the Modern Hindu or Indian-Saracenic styles. The history of Indian architecture commences in the 3d century B.C. with the religious buildings and monuments of the Buddhists. Among the principal forms of Buddhist architecture are first, the *topes, stupas,* or towers built to mark some sacred spot, and the *dagobas,* constructions of a similar nature, containing relics of Buddha or Buddhist saints. These buildings generally consist of a circular stone basement, varying from 10 or 12 to 40 feet in height, and from 40 to 120 feet in diameter, on which rose a rounded domical structure, generally of brick or small stones laid in mud, the whole edifice rising sometimes 50, sometimes 100 feet high. Second, the rock-cut *chaitya* halls or churches, and the *viharas* or monasteries. Most of these are found in Bombay; some also in Bengal and Behar. In rock-cut buildings architectural skill is confined to the façade and the interior. Among the most notable for beauty of design are those at Ajanta, and, finest and largest of all, the great Chaitya cave at Karli, near Bombay, the date of which is probably about 80 B.C. Another interesting example is at Ellora. The Jaina style is a development or corruption of the pure Buddhist. It is characterized by the square or polygonal court, the twelve-pillared dome, the slenderness and elegance of the columns, the horizontal arch, the *sikras* or towers surmounting the cells containing the images, and, lastly, by the peculiar grouping of many temples together on hill-tops. Prominent examples of Jaina architecture are found at Girnar in Gujerat, and at Mount Abu. The most flourishing epoch of the Dravidian style comprises the 16th, 17th, and even 18th centuries of our era. To this late period belong the great temples at Tanjore, Tiruvalur, etc. The distinctive parts of a Dravidian temple are the *vimana* or temple proper, with storied pyramidal roof; the *mantapas* or porches, covering the door which leads to the cell; the *gopuras* or gate-pyramids, in the quadrangular enclosures surrounding the vimanas; and the *choultries* or pillared halls, used for various purposes. The

general characteristics of a Dravidian temple of the first class are the storied pyramidal towers, the hall of 1,000 columns, the bold cornice with double flexure, the detached shafts, the richly carved stylobate, and the large tanks with flights of stone steps. The Chalukyan style, so named from a dynasty which rose in the 6th century in what is now Mysore and the Nizam's Territory, reached its perfection in Mysore from the 11th to the 14th century. The characteristic features are the open porch, the straight-lined, conical-shaped tower, the star-shaped temple, and the basement terrace of stone.

The Indian-Saracenic style is a general name for a number of somewhat varying styles, the result of the mixture of Saracenic principles of architecture, brought with them by the Mohammedan conquerors of India, and the distinctive architectural features of the different localities where they settled. Under the Mogul emperors in the 16th century were erected some most magnificent buildings, such as the tomb of Humayun Shah at Old Delhi; that of Akbar at Secundra; the palaces of Shah Jehan at Agra and Delhi; and the Taj Mahal, built by the same monarch at Agra. (See AGRA.) The Moslem architecture of India contrasts with the native Indian styles in its use of the radiating arch, in the superior simplicity and grandeur of its style — its flat ornamentation not interfering with the lines of true architectural construction. A characteristic feature also is its fine conventionalism of vegetable forms for decoration and tracery. See *Moslem Architecture* under ARCHITECTURE.

Indian Bean, a catalpa (q.v.); specifically the large southern tree (*Catalpa catalpa*), now planted as a shade or ornamental tree all over the country on account of the beauty of its masses of spring flowers and the quaint appearance in autumn of its long, bean-pod-like fruit.

Indian Bible, the first Indian translation of the Bible in the New England colonies. This translation was made in 1663 by John Eliot, "The Apostle to the North American Indians." It was in the dialect of the Naticks, a Massachusetts tribe of the Algonquins. A second revised and corrected edition was printed in 1685, only 12 copies of which are known to exist. An edition with notes by P. S. Du Ponean, and an introduction by J. Pickering, was published in Boston in 1822. When the original edition was issued, 20 copies were ordered to be sent to England. A copy of the edition of 1663, with the Epistle Dedicatory, was sold in 1882 for $2,900.

Indian Bread-root, a plant of the genus *Psoralea;* the "large" was *P. esculenta;* the "small" *P. hypogæa.* See BREAD-ROOT.

Indian Corn. See CORN, INDIAN.

Indian Fig. See PRICKLY PEAR.

Indian Head, (1) the highest point of the Palisades, 550 feet; so called because it resembles somewhat the head of an Indian. It is in the northeastern part of New Jersey, on the Hudson and opposite Hastings. (2) The name of a village in Fayette County, Pa. (3) A small town in Maryland, on the Potomac River, below Washington, the seat of a naval station.

Indian Hemp. Sometimes called Canada hemp. See APOCYANACEÆ.

Indian Hippo, an American plant. See BOWMAN'S ROOT.

Indian Humped Cattle, a species of East Indian oxen (*Bos indicus*), now known only in the domesticated state, distinguished by a high fatty hump on the withers, by the prevalent ashy gray color, large drooping ears, enormous dewlap and several structural peculiarities. They vary in size from those as large as a European ox to the smallness of a half-grown calf. They form the working cattle and draft animals all over India and eastward more or less locally to China. They are venerated by the more pious sects of Hindus, especially in the persons of certain privileged bulls, called Brahma or Brahminy bulls, which wander about the bazaars of cities unharmed and unchecked in their depredations upon market produce.

Humped cattle are known in Madagascar, and in Abyssinia, and it has been suggested that the species was originally African. The Abyssinian form is a large animal with huge horns called "galla ox" or sunga. These animals seem to thrive only in hot countries, and have never been found profitable outside of their present range.

Indian Language and Literature. See INDIA.

Indian Mutiny. The British occupation of India had been largely aided by native troops called Sepoys, who were enrolled under British officers in the service of the East India Company. At the close of Lord Dalhousie's sway in 1856, when the whole of India seemed to have been either reduced directly under British rule, or if retaining its native princes to have placed itself under British protection, the Sepoy mutiny, a contingency for which the government ought not to have been altogether unprepared, occurred. Previous symptoms of disaffection had not been wanting. Mutiny had on several occasions broken out in the native army, in a way to indicate how easily through causes which Europeans, from their defective sympathy with native thought and feeling, could not anticipate, these troops might be alienated; but, on the other hand, the general fidelity of the Sepoys merited confidence, and this feeling prevailed over any grounds of suspicion which might have been formed from isolated occurrences. The Sepoys in Bengal were mostly either Mohammedans, or Hindus of the Brahmanical or military castes. The recent annexations had alarmed the native chiefs, while the fanatical Hindus had been deeply offended by reforms, including the successive abolition of various rites of their worship. Two European regiments had been drafted off for the Crimean war, and had not been replaced. Others had been sent to Burma, and in the beginning of 1857 fresh regiments were despatched to Persia, so that only eighteen regiments were left in all Northern India, of which nine were in the Panjab. In Oudh, where, from its recent annexation, disaffection was rife, there was only one British regiment, and Delhi and Allahabad, the two chief arsenals, were guarded by native troops. To add to these favorable cir-

cumstances a Hindu devotee had prophesied the termination of British rule at 100 years after the battle of Plassey. A slight incident sufficed to give point and direction to a spirit of disaffection which so many circumstances tended to favor. At this time the Enfield rifle was introduced into the Bengal army. This rifle was loaded with a greased cartridge, the end of which required to be bitten off at the time of loading. By a natural inadvertence the authorities had neglected to consider how this seemingly trifling requirement might affect the easily excited sensitiveness of the Hindus in regard to caste, and this insignificant circumstance removed the last security against a united movement of disloyalty among the native troops, by establishing a bond of sympathy between the Mohammedans and Hindus. A report got abroad that the cartridges were to be soaked in cow and pork fat. The prejudices of Hindus and Mohammedans were thus equally involved, and as this rumor rapidly spread, the excited imagination of the Sepoys conceived a conspiracy on the part of the government to convert them forcibly to Christianity, by compelling them to violate the laws of their own religion. When this grievance was explained it was at once removed, the manufacture of greased cartridges at Dumdum was stopped, and the men were instructed to grease them themselves with materials procured at the bazaars. Suspicion once aroused, however, was not to be allayed, and easily found a new object of contention. The paper of the new cartridges was glazed, and it was again alleged that grease was used in its manufacture. The spirit of disaffection became too deep-rooted for any measures of conciliation. Conferences among the disaffected gave rise to ambitious schemes, and the original grievances became a pretext in the hands of unscrupulous leaders, whose excesses debarred them even from the plea of patriotism, to extirpate the British power in India. On 26 February the first overt act of mutiny took place at Berhampur, when a regiment refused to receive their cartridges. Another dangerous outbreak took place at Barrackpur on 29 March. The arrival of a British regiment from Burma and the disbandment of the disaffected regiments was thought to have ended the trouble, but it soon became evident that disaffection, which had only wanted an occasion, was spreading rapidly not only among the Sepoys, but among the Hindus generally. Another outbreak took place on 2 May, near Lucknow, when a regiment of cavalry were, by some oversight of the government's instructions, ordered to bite their cartridges. Sir Henry Lawrence succeeded by a show of force in disarming it. A more formidable outbreak occurred about the same time at Meerut, 35 miles northeast of Delhi, when the mutineers, with the assistance of the native inhabitants, indiscriminately massacred the Europeans and escaped to Delhi. The advance-guard of the mutineers reached Delhi on 11 May, and at once entered the city, where they were assisted by the king's servants in massacring the Europeans. The native troops cantoned outside the city in the meantime joined the main body of the mutineers, and assisted in massacring their European officers. About 50 Europeans sought refuge in the palace, and placed themselves under the protection of the king, who had placed himself on the throne of the Moguls. These after some days were coolly murdered in an open court in presence of a general concourse of spectators, conspicuous among whom was Mirza Mogul, the king's eldest son, who had assumed the title of commander-in-chief. The magazine at Delhi had been blown up by its defenders; but the explosion was only partial, and most of its contents fell into the hands of the mutineers. European troops were now summoned from all quarters. Several regiments were detached from an expedition which was proceeding under Lord Elgin to China, and the Persian war having been concluded, the troops engaged there were immediately recalled. When intelligence of these events reached the Panjab the mutinous spirit which prevailed among the large body of Hindustani troops there was promptly subdued by disarmament. The Sikhs, though the Panjab had been so recently annexed, continued faithful. But the revolt had spread rapidly elsewhere, and British authority was almost extinct throughout the Bengal Presidency. Everywhere the mutiny was attended with savage excesses — women were outraged, and Europeans, without distinction of age or sex, barbarously murdered. Sir Hugh Wheeler, at Cawnpore, was betrayed by Nana Sahib, maharajah of Bithur, who, after offering aid, took the mutineers into his pay, and raising the Mahratta standard, besieged Cawnpore. The siege, or rather bombardment, lasted from 7–24 June, when a capitulation was agreed to, on a sworn promise of Nana Sahib to allow the garrison to retire to Allahabad. But as the embarkation was proceeding the boats were attacked by the Nana's troops, and the men indiscriminately massacred. The women and children were for the meantime made prisoners. Sir Henry Lawrence was besieged in Lucknow, where he died on 4 July from a wound received in a sortie.

Meanwhile mutineers had been converging on Delhi, and British reinforcements were hastening to the besieging camp on the ridge above the city. After protracted operations and repeated reinforcements on both sides Delhi was taken by assault, 14–20 September. Sir Henry Havelock, who had been engaged in the Persian campaign, had arrived in Calcutta, and immediately set out for Allahabad, to commence operations for the relief of Lucknow and Cawnpore. While his force was victoriously advancing on Cawnpore Nana Sahib, on 15 July barbarously massacred his prisoners, consisting of 210 women and children. Havelock was succeeded in the command at Lucknow by Sir James Outram, who held it till relieved by Sir Colin Campbell, on 17 November. At first it was feared that the mutiny might extend to the Bombay and Madras presidencies, and from this cause and the occupation of the troops in Bengal the mutineers had been left unchecked in Central India. At length columns organized in these presidencies entered Central India, and were united under Sir Hugh Rose. By the operations of these commanders the brave Rani of Jhansi, who died fighting at the head of her troops, was defeated, and Tantia Topi whose military capacity had prolonged Nana Sahib's resistance, was captured and the mutiny was

finally suppressed. The war was substantially closed by June 1858, although the complete pacification of Oudh was not effected till the end of the year. See INDIA, EAST INDIA COMPANIES. Consult: Malleson, 'History of the Indian Mutiny' (1897).

Indian Ocean, that body of water which has Asia on the north, the East Indian Islands, Nicobar and the Andaman Islands, Australia and Tasmania on the east, Africa on the west, and the Antarctic continent on the south. The Cape of Good Hope, and the southern extremity of Tasmania may be considered its extreme limits from east to west. Its length from north to south somewhat exceeds 6,500 miles, its breadth varies from 6,000 to 4,000 miles. Its gulfs are the Red Sea, the Gulf of Aden, the Persian Gulf, the Gulf of Oman, the Arabian Sea, the Bay of Bengal, and the Great Australian Bight. Its islands are Ceylon, Madagascar, the Laccadives, Maldives, Socotra, Andamans, Nicobar, Mauritius, Bourbon, Kerguelen's Land, etc. Rocks and coral reefs render navigation dangerous. The Ganges, Brahmaputra, Irrawaddy, Indus, Euphrates, Gadavari, empty into the Indian Ocean. The southeast trade-wind blows between the 10th and 28th parallels of south latitude from April to October, after which date its limits are contracted; south of these are the northwest winds, which prevail almost in the same latitude, in the Atlantic and Pacific. The monsoons are mainly to be found in the north, from the continent of Asia to about lat. 8° S., and from the Mozambique Channel on the west to the western shores of Australia and the sea of China. They blow for six months, changing about the equinoxes. North of the equator the northeast monsoon prevails from October to April, the southwest from April to October; while south of that the northwest monsoon blows while the northeast is blowing on the north side, and the southeast prevails during the time of the southwest monsoon north of the equator. In the hot season, likewise, when the southeast trade-wind recedes south, the northwest monsoon flows between the equator and the 12th south parallel. The hurricanes of this ocean usually range between lat. 9° and 35° S., extending from Madagascar to the Island of Timor. They usually come from the northeast, and travel southwest and south, returning again east. Their season is from December to April.

According to the most recent soundings the mean depth of the Indian Ocean is 2,300 fathoms, or somewhat greater than that of the Atlantic. The greatest depths are in the eastern part to the south of the equator, where it is estimated that there are fully 50,000 square miles with a depth of over 3,000 fathoms. Over 13,000,000 square miles lie between the depths of 2,000 and 3,000 fathoms.

The area of land draining into the Indian Ocean is estimated at 6,813,600 square miles, and the rainfall on this land amounts to 4,379 cubic miles of water annually. The rivers flowing from the Asiatic continent are by far the most important, and they carry a vast amount of detritus into the Bay of Bengal and Arabian Sea, these forming immense deposits of blue mud. Along the African coasts, in depths from 100 to 1,000 fathoms, there are glauconitic sands and muds, and on these as well as other coasts, coral muds and sands, and blue and green muds in the shallower depths. In the deeper parts of the ocean, far from land, there are deposits of red clay, radiolarian-ooze, and globigerina-ooze. Toward the Antarctic continent the ocean bed is covered with a diatom-ooze.

The temperature of the surface waters varies much in different parts of the ocean, at different seasons, and under the influence of different winds. In tropical regions the temperature usually varies from 70° to 80° F., and the yearly range is 7° or 8° F. Off the Cape of Good Hope and Cape Guardafui, the annual range may be from 20° to 30° F. Sudden changes of temperature are often noticed off Cape Guardafui when the wind blows off shore. The cold and deep water is thus drawn up along the coast to take the place of the warm surface water which is driven east by the wind.

The temperature of the water at the bottom is very uniform and subject to little, if any, annual variation. In the Bay of Bengal and Arabian Sea temperatures of 33.7° F. and 34.2° F. have been recorded; these are only very slightly higher than those recorded by the Challenger in lat. 50° S. It is certain, therefore, that this deep cold water is slowly drawn into the Indian Ocean from the Antarctic to supply the place of the warm surface currents that are driven south by the winds.

The currents of the Indian Ocean are less constant than in the other oceans, being largely controlled by the monsoons. Some characteristic coral atolls and islands are found toward the central part, such as the great Maldive group, the Chagos, Diego Garcia, and the Cocos Islands. The tropical shores are generally skirted by fringing and barrier reefs. Christmas Island is coral formation, while St. Paul's, Mauritius, Rodriguez, and others are of volcanic origin, and Madagascar, Ceylon, and Socotra, continental islands.

The Indian Ocean was little known to the ancients. The first Europeans who explored it seem to have been the Phœnicians, who in the 7th century B.C., held the thalassocracy, or marine domination of the Mediterranean. Necho, an Egyptian monarch who flourished about 610 B.C., is reported by Herodotus to have sent some of his vessels, manned by Phœnicians, into the Indian Ocean, then known as the Erythræan Sea, to circumnavigate Africa. This they did, starting from the Arabian Gulf and regaining Europe by the Columns of Hercules. In the 6th century B.C. this sea was traversed by Hanno, a Phœnician admiral of Carthage. There is still extant his account of the voyage which is translated into Greek under the title 'Hanno's Voyage of Circumnavigation.' The Greek historian Arrian has given us an account of the coasting voyage of Nearchus, one of Alexander's generals, from the Indus to the mouth of the Tigris and Euphrates.

Hippalus, an Egyptian navigator who flourished about the beginning of the Christian era, was the first to observe the regular monsoons of the Indian Ocean, and to profit by them. In the 9th century the Arabs made frequent voyages across the Indian Ocean. In 1486 the Portuguese rounded the Cape of Good Hope,

and in 1498 Vasco da Gama reached the coasts of India by the same route. In 1521 a ship of Magellan's squadron crossed the Indian Ocean in completing the first circumnavigation of the world, and has since been habitually traversed in a direct line between Arabia and Hindustan.

Indian Paint, the name of two American plants: (1) the golden seal (q.v.) or orange-root, which furnishes a yellow color; and (2) the bloodroot. (See SANGUINARIA.)

Indian Physic, an American plant. See BOWMAN'S ROOT.

Indian Pipe, or **Corpse-plant**, a smooth, waxy-looking, fleshy herb (*Monotropa uniflora*), of the order *Ericaceæ*, widely distributed in dark, rich woods almost throughout North America. It is said to derive some of its food from the roots of other plants, but much is obtained from decaying vegetable matter. From a matted mass of fibrous rootlets the white scaly, but not leafy, stems rise to a height of perhaps eight inches, and bear solitary, nodding, white, inodorous flowers during summer, followed by erect many-seeded fruits.

Indian Races. The numerous peoples of India belong to several distinct groups or families, speaking numerous dialects founded on two or three distinct stocks which are much blended by the intercourse of the different peoples with each other. Previous to the Mohammedan ascendency the dominant race were the Hindus, whose language is spread in various dialects over a great part of India, but who were not the aboriginal inhabitants nor even the first invaders. From the northwest of India, through Kashmir and down the valley of the Indus, and from Tibet through the passes of the Himalayas, the inhabitants of northern Asia have from a very early period migrated southward to the milder and more fertile plains of India. Two great successions of these invasions are recognized as having taken place before the period of authentic history. The first immigrants, of dubious ethnological connections, but commonly known as the Tamil races, appear to have overspread the entire peninsula. Following them the Sanskrit-speaking peoples, called the Hindus, of Aryan speech, dispossessed the Tamil races, and superseded their language in the whole of India north of the Narbada. The Hindus subsequently descended into the peninsula and penetrated as far as Cape Comorin; but though their influence on the languages of Southern India was considerable in the way of introducing new terms, the grammar and construction of the Tamil languages maintained their place in the districts south of the Narbada. Two great groups of languages were thus spread over India, which were further modified by the Mohammedan invasion. The native tribes were not exterminated by these invasions, but are still to be found under various names, as Bhils, Catties, Coolies, Gonds, etc., inhabiting the fastnesses of the mountain ranges in Bengal, the Vindhya and Satpura Mountains, the Ghâts, etc. The hill tribes and other aborigines in all India are estimated at 70,000,000. The leading religion is Brahmanism, the professed creed of the majority of the Hindus and the religion most distinctive of India. It reckoned 207,000,000 adherents in 1901. Large numbers in the north and northwest are Mohammedans (about 62,500,000). Buddhists number about 9,500,000, Parsees or Fire-worshippers 95,000; Sikhs 2,200,000. Among the Hindus the caste system still prevails. European missionaries have long been active, but only a mere fraction of the people are as yet Christians (2,284,380). Education is now making good progress, schools and colleges of all kinds having been established throughout the country. The pupils, however, only number about 4,000,000 in all. There are universities at Calcutta, Bombay, and Madras, besides other two at Lahore and Allahabad.

Indian Red, an impure oxid of iron, used as a pigment by painters. It was originally imported from India, but is now chiefly prepared by roasting ferrous sulphate. The sulphuric acid is expelled by the heat, and the red oxid of iron remains behind. It is very permanent, and the color varies from purplish to a yellowish red.

Indian River, an important stream in the eastern part of Florida, in Brevard and Volusia counties. It connects with the Halifax River at Titusville and extends 100 miles southeast to the ocean at Indian Inlet. Its width varies from 300 feet to 3 miles and it is navigable for vessels drawing five feet. The Indian River is famous for the excellent oranges grown along its banks.

Indian Schools, in the United States, are schools specially established either by private or denominational means or by the national government, for the education of children and youth of the Indian population of this country. For particulars concerning these schools see INDIAN AFFAIRS; INDIAN, EDUCATION OF THE.

Indian Shot. See CANNA.

Indian Summer, the name given to a period of mild summer weather which generally occurs toward the end of autumn. The term first made its appearance in the last decade of the 18th century. During the next decade the phrase was "second summer." This indicates that the spell of weather known by this name was not generally noticed much before 1800. The term Indian summer became established about 20 years after its first appearance, which was in western Pennsylvania, and spread to New England by 1798, to New York by 1799, to Canada by 1821, and to England by 1830. The term is, then, not an Americanism; to write in praise of Indian summer is now a literary convention of three continents.

It is by no means easy to account for the origin of the term. The principal characteristics of the season which it describes are haziness, smokiness, and high temperature. Some explanations of the origin of the term are (1) that the Indians predicted such spells of weather; (2) that the smokiness was produced by Indian fires; (3) that this was the last season of Indian attacks on the settlements of the whites; (4) that the season partook of the Indian character of deceptiveness; (5) that the name was given because one of the seasons of East India was similar in character. Horace Walpole used the term in 1778, not in reference to America, but in relation to weather in the tropics. "Squaw winter" was a name for the spell of cold weather preceding the Indian summer, and perhaps the key to the nomenclature is to be sought in this latter term.

Indian Territory, an organized body of land in the southwest centre of the United States, occupied by Indian allotments and reservations; not a "Territory" in the official sense, as it has no common local government, head, or capital, and sends no delegates to Congress. It lies between Kansas north and Texas south, Arkansas and a corner of Missouri east, and Oklahoma (till recently its own western half) west. It is about 250 miles north to south, and from 75 to 200 east and west. Area, 31,400 square miles, of which 400 are water.

The topography of the district is not yet fully studied, as Indians do not make surveys, and till less than a decade ago the government had no motive but a scientific one for undertaking them. Hence the interior was nearly as little known as central Africa, and as much misunderstood. Even yet, nearly every reference book describes the entire surface as "flat" or "gently rolling," and mostly prairie. But the government survey authorized in 1894, when the reduction to civilized conditions was undertaken, found it to be one fourth mountainous plateau, and two thirds woodland well distributed, mainly through the east and southwest portions. The prairie section is a continuation of the Kansas plains, and occupies most of the Cherokee district north of the Arkansas, and the Creek triangle between the Arkansas and Canadian, with about a fourth of the western half below the Canadian, the rest being timber land. In the extreme northeast is a rugged plateau cut by streams with a southward trend, west of which is a rolling plain with some hills. South of this the Ozark mountain chain, entering from Arkansas, stretches from northeast to southwest across the Territory, with a gradual declension; from about 2,500 feet high near the Arkansas line, they sink to about 1,000 feet in the centre. Their more pronounced elevations are termed the Boston, Poteau, Kiamichi, Sans Bois (treeless), Shawnee, etc. In the Chickasaw territory at the southwest, a set of low elevations from Tishomingo northwest, rising in the sharp spur called the Arbuckle Mountains, and again farther on in the Wichita Mountains of Oklahoma, connect the Ozarks with the outliers of the Rockies. The highest elevation in the Territory is about 3,000 feet above sea-level, the lowest 350. The timber north of the Canadian is mainly confined to a belt in the west, save for cottonwoods, elms, pecans, and a few other sorts along the streams; south of it the timber occupies much the greater portion, even in the west. The eastern half of the Territory is nearly all well wooded, the mountainous parts most heavily so; the woods besides the above are oak, largely in a belt from the Arkansas to the Red called the Cross Timbers (used only for fuel and railroad ties, not for construction), with valuable yellow pine and red cedar on the elevated grounds, and walnut in the bottoms.

The drainage belongs entirely to the Arkansas and Red River systems. The former, flowing across and cutting off a northern cantle, is joined east of the centre at Webber's Falls by the long Canadian, its main affluent, which forms nearly the median line of the Territory and its northern boundary with Oklahoma; and is further fed from the north by the Neosho and the Verdigris joining close together, and by the Illinois near the Canadian. The latter has hardly any water-shed on the south. Nearly the whole southern half of the Territory is drained by the affluents of the Red, forming the entire boundary with Texas; the chief are the Washita in the southwest and the Kiamichi in the southeast.

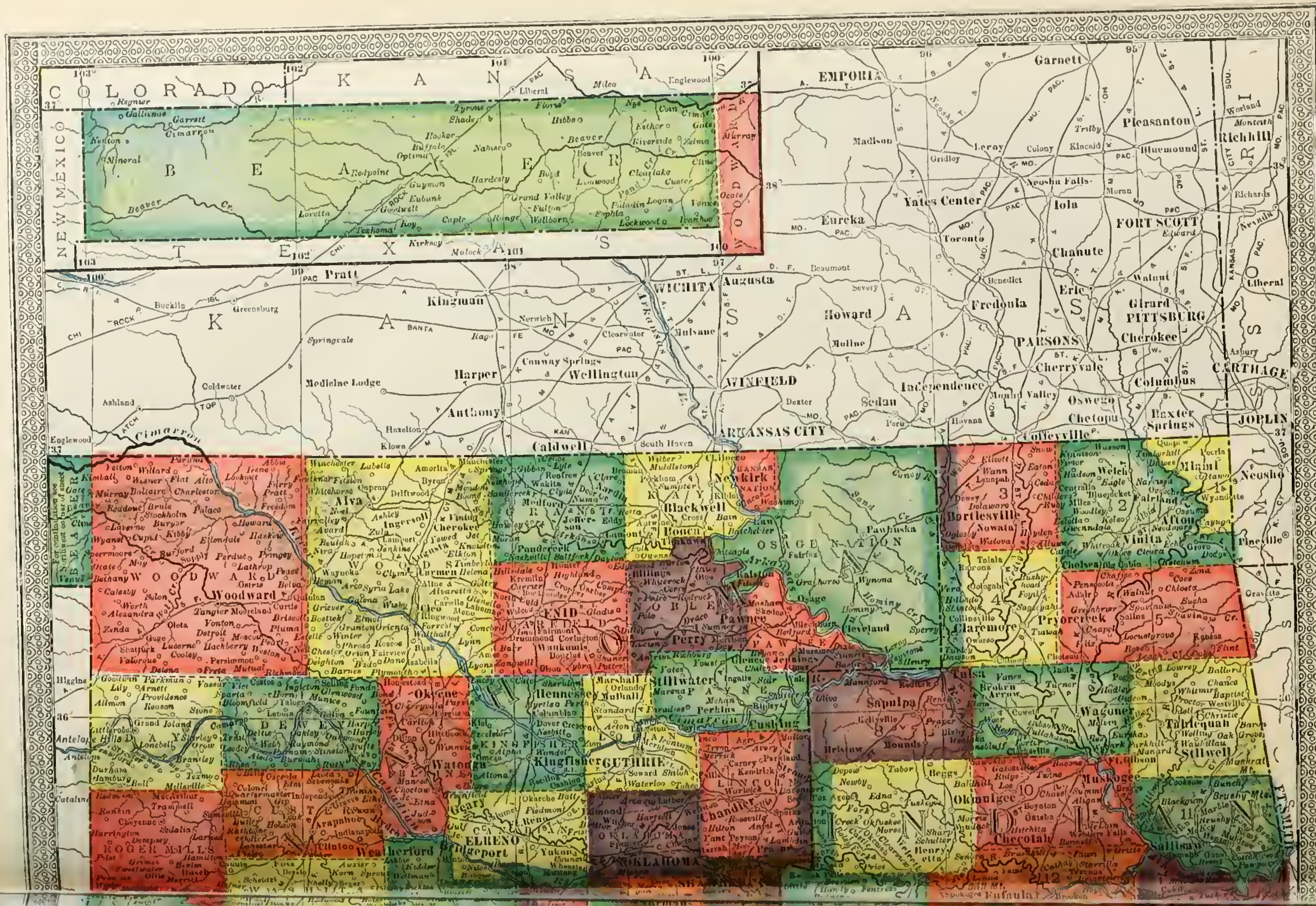
Geology and Minerals.— Geologically, the Territory may be divided into four sections: (1) The Arbuckle-Wichita region, with an outlying granite field at Tishomingo. This contains coal measures on the north and asphalt on the south; the former is the chief mineral product of the Territory. For the year ending 30 June 1903, there were employed in coal mining 6,091 men and boys; there were in operation for the same year 280 coke ovens, producing 52,625 tons of coke; the coal tonnage for the same year was 3,243,692 tons. Large bituminous asphalt deposits occur in the Choctaw and Chickasaw Nations; these have been worked some, but owing to the want of railroad facilities, and the asphalt trust, the operators have not been encouraged with very great success. There are also sandstone and limestone as well as granite. (2) The Ozark system, Carboniferous and Silurian, containing zinc and lead. (3) The northern prairie, Carboniferous, with coal and large quantities of petroleum. (4) The southern plains cropping over from Texas, underlaid by the Cretaceous, with artesian strata, and sand and marl above. There are valuable gold and silver deposits from which Indians have long made all their trinkets, but they have kept the places secret, to prevent an influx of miners.

Fauna.— The characteristic species are the timber and prairie wolves, panthers and foxes, black bear, deer, prairie dogs, and some smaller game. The wild turkey is the most important bird.

Climate and Rainfall.—The Territory belongs to the southern division by temperature and to the middle one by precipitation. It has a mean winter temperature of 35° to 48°, and a summer one of 77° to 82°; while the rainfall, light in the north like western Kansas, is heavy in the southeast (52 inches), and steadily decreases to the west (about 35 inches at Fort Gibson and 30 in the southwest). But hardly anywhere is it too scant for favorable agricultural conditions.

Agriculture.— Scarcely any region of the United States has greater natural advantages in fertile soil and plentiful water supply. With the opening of the Territory to white settlement and ownership, a vast increase in production will be effected. Until within the present year (1904) the word "ownership," as applied to tenures in the Indian Territory, had a peculiar meaning. To protect Indian interests, white men (except licensed traders and those made citizens by marriage to Indian wives in accordance with the laws of the tribe, or adopted into the tribe by tribal legislature) could not hold land, except as tenants of Indian landlords. The fee to the land in all cases was in the Indian tribes, and even the Indian citizen had only in a sense an occupancy right, owning the improvements absolutely, and cultivating the land practically as a fee simple owner, but always subject to future allotment among all the members of the tribe.

Within the past few years, agreements have been made between the United States and each of the five civilized tribes by which the lands of such tribes are being allotted in severalty to



COLORADO
NEW MEXICO
KANSAS
TEXAS
BEAVER
WOODWARD
EMPORIA
Garnett
Pleasanton
Richhill
Madison
Leroy
Yates Center
Iola
Eureka
FORT SCOTT
Chanute
Pratt
Kingman
WICHITA
Augusta
Fredonia
Erie
Girard
PITTSBURG
Howard
PARSONS
Cherokee
CARTHAGE
Medicine Lodge
Harper
Wellington
WINFIELD
Independence
Cherryvale
Columbus
Anthony
Sedan
Oswego
Chetopa
Baxter Springs
JOPLIN
ARKANSAS CITY
Coffeyville
Caldwell
Cimarron
Alva
Newkirk
Blackwell
Ponca
OSAGE NATION
Pawhuska
Bartlesville
Vinita
Miami
Neosho
Woodward
ENID
Perry
Pawnee
Claremore
Pryorcreek
Okeene
Hennessey
Stillwater
Sapulpa
Wagoner
Tahlequah
Stillwell
Watonga
Kingfisher
GUTHRIE
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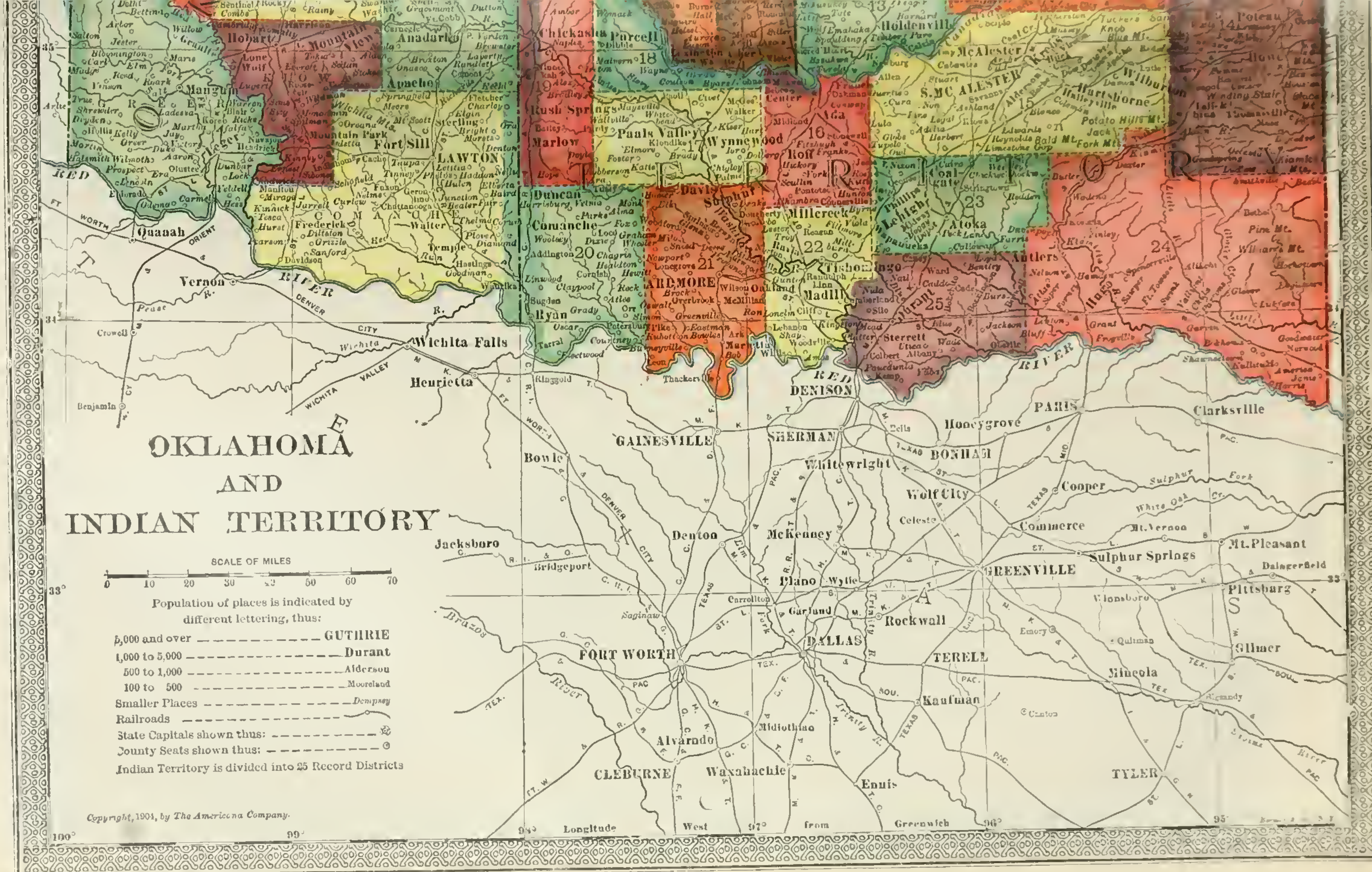


the citizens thereof, with the power of alienation in most of the nations, under certain restrictions, of all, except a certain amount reserved as a homestead, which, in some cases, is inalienable during the life of the allottee, and in others for 21 years, if the allottee lives so long.

In the Creek Nation, 120 acres of an allotment can at present be alienated with the consent of the secretary of the interior, which is being rapidly accomplished, under the rules and regulations prescribed by him, and the allotments are being bought by whites, who are either occupying them themselves or leasing them to other whites. The real Indian, as a rule, is not much of a farmer, and, as the amount granted to an Indian family is generally greater than the head can utilize or cares to utilize, the remainder is leased to some white farmer or cattleman. The whites farm a large proportion of the farms at present. In the year 1890, of the 35,451 farms cultivated by whites only 3,475 were owned by them.

These allotments to the Indians vary in the different tribes. A Choctaw and Chickasaw allotment is 320 acres of average allotable land, and of this the homestead consists of 160 acres of average allotable land, the latter inalienable during the lifetime of the allottee, not exceeding 21 years from the date of the certificate of allotment; the remainder of the land is alienable after issuance of patent, as follows: one fourth in acreage in one year, one fourth in acreage in three years, and the balance in five years; in each case from date of patent.

The Creek allotment is 160 acres, 120 of which is inalienable before the expiration of five years from the 8th day of August 1903, except with the approval of the secretary of the interior; the balance of 40 acres constitutes a homestead, which is inalienable for 21 years, unless the allottee sooner die, in which event the homestead remains for the use and benefit of children born too late to receive an allotment; but, if there be no such issue, then the allottee may dispose of his homestead by will free from restrictions, and, if this be not done, it descends to his heirs free from any limitations.

In all the above cases, as well as in the Seminole Nation, where the land was divided equally between all the members of the tribe, the allottee had the right to select his allotment so as to include any improvements owned by him at the time. At present the allottees can rent their allotments for one year for grazing purposes, and five years for agricultural purposes, and longer in some cases with the consent of the secretary of the interior. Mineral leases may also be made up to 15 years with the consent of the secretary of the interior.

The productions might easily be of the greatest variety in this warm moist region, but the conditions of tenure hitherto did not encourage tenants to diversify crops or improve the condition of farms to revert to Indian owners. The great crop at present is corn, of which in 1900, 30,709,470 bushels were raised; 1,486,820 of wheat, and 1,102,200 of oats were reported. The territory is well within the cotton belt, and 154,850 bales were shipped in 1900. The other products of note were about $1,000,000 of vegetables and fruits. Stock-raising is largely carried on; the value of domestic animals in 1900 exceeded $40,000,000, and included 110,687 dairy cows, 275,000 horses, mules and asses, 17,000 sheep, 10,500 goats and 650,000 swine. It has been known to many that there was a large quantity of oil and gas in this country, but owing to the lack of laws permitting leases and development in the Indian lands, nothing was done until within the last 18 months. The change in the laws, however, has permitted a great deal of development work in some of the towns as well as on outside allotments, and the production is proving very satisfactory to the lessees, as well as the lessors. The field thus far developed is in the northern portion of the Cherokee Nation and the border of the Creek Nation.

Manufacturing.— The manufactures till recently have been mostly confined to the Indian hand-made blankets, shawls, baskets, and trinkets. But within the decade a considerable genuine manufacture by whites has arisen. With only 20 establishments in 1890, there were 789 in 1900; the capital had grown from $204,329 to $2,624,265, the wage-earners from 167 to 1,714, the value of products from $248,932 to $3,892,181. The one great industry, nearly a third of the total products, was flour and grist milling; next greatest, toward half a million each, were cotton-seed oil and cake; and lumber, saddlery and harness, and car-shop work were also noted.

Railroads.— There are about 1,800 miles of railroad in the Territory: Several great lines cross it, giving the facilities for the vast business growth. The main lines are the Frisco System (St. L. and San F.), the St. Louis, Iron Mountain & Southern, the Missouri, Kansas & Texas, the Choctaw, Oklahoma & Gulf, the Atchison, Topeka & Santa Fe, and the Ft. Smith & Western.

Banks.— In 1902 there were 69 national banks, with capital of $2,779,000, deposits of $5,896,000, cash and other resources $548,000, and loans and discounts of $7,277,000. There were also 20 private banks, having capital of $203,975, deposits of $495,810, cash of $56,354 and loans and discounts of $602,676.

Population.— The total population in 1890 was 180,182; in 1900, 392,060, the increase being all white. The real Indian population had probably somewhat decreased, though it showed on the face a slight increase, from 51,279 to 52,500. But the word "Indian" is misleading: for legal purposes and tribal recognition, any one is an Indian who has even 1-64 or in fact any degree of Indian blood in him; and probably two thirds of the so-called Indians are mixtures of various complexities and elements. The negroes, numbering 36,853, are for the most part the former slaves of the Indians, to whom the United States after the war forced the tribes to grant citizenship and a share of the tribal lands and bounties, or their descendants. These two and the vast white population — married and adopted, leaseholders and tenant farmers, hired farm laborers, business men with permits, coal and railroad company employees, etc.— were distributed among the chief districts as follows (besides 27 Chinese):

Chickasaw Nation, 124,306 whites, 9,066 negroes, 5,872 "Indians." Cherokee Nation, 66,951 whites, 9,162 negroes, 25,639 Indians. Choctaw Nation, 79,332 whites, 10,123 negroes, 10,321 Indians. Seminole Nation, 1,143 whites, 981 negroes, 1,662 Indians. The other reservations — Modoc, Ottawa, Peoria, Quapaw, Seneca, Shawnee, Wyandotte — had 5,762 whites and

1,043 Indians. The concentration of whites in the Chickasaw district had made it the industrial leader of the territory.

The towns which grew there formerly had a peculiar status. They were "white" towns with white men occupying the buildings they had erected, and doing business insecurely, without legal title, but the ostensible owners of the ground were the Indians. The so-called Curtis Bill and the various agreements made with the tribes above referred to have changed this condition, and made it possible for the white man, or any other occupants of towns in the Indian Territory to purchase lots under the various provisions of these bills upon which they owned houses or other valuable improvements. The result is that all the larger towns have been platted, surveyed and sold to the occupants, so that the Indian titles have become almost entirely extinguished. Within a year or eighteen months every town within the limits of the Indian Territory will have been so platted and sold. The changes are so great and constant that statistics are nearly as useless as in a new mining district, but it may be said that the present chief towns are Ardmore, and Chickasha, in the Chickasaw Nation, South McAlister in Choctaw Nation, and Muskogee in the Creek Nation, is the handsomest town in the Territory, with good public schools, churches and four colleges of the four leading denominations — Baptist, Methodist, Presbyterian, and Roman Catholic. These towns now have a population approaching 10,000 each and there are over 20 others with over 1,000. The oldest white settlement is Vinita in Cherokee; the oldest in the southeast is Caddo; the best known has always been Tahlequah, for some generations the capital of the Cherokee Nation.

Internal Conditions and History.— The Territory was part of the Louisiana Purchase. Early in the 19th century many of the Southern Indians, their old hunting grounds invaded by the whites, removed to this virgin forest. In 1832 it was fixed on by the national government as a place for the tribes whom agreements with the Southern States had bound us to deport, and in 1834 special reservations were set apart. The Five Civilized Tribes, as they are called, established governments on the civilized model, with elected legislature, council and governor, courts and schools and responsible financial management, and even newspapers in the Cherokee tongue, with Sequoyah's famous alphabet. But the vast enclave of nearly 70,000 square miles in the heart of a swelling settlement could not be maintained, and the Indians from some constitutional blight do not grow to fill their districts. In 1866 some 5,500,000 acres were purchased of the Indians in the present Oklahoma; on 22 April 1889 over 3,000,000 acres were thrown open to settlement; on 2 May 1890 this and other territory was formed into Oklahoma. Meantime the old system in the eastern part was going to wreck, not so much from the white immigration, following the railroads which began to cross it, as from internal development which was making the primal object of the system a mockery. It was designed to protect the half-helpless Indian from white greed till he could stand on his own feet; in fact, the half-breeds and the intermarried whites were rapidly appropriating everything to themselves, while the full-blood was "crowded out upon the mountain and unproductive land, to take care of himself as best he could." (Dawes Commission.) The tribal governments were under control of these governments and were "recklessly leasing the community lands to cattlemen and coal companies" (Hinton), to railroads, oil and lumber companies, etc. The government, therefore, under the lead of ex-Senator Henry L. Dawes of Massachusetts, set about negotiations to break up the tribal governments, and turn the Territory into a set of ordinary civilized communities with ownership in severalty, protecting the Indian for a time by restraining his liberty of alienation. The Dawes Commission of 1893 began this work; in 1897 the United States extended its judicial power over the district; in 1898 the Curtis Act carried out the work, providing for the enrollment of citizens for allotment of lands, for laying out town sites and incorporating towns with power to elect officers and tax themselves for schools, etc., and giving the President a veto power over the tribal legislatures. The arrangements vary with the different tribes; the Seminoles continue their government after a fashion for the present, the Choctaws and Chickasaws with some modifications till 4 March 1906. The present government consists in reality of four federal judges or one court of appeals and four district courts, with 20 commissioners acting as petty courts and justices of the peace, and a resident Indian Inspector. The statutory code is in the main that of Arkansas.

The educational situation has been a part of the anomalous position of all social matters. The tribes maintained schools and admitted white children on payment of a fee; and the missionaries have operated others. But all were very insufficient, and the tribal schools, once the best of the vicinity, have not kept their quality. The Curtis Act of 1898 for the first time provided a public-school system, in cities and towns, and power of towns to levy taxes for them. In 1900 it was estimated that 50,000 white children were deprived of school advantages. Of academic schools, some claiming collegiate rank, there are good ones in each nation; these have sent many pupils to Eastern colleges. By act of 19 May 1902 municipalities of 2,000 or more inhabitants may issue bonds up to 10 per cent of their assessed valuation for school buildings, sewers, and waterworks on a two-thirds vote and with a 20-year sinking fund. Pop. (1900) 392,062; (1903) fully 500,000. Consult: 'Report of the Dawes Commission' (1903); Curtis Act in U. S. Statutes.

WILLIAM T. HUTCHINGS,
Muskogee, Indian Territory.

Indian or Wild Tobacco, one of the North American lobelias (*Lobelia inflata*), also called asthma-weed and gag-plant,— a tall plant with small light blue flowers quite overshadowed by numerous thin, oval, or obovate dentate leaves; the plant branches as a panicle, is fubescent and the pod is inflated. Its leaves have an acrid taste, and are, as Gray says, "poisonous and a quack medicine"; they were dried by the Indians as a substitute for smoking tobacco, or to mix with it, for the sake of their narcotic properties. The dried flowers still have a place in materia medica. It grows in dry fields and thickets through North America. Compare KINNIKINICK.

Indian Turnip. See JACK-IN-THE-PULPIT.

Indian Yellow, known in commerce as PURREE, a pigment of unknown origin which is exported from India, China and probably from Arabia. It comes in the shape of balls, which are outside of a brown tint, and inside of a brilliant yellow. It has the odor of urine, musk or castoreum, is soluble in water or alcohol, and an essential element in its composition is carbonate of euranthin. It is used in India for house decoration, and is valued by artists all over the world as a dazzling pigment.

Indiana ("The Hoosier State"), a north-central State of the United States (No. 19 in order of admission) bounded north by Michigan, south by Kentucky, east by Ohio, west by Illinois; extreme length 276 miles, extreme breadth 177 miles; area (No. 34 in U. S.) 36,350 square miles, 440 water; pop. 1900 (No. 8 in U. S.) 2,516,462, or 70.1 to the square mile. (No. 11 in density.) The State boundary in Lake Michigan is an east and west line 10 miles north of the extreme southern point of the Lake. The Ohio River runs along the southern boundary, but, by a provision of the Virginia cession of Northwest Territory, Indiana extends only to low-water mark on the north bank of the Ohio. In consequence all islands in the Ohio belong to Kentucky, the Supreme Court having recently held this as to Green River Island (Indiana *v.* Kentucky, 136 U. S.) which, although an island at the time of the cession, became connected with the Indiana shore by alluvial deposits, and had been governed and taxed as part of Indiana for many years.

Topography.— The surface of the State is comparatively level, the highest point, in Randolph County, in the centre of the eastern tier of counties, being estimated at 1,285 feet above sea-level, and the lowest, at the southwest corner of the State, being 313 feet above sea-level. The Ohio at the southeast corner of the State is 436 feet above sea-level, and Lake Michigan at the northwest corner is 585 feet above sea-level. From the table-land of the east central part of the State, and western Ohio, radiate low water-sheds separating the drainage basins of Indiana. The northern part of the State is quite flat, the central part slightly rolling, and the southern part rather hilly on account of the valleys cut out by water. There are no mountains, and no large lakes, but there are hundreds of small lakes, chiefly in the northern part of the State.

River Systems.— The southern parts of the State are drained to the Ohio River by the Whitewater and smaller tributaries. The central part of the State — about four fifths of its area — is drained by the Wabash and its tributaries, the most important of which are the White, Tippecanoe, Eel, Salamonie and Mississinewa rivers, and Wild Cat Creek. The northeastern corner of the State is drained by the St. Joseph's and St. Mary's rivers; these unite at Ft. Wayne to form the Maumee, which flows into Lake Erie. The extreme northern part of the State is drained by another St. Joseph's, the Calumet, and smaller streams, into Lake Michigan. A part of the northwestern section is drained by the Kankakee and its tributaries to the Illinois River. The Wabash is navigated to a limited extent, by small boats, as high as Terre Haute, and also the lower part of White River. The remaining streams are not navigable.

Climate.— The climate of Indiana is mild, ranging from an average of 31° F. in the winter months to an average of 76° in summer. The mean temperature is 53°. The average annual rainfall is 43 inches, that in the southern part of the State being slightly in excess of that in the northern part. Serious droughts and destructive storms are rare. In earlier years parts of the State were malarial, but with the clearing of the forests and the drainage of lands this condition has almost wholly disappeared.

Geology.— The earliest geological formation that outcrops in Indiana is the Hudson and Trenton limestone, of the Silurian Age, which appears in the southeastern corner of the State, throughout the Whitewater Valley and the adjacent region. West of this is a belt of Niagara limestone, which broadens at the north and extends entirely across the State, covering all of a dozen counties and large parts of as many more. On the west of this, and also extending to the State line on the north, are belts of Hamilton limestone and sandstone of the Devonian Age. The remainder of the State — the southwestern corner and a broad belt to the north reaching beyond the Wabash — is of the subcarboniferous and carboniferous formations. The northern and central parts of the State are covered by glacial drift, which in some regions is of a depth of 400 feet.

Soils, Agriculture and Forests.— The soil of the State varies in character, but for the most part is fertile. Originally the southern part of the State, and as far north as the Wabash, was covered with a very heavy growth of forest, mostly of hardwood trees. North of this were low prairies interspersed with sand ridges and dotted with hundreds of small lakes. This region is now found very productive of cucumbers, melons and small fruits in the sandy parts. The richest lands are the alluvial valleys of the streams and the drained prairies. The forests have so far disappeared that the State is now encouraging tree planting. Agriculture is the chief industry of the State, the value of farm products in 1899 being reported at $204,450,196. The chief agricultural products were corn, 178,967,070 bushels, wheat 34,986,280 bushels, oats 34,565,070 bushels, potatoes 6,209,080 bushels, hay 3,470,378 tons. The value of animal products was $81,947,922, of forest products $5,235,459, of orchard products $3,166,338, of dairy products $15,739,594. The value of the poultry raised in 1899 was $8,172,993, and of the eggs produced $7,441,944.

Minerals and Mining Industries.— About one fifth of the surface of Indiana is underlaid by coal, workable veins having been found in 19 counties. There are at least 7 distinct veins of workable thickness, varying from 3 to 11 feet. The coals of the State are of two classes — caking or bituminous, and non-caking or block coal. The latter can be burned in blast furnaces without coking. The production in 1901 was 7,019,203 tons, valued at $7,370,163, the State ranking sixth in the Union as to quantity and seventh as to value of the product. The number of people employed in coal mining was 12,968. The mineral product second in value was petroleum, the production of which is a

comparatively new industry. In 1901 the oil product of the State was 5,749,975 barrels, valued at $4,795,312. This was largely increased — over one third — in 1902. Next in value of the mineral products of the State is building-stone, of which the chief varieties are the oolitic limestone, the blue Devonian limestone, the gray Niagara limestone, and sandstone. The oolitic, so called because composed of minute fossil shells resembling a mass of fish eggs, has become celebrated throughout the United States on account of its superior qualities. In 1901 Indiana was first in rank in the Union in the production of limestone for building purposes, and fifth in rank as to building-stone of all kinds, the product being valued at $3,028,145. There is also a large production of cement and lime. Good clay is abundant throughout the State, and brick and tile making are extensive industries. Kaolin and glass sand are also found in quantity in several counties, and are profitably mined. Natural gas has been found, by sinking wells, throughout a large part of the State. The supply at one time reached a daily flow of 900,000,000 cubic feet. It served to draw many manufactories to the State, but the pressure is now decreasing. In many places its cessation has been followed by a flow of petroleum. Many other minerals have been found in Indiana, but not in quantities of commercial importance.

Manufactories.— The manufactures of Indiana are chiefly a development of the past 30 years. In the earlier period manufacturing was confined almost wholly to supplies for domestic consumption, and was chiefly conducted at the homes of the people. In 1900 there were reported 18,015 manufacturing establishments in the State, employing 155,956 wage-earners, and producing goods to the value of $378,120,140. The leading classes of manufactures, with the value of products in 1900 and in 1890, are as follows:

	1900	1890
Slaughtering and meat packing	$43,862,273	$27,913,840
Flour and grist mills	30,150,766	31,239,627
Distilleries	22,738,106	9,677,973
Lumber and wood manufactories	34,471,902	32,725,647
Iron and steel (including foundries)	36,566,527	14,285,259
Glass and glassware	14,757,883	2,995,409
Carriages and wagons, and materials	15,891,826	10,531,683
Railroad cars	19,248,999	14,362,711
Agricultural implements	6,415,081	5,756,131
Textiles and clothing	8,618,360	7,736,890
Clay products	4,222,529	3,142,454

It is probable that this rate of increase will not be continued in the next decade, partly because of the decrease of natural gas, partly because of abandonment of plants under trust control, and partly for other reasons. The production of lumber in the State was almost stationary in the past decade, and will probably decrease in this on account of decreasing forest supplies.

Commerce and Navigation.—About one tenth of the people of Indiana (in occupations) are engaged in commerce and transportation. The navigation of the State is limited, being confined to the Ohio River on the south, with the lower Wabash and a small part of the White River, and Lake Michigan on the northwest. The canals of the State are practically abandoned except for water-power. The railroads furnish the chief means of transportation. Commerce is chiefly domestic, but both exportation and importation are steadily increasing.

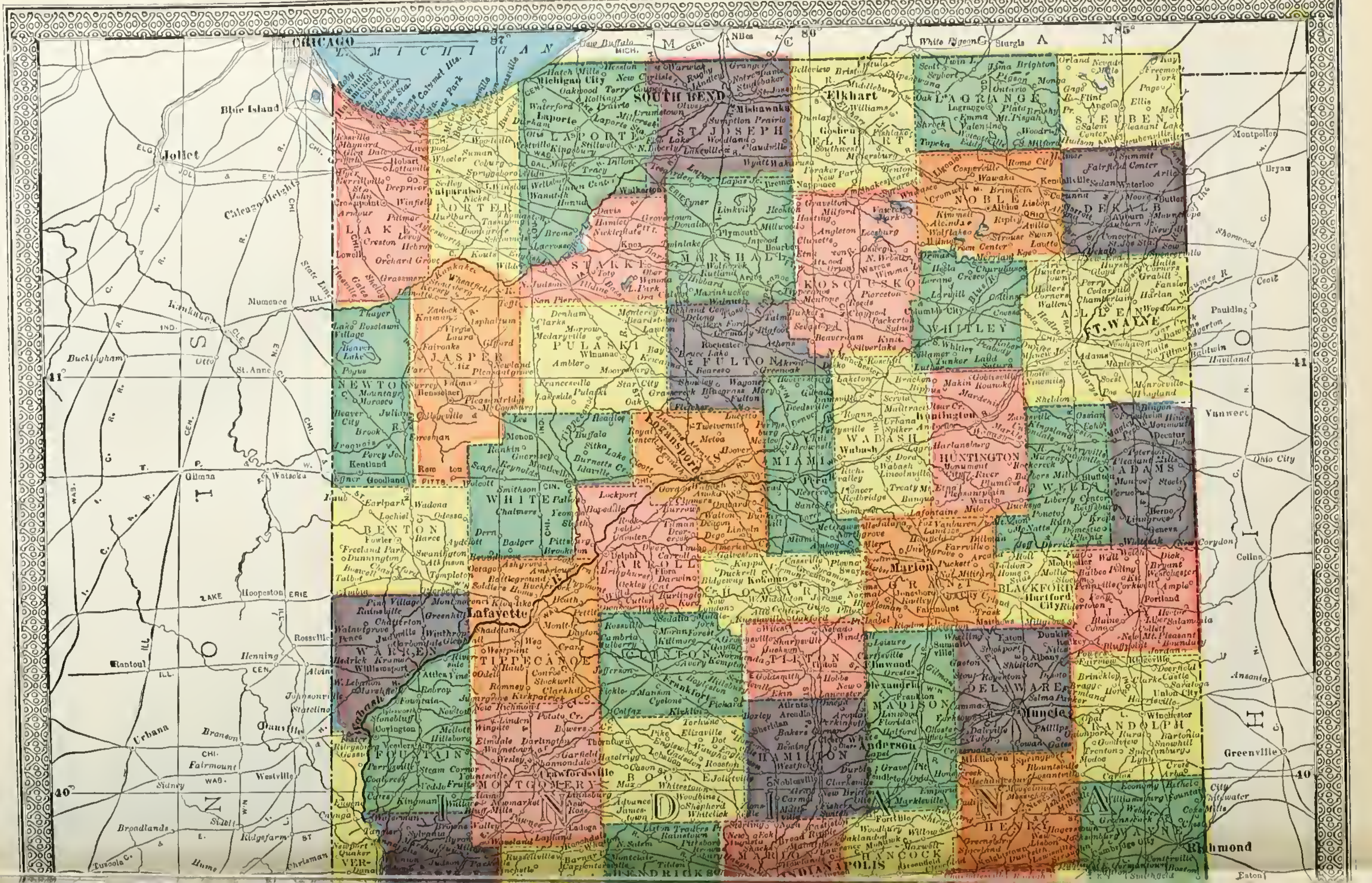
Fisheries.— Indiana has no fisheries of commercial importance, though it has waters that might be made valuable. Recently laws have been passed for the protection of fish, and some interest is being shown in their propagation.

Railroads and Street Railways.— The railroad mileage of Indiana, in 1902, was 6,651 miles, exclusive of second main and side tracks. In 1850 it was 228 miles; in 1880, 4,320. Railroad lines extend through all but 3 counties in the State. The chief railroad centre is Indianapolis, from which 14 lines radiate. These are connected outside of the city by a belt railway. The valuation of railroad property for taxation in 1902 was $162,797,978. There are street railways in all of the cities and larger towns, the total aggregating 168 miles. In 1899 there began an extraordinary development of electric interurban lines. By the close of 1902 about 400 miles of these were in operation, and 500 miles were under construction, while new lines aggregating over 1,000 miles were projected. These lines have made a material change in the transportation of both passengers and freight, and will apparently furnish large competition with the steam railroads. One of these lines, operating between Indianapolis and Columbus, Ohio, has added sleeping-cars to its equipment.

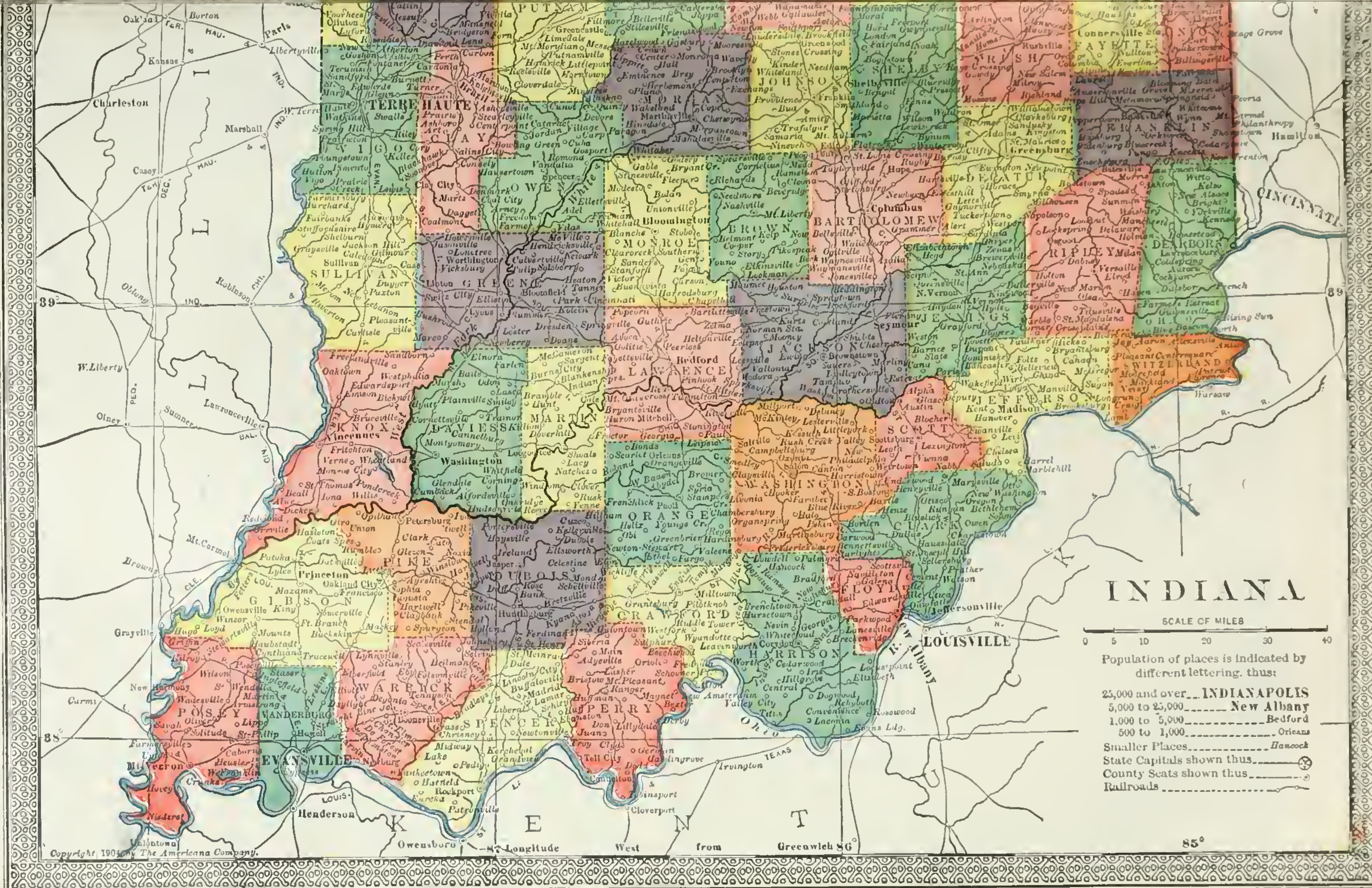
State Finances.— The assessed valuation of the State in 1901 was $1,397,981,497, from which deductions for mortgage exemption were made amounting to $35,169,250. Individuals are permitted to deduct *bona fide* mortgage indebtedness from their schedules to the amount of $700. The total number of polls was 436,522. The State tax levy for general State government was 9 cents on $100, and 50 cents poll; for the benevolent institutions 5 cents; for sinking fund 3 cents; for State tuition — which is distributed to the school districts for support of the common schools — 11 cents and 50 cents poll; for State institutions of higher education 1⅔ cents; making a total State levy of 29⅔ cents and $1 poll. The reduction of the State debt was begun in 1889, when it amounted to over $10,000,000. On 31 Oct. 1902, it had been reduced to $2,887,615.12, on which the annual interest charge was $101,565.

Banks.— In 1902 there were 137 national banks with $16,618,552 capital, $4,789,956 surplus, $71,533,942 deposits, and $7,210,780 outstanding circulation; 113 State banks with $4,884,490 capital, $915,413 surplus, and $24,240,334 deposits; 5 savings banks, with $7,812,157 of deposits; 37 trust companies transacting bank business, with $4,392,500 capital, $465,947 surplus, and $12,378,348 of deposits, and 203 private banks, which are not required to make returns by the State. Of these last named, however, 68 made returns to the comptroller of the currency, showing $9,671,733 deposits. The only clearing-house organization in the State is at Indianapolis, and the volume of clearings in 1902 was $270,409,456.

Education.— Indiana has always given much attention to education and especially since the



CHICAGO
SOUTH BEND
Elkhart
FT. WAYNE
Logansport
Lafayette
Marion
Muncie
Anderson
Crawfordsville
INDIANAPOLIS
Richmond
Joliet
Kankakee
Urbana
Greenville


INDIANA
SCALE OF MILES
0 5 10 20 30 40
Population of places is indicated by different lettering, thus:
25,000 and over INDIANAPOLIS
5,000 to 25,000 New Albany
1,000 to 5,000 Bedford
500 to 1,000 Orleans
Smaller Places Hancock
State Capitals shown thus
County Seats shown thus
Railroads
87° Longitude West from Greenwich 86°
85°
89
88
TERRE HAUTE
EVANSVILLE
LOUISVILLE
New Albany
CINCINNATI
Bloomington
Bedford
Columbus
Vincennes
Washington
Princeton
Jeffersonville
Henderson
Owensboro
Charleston
Ohio
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adoption of the present school law in 1852. At that time there was created a public school fund, the interest on which was to be distributed to the various school districts. The principal factor in this was the profits which the State had derived from the State Bank of Indiana, amounting to about $3,500,000, to which was added $573,000 of the surplus revenue distributed by Congress in 1836, and several smaller funds. To this additions have been made by fines and other public receipts, until in 1902 the common school fund amounted to $7,978,580.68, to which is to be added the Congressional township fund, derived from the sale of school lands donated by the national government, amounting to $2,465,304.64. This total fund of $10,443,885.32 is held by the several counties, and the interest on it is applied to the support of the public schools. Added to this is a State tax of 11 cents on each $100, and 50 cents on each poll, the proceeds of State liquor licenses and dog licenses, and local taxes assessed by local authorities. From all these sources the actual revenues raised for the public schools in 1902 amounted to $8,585,354.98. The enumeration of children of school age — 6 to 21 years — was 761,801 (of whom 15,002 were colored). A large number of these attended private schools, and the attendance in the public schools for the year was 423,078. The revenue was therefore in excess of $20 to each child in attendance. There were employed 16,039 teachers, and the average number of days of school was, in townships 126, in towns 153, in cities 179, in the State at large 146. The number of public schoolhouses is 5,080 brick, 4,807 frame, 97 stone, and 3 log. The value of schoolhouses and grounds is $22,904,607 and of school apparatus $1,277,455. In these figures are included 704 high schools, which are a part of the public school system. There are also a large number of private schools, notably those maintained by the Roman Catholics and Lutherans for children of all ages, and a number of academies, seminaries, institutes, boarding-schools, military institutions, colleges, normal schools, etc., for intermediate education.

There are three institutions of higher education that receive aid from the State, Indiana University at Bloomington, the State Normal School at Terre Haute, and Purdue University at Lafayette. Indiana University has an income of about $125,000 derived from a State tax levy and the interest on an endowment fund of $600,000 raised by State taxation. It had 1,285 students in 1902. The State Normal is also supported by a State levy, and the city of Terre Haute pays one half the expense of keeping the buildings in repair. It has 1,406 students. Purdue has an income of $150,000 derived from State tax levy and interest on endowments, and including $57,000 paid to it annually by the United States government as an agricultural school. It has 1,180 students.

Among the private institutions for higher education the more important are Wabash College (Presbyterian), University of Notre Dame and St. Meinrad's College (Roman Catholic), DePauw University (Methodist), Earlham College (Society of Friends), Franklin College (Baptist), Hanover College (Presbyterian), Northern Indiana Normal (non-sectarian), Winona Technical Institute (non-sectarian), and the University of Indianapolis. The last named was formed by the union of Butler College (Christian) with the Medical College of Indiana, the Indiana Dental College, and the Indiana Law School, all of which are located at Indianapolis.

An important branch of educational work in Indiana is the development of libraries. A feature of the school system adopted in 1852 was the establishment of a free public library in each township in the State. The State expended $273,000 for books, and the system was received with great public favor, but no provision was made for maintaining or increasing the libraries, and in the pressure of the war times they were allowed very generally to fall into ruin. To some extent these have been replaced as school adjuncts by the libraries of the Young People's Reading Circle, which are found at many of the schoolhouses of the State. These libraries in 1902 contained 436,151 volumes. There has also been a notable development of town and city libraries, 28 towns having accepted donations from Andrew Carnegie, aggregating $660,000, agreeing to maintain libraries in the buildings thus provided. There are 25 others that are maintaining libraries in buildings provided by themselves. The general supervision of library work is lodged in the Public Library Commission, which has charge of a system of traveling libraries furnished by the State. It also maintains a school for the training of librarians engaged in the work in Indiana.

Churches.— The principal religious denominations of Indiana in the order of their strength are the Methodists, Roman Catholics, Disciples or Christians, Baptists, Presbyterians, United Brethren, and Lutherans.

Charitable and Penal Institutions.— The State maintains 9 charitable and 4 penal institutions, at an annual cost of over $1,500,000. Of the former, 4 are hospitals for the insane located respectively at Indianapolis, Logansport, Richmond and Evansville. On 31 Oct. 1902, these had 4,039 inmates. The annual cost of maintenance was $649,834.54, or $173.79 per capita. The other charitable institutions are the Institution for the Blind, Indianapolis, inmates 127, per capita cost $276.40; Institution for the Deaf, Indianapolis, inmates 318, per capita cost $231.66; Soldiers and Sailors' Orphans' Home, Knightstown, inmates 603, per capita cost $174.52; Soldiers' Home, Lafayette, inmates 739, per capita cost $167.30; School for Feeble-Minded, Fort Wayne, inmates 318, per capita cost $127.05. The correctional institutions are the State Prison, Michigan City, inmates 796, per capita cost $133.32, earnings $53,395.86; Indiana Reformatory, Jeffersonville, inmates 923, per capita cost $130.68, earnings $62,350.67; Reform School for Boys, Plainfield, inmates 531, per capita cost $122.13, earnings $298.91; Industrial School for Girls and Women's Prison, Indianapolis, inmates 52 women and 175 girls, per capita cost $191.55, earnings $1,436.69. At the legislative session of 1903 a law was passed for the division of the last named institution and the establishment of a new Industrial School for Girls. The State has the convict-contract-labor system, but efforts have been made to abolish it, and the legislature of 1903 provided for a commission to investigate and report on the subject. The convict labor is all done within the prisons. The State has the indeterminate sentence system with commutation of time for

good behavior. In addition to the State institutions each county maintains a poor asylum. In these, and the Marion County asylum for the incurable insane, there were on 31 Aug. 1902, 3,046 inmates, of whom 1,975 were men and 1,071 women. Of these inmates 518 were classed as insane, and 889 as feeble-minded. There are in the State 46 orphans' homes, in which there were on 31 Oct. 1902, 1,565 inmates, of whom 1,025 were boys and 540 girls. At the same date the Board of State Charities reported 811 orphan children maintained in private homes, without public expense.

State Government.— The elective State offices are held for periods of 2 years, with eligibility restricted to 4 years in any period of 6 years, except as to the governor, lieutenant-governor, and geologist, whose terms are 4 years. No one is eligible to the office of governor or lieutenant-governor for more than 4 years in any period of 8 years. The governor's salary is $5,000, with an allowance of $1,800 for house rent. The governor's veto power extends to all laws passed by the legislature, but the veto may be overthrown by a majority vote in both Houses. The legislature meets once in 2 years, and may be called in special session by the governor; regular sessions are limited to 60 days and special sessions to 40 days. The Senate is composed of 50 members elected for 4 years each, and the House of 100 members elected for 2 years each. The members receive $6 a day while in session, and $5 for each 25 miles traveled in reaching the capital and returning home. The State is required to be redistricted for legislative purposes every 6 years. The present Constitution was adopted in 1851, and is very generally considered unsatisfactory, especially as to legislative representation and the location of the appointing power. It can be amended only by the majority vote of both Houses of two consecutive legislatures, followed by a majority vote of the electors of the State.

Congressional Representation.— The State has 13 representatives in Congress.

Population and Divisions.— The population of Indiana territory in 1800 was 5,641, but only about 2,500 of this was within the boundaries of the State. In 1810 the population of the territory, with practically the same boundaries as the State, was 24,520. A territorial census taken in 1815 showed 63,897 inhabitants. After the admission of the State the census returns were as follows: 1820, 147,178; 1830, 343,031; 1840, 685,866; 1850, 988,416; 1860, 1,350,428; 1870, 1,680,637; 1880, 1,978,301; 1890, 2,192,404; 1900, 2,516,462. Of the population in 1900, 142,121 were foreign born, and 57,505 were negroes. The tendency of the negroes is to gather in the cities, more than one fourth of the entire number being found at Indianapolis, and an eighth at Evansville.

The State has 92 counties, whose names and county-seats are as follows:

Adams, Decatur.
Allen, Ft. Wayne.
Bartholomew, Columbus.
Benton, Fowler.
Blackford, Hartford City.
Boone, Lebanon.
Brown, Nashville.
Carroll, Delphi.
Cass, Logansport.
Clark, Jeffersonville.
Clay, Brazil.
Clinton, Frankfort.
Crawford, English.
Daviess, Washington.
Dearborn, Lawrenceburg.
Decatur, Greensburg.
Dekalb, Auburn.
Delaware, Muncie.
Dubois, Jasper.
Elkhart, Goshen.
Fayette, Connersville.
Floyd, New Albany.
Fountain, Covington.
Franklin, Brookville.
Fulton, Rochester.
Gibson, Princeton.
Grant, Marion.
Greene, Bloomfield.
Hamilton, Noblesville.
Hancock, Greenfield.
Harrison, Corydon.
Hendricks, Danville.
Henry, Newcastle.
Howard, Kokomo.
Huntington, Huntington.
Jackson, Brownstown.
Jasper, Rensselaer.
Jay, Portland.
Jefferson, Madison.
Jennings, Vernon.
Johnson, Franklin.
Knox, Vincennes.
Kosciusko, Warsaw.
Lagrange, Lagrange.
Lake, Crown Point.
Laporte, Laporte.
Lawrence, Bedford.
Madison, Anderson.
Marion, Indianapolis.
Marshall, Plymouth.
Martin, Shoals.
Miami, Peru.
Monroe, Bloomington.
Montgomery, Crawfordsville.
Morgan, Martinsville.
Newton, Kentland.
Noble, Albion.
Ohio, Rising Sun.
Orange, Paoli.
Owen, Spencer.
Parke, Rockville.
Perry, Cannelton.
Pike, Petersburg.
Porter, Valparaiso.
Posey, Mt. Vernon.
Pulaski, Winamac.
Putnam, Greencastle.
Randolph, Winchester.
Ripley, Versailles.
Rush, Rushville.
Scott, Scottsburg.
Shelby, Shelbyville.
Spencer, Rockport.
Starke, Knox.
Steuben, Angola.
St. Joseph, South Bend.
Sullivan, Sullivan.
Switzerland, Vevay.
Tippecanoe, Lafayette.
Tipton, Tipton.
Union, Liberty.
Vanderburg, Evansville.
Vermilion, Newport.
Vigo, Terre Haute.
Wabash, Wabash.
Warren, Williamsport.
Warrick, Boonville.
Washington, Salem.
Wayne, Richmond.
Wells, Bluffton.
White, Monticello.
Whitley, Columbia City.

Chief Cities.— The largest city in Indiana is the capital, Indianapolis, with a population (1900) 169,164. Next in size are Evansville (59,007), Ft. Wayne (45,115), Terre Haute (36,673), and South Bend (35,999). Each of these cities has a charter specially made for it, though under guise of a general law. These charters are of recent creation — the oldest made in 1891 — and establish advanced forms of city government. Of cities of secondary importance may be named Muncie (20,942), New Albany (20,628), Anderson (20,178), Richmond (18,226), Lafayette (18,116), Marion (17,337), Logansport (16,204), and Elkhart (15,184). There were in all 80 cities and 330 incorporated towns in the State in 1901.

History.— The first-known visits of white men to Indiana were those of Sieur de la Salle, who followed the Ohio River along its southern boundary in 1669–70, and crossed its northwestern corner by way of the St. Josephs-Kankakee portage in 1671. There were no Indians living below the Wabash at that time, and probably not many in the northern part of the State, but those there were LaSalle induced to join his confederacy against the Iroquois, and they all removed to the Illinois River, leaving Indiana practically uninhabited. After some years they began moving to the East, reaching Detroit by 1712, and shortly afterward located at points along the Maumee and Wabash rivers. The Delawares, who afterward lived in the central part of the State, on White River, came there about 1750. It is probable that the French first placed representatives at the Indian villages near the site of Ft. Wayne, and next, about 1720, at Ouiatenon — on the north side of the Wabash just below Lafayette — and that there were stockade forts at these places, but there is nothing to indicate a permanent settlement at either place. The post at Vincennes was established in 1731, largely under the influence of Father De Beaubois, a Jesuit who had been stationed at Kaskaskia. Families located there soon afterward, and it remained a permanent settlement, though there is but one land grant recorded of

STATE CAPITOL AT INDIANAPOLIS.

date prior to 1736. The French posts were small and unimportant, and the history of the region under French and British rule presents no very striking features. In 1778 Vincennes was surrendered to representatives of Gen. George Rogers Clark, and the Wabash country was brought under American control. A recapture by the British was followed by a second taking by Clark in 1779. The region was ceded to the United States by the treaty of 1783, and was included in the Territory northwest of the Ohio River, by the ordinance of 1787. It was thus governed until 1800, when Indiana Territory was formed, including all of the Northwest Territory except Ohio. From Indiana Territory, Michigan Territory was cut off in 1805, and Illinois Territory in 1809, leaving it with practically the present State boundaries. By act of Congress of 19 April 1816, Indiana was authorized to form a State government, and the State was formally admitted by act of 11 Dec. 1816. In the meantime a State Constitution had been adopted on 29 June; State officials had been elected, and the State government had been actually inaugurated on 7 November.

There were almost continuous Indian troubles in the Ohio Valley from 1788 to 1795, when, after Gen. Wayne's successful expedition, peace was made at Ft. Greenville. After that date the American immigration began, and there was no material trouble with Indians until the formation of Tecumseh's confederacy in 1811. The Indians were overwhelmed at the battle of Tippecanoe (q.v.) on 7 November of that year, by the troops under Gen. Harrison, and sued for peace, but when the war with England came on there were Indian hostilities of minor importance continuing until the close of the war in 1815. After that year there was a gradual extinction of Indian titles, the Indians being concentrated in the northern part of the State and finally removed west of the Mississippi. The last removals occurred in 1836 and 1838.

The sobriquet "Hoosier," commonly used to designate the State and its people, was first applied to them about 1830. It was not coined for that purpose, as is commonly supposed, but was a slang word signifying an uncouth rustic, which was in common use in the South at that time, and is still commonly used there in that sense.

The history of the State after its admission was chiefly that of peaceful development — clearing lands, opening roads, building towns and cities, and establishing industries. The most notable feature was the disastrous internal improvement enterprise on which the State entered in 1836. It contemplated transportation routes on 7 main lines, involving the construction of 1,289 miles of railroads and canals. That the routes were fairly well chosen is shown by the fact that they are now practically all occupied by successful railroad lines. The chief defect was that the improvements were mostly high-line canals, and the breaks in these before completion caused such great damage that the estimated cost was enormously increased. The financial panic of 1837 added to the difficulties, and the effects of this were aggravated by the general entering of the States on such enterprises on borrowed capital. The total debts of the several States swelled from about $13,000,000 in 1830 to $207,894,613 in 1842. In 1839 Indiana was unable to realize on the sales of her bonds, and was forced to default interest on those already issued. The canals and roads being unfinished, did not furnish the revenues anticipated. Compromises were effected by which the work done was turned over to creditors, but the State was left with a debt of about $10,000,000 without any property to represent it. In all, Indiana built 453 miles of canals, at a cost of $7,725,262, all of which are now abandoned so far as transportation is concerned. But under private management, and more favorable conditions, the transportation lines developed rapidly, and in 1849 the one railroad originally contemplated was paying 8½ per cent dividends on its stock. In 1860 there were 2,126 miles of railroads in successful operation in the State.

In the war with Mexico, Indiana furnished troops to the number of 4,470. Of these there were killed and wounded 183, and died of other causes 218. When the Civil War began the State occupied an important position, and its resources were utilized to the uttermost by its war governor, Oliver P. Morton. The State furnished 196,363 men for the War, and 784 paid for exemption, or in other words supplied 74.3 per cent of her total population capable of bearing arms, by the census of 1860. Only one State in the Union surpassed or equaled this record, Delaware being credited with 74.8 per cent of her military population. But of the supply credited to Delaware nearly one tenth was in money commutation for exemption, and nearly one tenth of the men in actual service were colored. On the basis of white troops furnished for 3 years or more of service, Indiana supplied 57 per cent of her military population of 1860, and on this basis was surpassed only by Kansas, which is credited with 59.4 per cent. Of the troops sent by Indiana 7,243 were killed or mortally wounded in battle, and 19,429 died of other causes, making a total death loss of over 13 per cent of all troops furnished. One feature of the War period in Indiana, and some adjoining States, was the formation of secret treasonable societies known as Knights of the Golden Circle, and later Sons of Liberty. These attracted much attention at the time, and much comment later, but in reality they were neither extensive nor dangerous. They were organized with a system of "circles within circles," with mysterious rites and bloodcurdling oaths, but the masses of the members understood that they were merely for mutual protection, and the treasonable designs were affairs of the inner circles. Among their members there were a number of government detectives who kept the authorities informed as to every movement, and at the final exposure the chief witness for the government was Felix Stidgers, a detective who had become so prominent in the order that he was made "Grand Secretary for Kentucky," and knew all of the secrets of the order. As is aptly stated by Gov. Morton's biographer, "No one can read the history of the secret organizations in Indiana and not feel that, widespread as they were, there was not an instant in which they were not securely within the grasp of the war governor." After the War, Indiana became peculiarly a political battleground. In 1868 the Republicans elected Conrad Baker governor by less than 1,000 plurality, and in 1872 the Democrats elected Thomas A. Hendricks to that office by the narrow plurality of 1,148, although Gen. Grant received the vote of the State for President. After 1872 neither

party carried the State at two consecutive Presidential elections until after 1896, and neither carried it by a majority of all the votes cast, or by a plurality of as much as 20,000. One result of this close balance has been an improvement in State legislation, the Democrats leading in the legislature of 1889 which they held although they had lost the State offices and the Presidential vote of the State in the preceding year. Indiana in that year adopted the Australian ballot system, being the second State in the Union to do so, with some improvements that have been extensively copied. Other notable reform laws are a school-book law that has made a large reduction in the cost of books used in the common scools; a Board of State Charities law that has greatly improved the charitable and penal institutions of the State; a fee and salary law putting officials on salaries and requiring the payment of all fees into the public treasuries; a compulsory education law; laws for the encouragement of public libraries; laws for the incorporation of cities which provide the most modern modes of city government; laws for the reform of county and township government providing supervisory boards to which local legislation is entrusted and a tax law that has been largely effective in equalizing taxation and has been copied elsewhere. Another feature of Indiana's development that has attracted notice in later years is its production of native writers of poetry and fiction. Among the former may be named Joaquin Miller, John Hay, John James Piatt and James Whitcomb Riley; among the latter Gen. Lew Wallace, Maurice Thompson, Edward Eggleston, Charles Major, Meredith Nicholson, Booth Tarkington and Annie Fellows Johnston. These with lesser lights and some writers of note in other lines form a notable group for a commonwealth whose settlement and development have occurred in little more than a century.

JACOB PIATT DUNN,
Secretary Indiana Historical Society.

Indiana University, the State university located near Bloomington. In accordance with a provision of the State constitution, the legislature passed an act in 1820 providing for the establishment of a State seminary, which was opened in 1824 under the name of Indiana Seminary; in 1827, it was raised to the dignity of a college, and in 1838 the name was changed to Indiana University. In 1868 the university was opened to women, and has since been coeducational in all its departments. The university is the head of the public school system of Indiana, and no tuition fee is charged; the government is by a board of trustees which reports biennially to the governor. Courses are offered in languages, science, and history, all graduates receiving the degree of A.B. The degrees of Ph.D. and A.M. are given for graduate work; there is also a school of law connected with the university which confers the degree of B.L. There is a biological experiment station on Winona Lake, under university control, and a summer session is maintained. In 1904–5 the university reported: faculty, 78; students, 1,538; volumes in library, 53,000.

Indianapolis, Ind., capital of the State, county-seat of Marion County, the largest city in the State and the 21st in the United States; situated on the west fork of White River. It is the centre for 16 radiating railroads, which connect it with Chicago, 184 miles northwest, Cleveland, 283 miles northeast, St. Louis, 240 miles southwest, Louisville, 110 miles south, Cincinnati, 111 miles southeast, Columbus, 181 miles east, New York, 819 miles east, and other termini in Ohio, Michigan, Illinois, and Indiana. Its area is 29.35 square miles.

The site was selected in 1820 as the location of the capital by a legislative commission, and its name was adopted by the legislature in session at Corydon, 6 Jan. 1821. The first plat included a square mile, which was laid out with broad rectangular streets and avenues radiating from a central circle. The character of the plan was undoubtedly influenced by l'Enfant, the designer of the city of Washington, D. C., for one of the surveyors who made the town plat had aided in the work at the national capital. While the additions to the city have not been developed upon the same broad lines, most of them have been treated liberally and the city is noted for its wide streets, well paved and beautifully shaded. The city is very level, nearly all of its area being 700 to 800 feet above sea-level. There are 439.6 miles of platted streets, of which 92 miles are paved, 44 miles with asphalt, 27 miles with brick, 17 miles with wooden blocks, and 4 miles with macadam. The chief business streets are Washington Street, which is a section of the old National road projected and partly completed to run from Baltimore to St. Louis; Market, Maryland, and Georgia streets, all running east and west; Meridian, Pennsylvania, Delaware, and Illinois streets, running north and south, and Massachusetts, Indiana, Virginia, and Kentucky avenues, which are diagonals, radiating from the circular Monument Place. This central circle contains the State's monument to its soldiers and sailors, perhaps the most successful of the innumerable monuments erected by towns, cities, societies, and States in commemoration of the nation's defenders, and is generally regarded as one of the greatest in the world from an artistic point of view. The finest residence streets are Delaware, Meridian, and Pennsylvania. Several other residence districts are particularly well designed and cared for, such as Woodruff Place — a residence park, with esplanades, fountains, statues, etc.,— which has a town government of its own, though completely surrounded by the city; Morton Place, and Meridian Heights.

Public Service.— The first water supply and the first sewer system were constructed in 1870 to 1875, and but little else was done in the way of comprehensive public improvements until after the adoption of the present efficient charter in 1891. Prior to that year the city government had been by mayor and council. Public-spirited citizens who recognized the impossibility of comprehensive public improvements, through the Commercial Club and Board of Trade agitated the adoption of the new charter, which separated the legislative and administrative functions of the city government, making the mayor and his appointees fully responsible for the latter. The first Board of Public Works devised a broad system of improvement, including sewerage, paving and street cleaning, which was supplemented in 1895 by a Park Commission. Under these two boards the progress in the establishment of municipal public works adding to the beauty and convenience of the city has been rapid. As a step preliminary to the era of im-

SOLDIERS' MONUMENT.

provement which began in 1890 a paving exposition was held for the purpose of educating the people of the city regarding paving materials and methods. It was the first ever held in America and attracted attention throughout the country. Official delegations were sent to it from many cities. Prior to 1890 less than two miles of pavements had been laid. The amounts expended since the adoption of the new charter in 1891, including the year 1902, are as follows: for pavements of asphalt, $2,726,668.01; brick, $1,011,214.39; wooden block, $969,652.82; macadam, $154,522.91; gravel, $757,112.50; for alley improvements, $46,655.26; for cement walks, $879,010.21; for brick walks, $65,995.41; making a total for paving of $6,611,431.51. During the same period the expenditure for construction of 105 miles of sewers added to the 23 miles previously in use was $1,828,878.67, and for bridges $240,485.32. The grand total for the 12 years shows $8,680,795.50 expended in these departments of public improvements. The waterworks owned by the Indianapolis Water Company have developed with the city. The system of pumping by direct pressure is used, and a system of filter beds to purify the water taken from White River some miles above the city has been installed. The company has 226 miles of water mains and receives from the city about $85,000 a year for public water and fire protection service. Electric lights are in general use. The city pays about $115,000 a year for about 1,350 electric arcs for street lighting and about $7,000 for about 400 gas and vapor lights. The police department contains 175 men and costs $150,000 a year. The police court, city clerk, city dispensary, and central station are housed in a handsome building of recent construction. The fire department has 100 horses, 9 steam fire-engines, 20 hose wagons, 1 water tower, 1 aerial, and 4 service trucks, 4 chemical engines, and 175 men, and is housed in 22 stations. It costs the city $175,000 a year. There are 50 miles of underground conduits used by the telephone, telegraph and electric light and power companies, and 125 miles of electric street railway lines, owned by the Indianapolis Street Railway Company. The city is the most prominent centre of interurban railway traffic in the United States. Ten systems are in operation or in active construction, and others are early probabilities The city has recently made a contract with the Indianapolis Terminal and Traction Company, lessee of the city lines, under which a great terminal station and belt lines for the passenger and freight traffic of the interurban lines are under construction, the whole making a model system.

Parks and Cemeteries.—The public park system includes 9 parks of nearly 1,200 acres area. Riverside Park, purchased in 1898, contains 950 acres along White River, Garfield Park 108 acres, and Brookside Park 80 acres. Since the establishment of the park commission in 1895 $300,000 has been spent in purchasing new parks and $400,000 in improving them. There are several small parks scattered about the city, such as Military Park, 14 acres; University and St. Clair Squares, each 4 acres; Spades Place, 8 acres; Indianola Place, 2 acres; Highland Square, and combinations of park, boulevard, and residences as Elmwood, Fletcher, Morton, and other places, of which the largest is Woodruff Place, above noted. The city street railway company maintains two parks a short distance outside the city limits. The first cemetery of the city, Greenlawn, has not been used as such for many years and is kept in park form by the Board of Park Commissioners. Crown Hill cemetery, one of the notable cemeteries of the country, embraces over 540 acres. There are also Roman Catholic, Lutheran, and Jewish cemeteries.

Buildings.— The Indiana State House, costing $2,000,000, and built of Indian oolitic stone, is perhaps the most notable building. With its grounds it occupies two large blocks. The county building was completed in 1878 at a cost approximating $1,750,000. The new Federal building, containing the post-office, custom-house, and United States courts, is under construction at a cost of $2,400,000. Other municipal buildings of note are the police building, the public library, containing also the offices of the public schools, and some of the new public school buildings. Tomlinson Hall, a bequest by Dr. J. M. Tomlinson, is a public building, its lower story being used as a market. The Indianapolis Art Association is considering plans for an art museum and school. Among the prominent business buildings ornamenting the city, special mention may be made in the order of their construction of the Commercial Club, Majestic, Law, Stevenson and Newton Claypool buildings and Claypool Hotel. The Columbia Club building is an important feature of one quadrant of Monument Place, which surrounds the Indiana State Soldiers and Sailors' monument. This massive shaft is the central and most notable decorative feature of the city. It is 285 feet high, including the bronze statue, and its base is ornamented with symbolic groups of statuary and reliefs in stone and bronze. It was designed by Bruno Schmitz and cost over $500,000. Four epochs in the history of the State are commemorated by the statues of George Rogers Clark, William Henry Harrison, James Whitcomb, and Oliver P. Morton, which are grouped about its base. The width of Washington street, 120 feet, and of the streets of the original plat, 80 and 90 feet, give space for the best possible display of architectural features.

Transportation.— Indianapolis is the centre of trade for the State. With the completion of the Indianapolis Southern Railway every county in the State except three, which are on the Ohio River, can be reached by railroad in less than one day's travel. Consolidations have placed most of the railroads in two systems. One of these, the Pennsylvania lines west of Pittsburg, now operates the Madison and Jeffersonville lines, which reached the city in 1847, and the Vincennes line, completed in 1868; the Indiana Central to Columbus and the East, completed in 1853, and the Terre Haute and Richmond, later the Vandalia, completed in 1852, and now reaching St. Louis; also a line to Chicago, partly over the Lake Erie and Western. The other, the Big Four system, operates the Bellefontaine road to Cleveland, completed in 1852; the Indianapolis and Cincinnati, which reached the city in 1850; the Indianapolis and Lafayette, of 1852, now reaching Chicago; the Indianapolis, Bloomington and Western to Peoria, finished in 1870, its eastern extension to Springfield, O., completed about 15 years later; the Indianapolis and St. Louis, completed in 1876. Through trains are also run to Benton Harbor, Mich., and to Louisville, over branches of these lines. The

Cincinnati, Hamilton and Dayton Railroad Company operates the Cincinnati and Indianapolis Junction road, completed in 1868, and the Indianapolis, Decatur and Springfield road to Springfield, Ill. The Indianapolis, Cincinnati and Louisville operates a line to Chicago, which was completed about 1880. The Lake Erie and Western Railroad Company operates the old Peru and Indianapolis road, completed in 1854, and reaches Michigan City, Toledo and Peoria.

The construction of the system of interurban electric roads began about 1890 with the Broad Ripple line, now a suburban city line. The next to be constructed was the Indianapolis and Greenwood line in 1900, now reaching Columbus, Ind. It was quickly followed by the Indianapolis and Eastern, which now connects with lines to Columbus, Ohio, and other Eastern points. The Union Traction Company entered the city with a line from its centre in Anderson in 1901 and completed a new line north to Tipton and other points in 1903. The Indianapolis, Shelbyville and Southeastern is another line completed in 1901. Lines entering the city in 1903 are the Indianapolis and Martinsville, the Indianapolis and Plainfield, and the Indianapolis and Northwestern, reaching Crawfordsville and Lafayette. The Indianapolis and Cincinnati is under construction in 1903 to Rushville, and contracts have been let for the Indianapolis and Southern railroad. The steam railroads are served within the city by the Union Railway Company owning the Union passenger station and the belt railway for facilitating the transfer of freight. The interurban electric roads will in like manner be served by the Indianapolis Terminal and Traction Company owning a large terminal station and belt lines for passenger and freight business.

Manufactures.— During the brief natural gas era in Indiana, Indianapolis benefited largely by the cheap fuel. Since the failure of the gas supply the superior shipping facilities of the city and relatively cheap coal fuel have attracted many more manufactories, and more than 160 industries are carried on in about 2,000 establishments. According to the United States census of 1900 there was invested in 1910 establishments capital amounting to $36,828,114, employing 27,478 persons, including proprietors, and turning out products valued at $68,607,579. Among the most important industries are slaughtering and meat packing, whose product was $18,781,442 in the census year from 7 establishments; iron work of all sorts, $6,727,990; flouring and grist mill products, $3,820,373; carriages and wagons and material therefor, $2,812,498; furniture factory product, $1,685,827; saws, $1,587,827; malt liquors, $1,770,939; printing and publishing books and newspapers, $2,924,385; clothing, $2,190,050, half of it factory product; lumber and lumber-mill products, $1,588,797.

Finances and Banking.— The assessed valuation of the city in 1870 was $24,656,460. In 1891 at the beginning of the era of public improvements it was $93,595,930, and in 1902 it had increased to $132,927,210. The tax rate for State, county, township, city, and school purposes was $2.08 in 1902. The bonded debt is $2,421,000. The city's expenses are about $1,200,000 a year. The post-office receipts are $635,000. The custom-house receipts are $165,000, and the valuation of imports $350,000. There are 14 banks and trust companies, including seven national banks. The aggregate capital of the national banks is about $4,300,000, their surplus about $1,900,000, and deposits over $18,000,000. The six trust companies have a capital of $2,900,000 and individual deposits of about $7,500,000. The trust companies and private banks carry savings accounts. There are about 90 building, loan and savings associations in various stages of progress and liquidation.

Churches.— Indianapolis is the seat of a Roman Catholic bishop, with an auxiliary bishop and of an Episcopal bishop. Including missions there are 12 Roman Catholic churches in the city, 47 Methodist, 16 Presbyterian, 7 Episcopal, 34 Baptist, 10 Congregational, 7 Lutheran, 15 Christian, 3 German Evangelical, 3 Evangelical Association, 3 Friends, 2 United Presbyterian, 5 German Reformed, one each of 11 other denominations. There are 4 Hebrew congregations.

Charities.— In the city there are 15 hospitals, State, county, college, church, charitable, and private, 4 homes for the aged, 6 industrial schools and orphan asylums, 4 homes for women and girls, 16 organized charitable and relief societies, and several such institutions as the Y. M. C. A., Y. W. C. A., Friendly Inn, Bureau of Justice, Humane Society, Day Nursery. The township trustee is a source of official relief. The charities of the city are most efficiently administered, as a result of co-operation between organizations largely brought about through the efforts of Rev. Oscar C. McCullouch. In 1894 a plan of relief for the unemployed, whereby over 5,000 people were provided with the necessaries of life throughout winter without pauperizing influences resulting, became widely known as the "Indianapolis Plan of Relief." The plan was devised and carried out on behalf of the people of the city by a Commercial Club committee composed of Hugh H. Hanna, Col. Eli Lilly, and William Fortune.

Education.—There are 60 public school buildings, including 2 high schools, one giving manual training, in which about 700 teachers are employed, with a total enrolment of about 35,000 pupils; 22 Catholic schools, 2 Lutheran schools, 5 private schools and academies, besides the schools in connection with institutions. The University of Indianapolis is an organization formed in 1896 to unite several institutions of the city, including Butler College, first incorporated in 1850 as the Department of Liberal Arts; the Medical College of Indiana, organized in 1869; the Indiana Dental College, organized in 1878, and the Indiana Law School. There are in all five medical schools, prominent among them being the Central College of Physicians and Surgeons, founded in 1879, two dental colleges, a law school, and 21 business, music and other special schools. The United States Arsenal grounds in the city were purchased in 1902 for a technical institute. Free kindergartens are operated under the Free Kindergarten Association, and 23 kindergartens and a normal school are maintained largely from public funds, besides a number of private kindergartens. The Art Association of Indianapolis maintains the John Herron Art Institute, including art gallery, school, and museum. The Propylæum is a building erected by an association composed exclusively of women.

Libraries.—The most notable libraries are the public library with about 100,000 volumes, under

the control of the board of school commissioners, and the State library with about 35,000 volumes. The State law library with 40,000 volumes, and agricultural and horticultural libraries in the State House, and the county library and bar association's library in the court-house may be noted. There are seven branches of the public library, including the newly erected Bona Thompson library of Butler College and many small special libraries of schools and associations.

Newspapers and Literature.— In 1903 the city had 9 daily papers, 23 weeklies, 38 monthlies, and 5 with other periods of issue. The list of trade and class papers published in the city is particularly notable. Indianapolis is the home of many writers whose names are familiar to the public, and it has in recent years become an important western book-publishing centre.

Organizations.— The development of the city has been markedly influenced by organized work in various directions. There are a great number of literary, art, and musical societies, and largely as a result of this activity there is a high standard of cultivation in such matters. This has had a notable influence in establishing in the social life of the city a standard of merit rather than determining the standing of the individual on questions of lineage or wealth. There are many social clubs, among the most notable being the University, Country, Contemporary, and Woodruff Clubs, the Deutsche Haus, the Männerchor, and the Elks, while the Columbia, Marion, and Indiana Clubs are political organizations, established in comfortable homes. The Columbia Club building, located on the Circle, is one of the finest club-houses in the United States. The Commercial Club, with a membership of over 1,000, which owns as its home an eight-story office building, was a dominant force in the new era of progress and development which started in 1890, and devotes itself to the welfare of the city. The Board of Trade, an older organization with a membership of about 500, has also been active in this direction. Organizations of various kinds, commercial, trade, fraternal, social, literary, art, musical, and miscellaneous, number over 500.

Government.— The administrative department is in the hands of a mayor, elected biennially, and of boards appointed by him. The council consists of 15 members elected one from each ward, and 6 members elected at large, with a two-years' term of office. The city clerk and police judge are also elected biennially. The mayor's appointees are the city comptroller, attorney, civil engineer, boards of public works, 3 members of public health and charities, 3 members of public safety, and of commissioners of public parks 4 members. The school system is in charge of a board of 5 school commissioners elected at special elections held for that purpose only.

Population.— Beginning with two or three families in 1819 or 1820, Indianapolis has shown a steady and rapid growth, having a population of 1,085 in 1830; 2,698 in 1840; 8,091 in 1850; 18,611 in 1860; 48,244 in 1870; 75,056 in 1880; 105,436 in 1890; and 169,164 in 1900. Since the last census the increase in population has been still more rapid. The growth of the city has been almost exactly parallel with that of Buffalo, but 20 years behind, and the parallelism promises to continue. In 1890 Indianapolis was 26th in population, and in 1900 it was 21st in the United States.

History.— The first settler, George Pogue, arrived in March of 1819 or 1820. The legislature of Indiana, meeting at Corydon, by committee selected, in 1820, the site for a State capital, and named it Indianapolis, 6 Jan. 1821. Another committee laid out the plat. Lots were slowly sold for several years, and the government was actually removed to the new capital in 1824, the first session of the legislature being held there in 1825. The first State House, modeled after the Parthenon, was completed in 1835. A town government was instituted in 1832 under three trustees, a town council was established in 1838, and a city government under mayor and council in 1847. The present metropolitan form of government, with the mayor as the responsible administrative officer and the council as the legislative branch, was adopted in 1891. A volunteer fire department was formed in 1826, which had much help from the State when the capitol building was completed. The first fire chief was appointed in 1853, and the department was changed to a corps of paid men in 1859. The police department was first established in 1854. The new town began to support a newspaper in January 1822, and a church in 1823. The first railroad reached the city in 1847, and several others were completed in the next four years. Their effect upon the town is seen in the large increase in population. The State capital was the centre of great activity during the War, and there was great expansion in business and manufactures as well as increase in population, most of which was retained. The city did its full share in raising regiments for the War, and is said to have expended a million dollars in contributions, bounties, and war expenses. Camp Morton, on its outskirts, was first a camp for training soldiers, and later for prisoners of war. The free school system now cited as a model by educational experts, was begun in 1853 with the accumulations of several years of special taxation spent in buildings and grounds. The Citizens' Street Railway charter was granted 18 Jan. 1864. The slaughtering and packing business, now so large a factor in the city's trade, began its great expansion in the same year. Public improvements were but few in number until the adoption of the new charter in 1891.

Indianapolis has numbered among her prominent citizens Benjamin Harrison, Thomas A. Hendricks, and others high in the affairs of the national government.

WILLIAM FORTUNE,
Prest. Municipal Engineering Co., Indianapolis.

Indiano'la, Iowa, city and county-seat of Warren County, 18 miles south of Des Moines, on the Chicago, B. & Q. and the Chicago R. I. & P. R.R.'s. There is a large and increasing trade here in grain, butter, eggs, fruit, live stock and garden products. Here is the seat of the Simpson Methodist Episcopal College, founded in 1867. The electric light plant is owned by the city. Pop. (1890) 2,254; (1900) 3,261.

Indians, American. Columbus, when he discovered America, believed he had reached a part of Asia, or of India, and in a letter of February 1493 wrote of "the *Indians* (in Spanish, *Indios*) I have with me." Thus the aborigines of the New World came to be called "Indians" (French *Indiens,* German *Indianer,*

etc.), or, to avoid confusion with the natives of India, "American Indians," for which rather cumbrous term the word "Amerinds," susceptible of many modifications by means of prefix and suffix, and easily adaptable to the exigencies of modern European and other civilized languages, has been suggested by an eminent American lexicographer and is used more or less by a number of anthropologists and other writers. The word "American," originally applied to the Indians, is still somewhat in use, and Dr. D. G. Brinton styled his comprehensive sketch published in 1891, 'The American Race'; but its employment to designate the white population of the continent seems to bar its ethnological application to the aborigines without some qualifying term. By some writers the Indians are called the "Red Race," and, more popularly, "Redskins" (in French *Peaux-Rouges*, in German *Rothäute*), or "Redmen," terms of no exact somatic significance. A few American, and many European, ethnologists continue to separate the peoples who created the civilizations of Mexico, Central America, Peru, etc., from the Indians, while others exclude the Eskimo, and others, again, the "Mound-Builders." But somatic, cultural, and linguistic evidence justifies the conclusions of Powell and Brinton in using the term "American Indians" to include not only the aborigines now existing, or known to have existed since the discovery, but also all the pre-Columbian peoples of America concerning whom we have little data,—the most divergent are no more than sub-varieties of American man. This unity is the great ethnic phenomenon of American aboriginal history. The study of Indian languages, archæological remains, arts, and industries, games, social and religious institutions, mythology and folk-lore indicates a general psychic unity, while the somatic diversities do not transcend those observable in the other great races of mankind. Whether one investigates, as McGee has so admirably done, the Seri of the Gulf of California, who represent about the lowest type of savage culture on the North American continent, or the Mayas of Yucatan, whose approach to a phonetic system of writing touches the high-water mark of Amerindian achievement, one receives the same impression: that it is a question not of very recent civilized or semi-barbaric intruders from Asia or from Europe, but of a race (whatever their remoter origins may be) who have dwelt for ages in an American environment, which has shaped them into the peoples met with by the whites at the time of the Columbian discovery. The limited effect of the "discovery" of the Norsemen may be held to discount any "discoveries" by Europeans before them; while, on the other hand, the American-Asiatic contact revealed by the investigations of the Jesup North Pacific expedition is as much American as Asiatic, and the "Bering Sea" culture is a local phenomenon no more fundamentally indigenous to the Old World than to the New. The arguments in favor of a trans-Pacific Malayo-Polynesian influence upon primitive America are no stronger than those that can be adduced to support the contrary opinion. The culture of the "Mound-Builders" does not in any way transcend the possibilities of what the American Indian was and is yet capable of, nor is it necessary to assume the presence of foreign culture-elements to explain the civilizations of Mexico, Yucatan, Colombia, and Peru. Since very primitive times America has been essentially the "ethnic island" of Brinton, Keane, and other investigators. The impress of America has been upon the aborigines so long that physically, socially, linguistically they have been "Americanized" in so marked a fashion that their right to be considered one of the "races" of mankind is not to be dismissed without cause. To group them merely as a branch of the Mongolian, or, again, of the Malay "race," is to obscure many points of great importance in the prehistory of America or to ignore them altogether. The American Indian is in too many respects a modified (and anciently so) variety of mankind to be thought of as expressing in any serious degree the type of the Mongolian or the Malay.

Language and Culture.—The ethnic isolation of the American race has already been noticed. The apparent independence of the culture-centres of North and South America is another interesting fact. With the exception of a few possible traces of the presence of tribes of Arawak lineage in ancient Florida and the spread of art-*motifs* of the Caribbean type over a portion of the adjacent Gulf region, no direct evidence of the influence of South America upon North American culture is forthcoming. The independent origin of Mexican and Peruvian civilizations seems certain, and convincing proofs of the community of origin of Peruvian and Chibchan and even of Mexican and Mayan are lacking. The possibility of inter-cultural relations having once existed is, however, not to be denied. The Pacific coast, from the Gulf of California to the Argentine and Chile, has been a nursery of culture just as the Mediterranean area was for the Eurafrican peoples. There has been a Mexico and a "greater Mexico," a Peru and a "greater Peru," while the Mayas and the Chibchas have also had their extensive spheres of influence. To the Pueblo culture north of Mexico corresponds the Calchaqui culture south of Peru. On the northern borders of Mexico still lie the savage Seri and Yaqui, and the culture-areas of Colombia and Peru have also their primitive frontagers,—and this was so in the time of the ancient Montezumas and the Incas. This juxtaposition of civilization and savagery is one of the characteristic facts of American ethnology, as it was once likewise of the history of the Mediterranean area in the Old World. In both areas we meet with a large number of peoples who rose above savagery, but, for some reason or other, failed to develop high stages of culture. That the more material evidences of civilization should be so confined to the Pacific coast is, to some writers, a significant fact suggestive of Asiatic relations; but the intellectual power of such Atlantic peoples as the Iroquois and some of the Muskhogean tribes of North America, and the moderate but distinct progress made by a few of the Brazilian tribes of the Atlantic area relieve us from any such theory, environment, and historical incident in America quite sufficing to account for the phenomena involved. (See Ethnology.) Certain other resemblances and contrasts in the various aspects of aboriginal culture in America merit attention here. At the extreme north of the continent, one stock, the Eskimo, with closely related forms of speech, kindred mythology, and folk-

1. Labrador Eskimo Woman. 2. Mexican of the coast. 3. Mexican of the highlands. 4. Yucatan Indian Woman. 5. Ecuador Indian. 6. Peruvian Indian. 7. Brazilian Indian (Iputrina).
8. Dakota (Sioux) Indian. 9, 10. Apache. 11. Bellacoola (N. W. Coast). 12, 13. Pueblo Indians (New Mexico). 14, 15. Indians of Zapoteca, Mexico. 16. Bororo. 17. Caraiá.
18. Botocudo. 19. Umaua or Omagua (16-19 of Brazil). 20. Araucanian (Chile). 21, 22. Indians of Tierra del Fuego, with a child. 23. Patagonian.

lore, similar customs and social institutions, etc., extends in a narrow line from east to west, even overflowing into Asia, while at the extreme south (much less extensive) the Fuegians, numbering altogether less than 10,000, are divided into three distinct linguistic stocks (Yahgans, Onas, Alikulufs). Eastern and northern North America, and the corresponding regions in South America, are areas of wide distributions of single stocks. The Pacific coast of America, as compared with the Atlantic, is a place where, in diverse spots, languages seem to pullulate. This region (including the narrow limits of Mexico and Central America) contained probably more independent tongues than all the rest of the continent. Indeed, within the present bounds of the State of California alone 22 such tongues are found, with several others in Nevada, and in Prof. Cyrus Thomas' list of the stocks of Mexico and Central America, made in 1902, nearly 30 are recognized.

The multiplicity of languages in primitive America has called forth explanatory theories of various sorts, among them Horatio Hale's suggestion of the origin of linguistic diversity through the spontaneous language activity of the child. As Gatschet has noted, the very existence of such a multitude of tongues all over America is proof that neither in ancient nor in later times has this continent been the scene, on a vast scale, of the suppression and extermination of peoples one by the other, which have been characteristic features of Old World history. In spite of the common belief to the contrary, mutual destruction was probably never so rife as when the coming of the white man introduced new means of warfare, and, crowding the natives for subsistence, led them to attack each other more effectively. The recent studies of Dixon and Kroeber in California have strengthened the view of a certain parallelism of language and culture.

That some culture-elements, however, have spread from tribe to tribe is shown by the distribution of certain inventions discussed by Mason, the northward movement of such plants as maize, the use of tobacco, the transmission of many themes and incidents of myths and legends (as demonstrated by Boas), the modes of occurrence of certain art-forms, etc. Interminglings of culture of a more or less local, though often of an extensive, character, have taken place in the Bering Sea area, in the Columbia River region, in the habitat of the Pueblo Indians of New Mexico and Arizona, in the southeastern part of the United States, in the Isthmian region of Central America, in Ecuador, in the Pampean country of the Argentine, etc.,—larger and more significant intermixtures have, perhaps, taken place in earlier times in Mexico, the Mayan country, Colombia, and Peru. A number of the borrowed culture-elements may be explained as the result of trade and commerce, by means of which useful or artistic objects, food, plants, etc., were easily conveyed long distances under primitive conditions. The widespread custom of adoption would also account for not a few instances of alien culture-grafts. So, too, with the exogamic marriage, when the women are culture-bearers. Where language-mixture has taken place it is more or less easily detectable in most American Indian stocks and tongues. When families of the same stock possess, in the one case (Algonkian) dialects which differ as much as Micmac and Blackfoot, in the other (Iroquoian) as much as Cherokee and Mohawk, we are justified in looking for culture-differences as well in such widely separated peoples. Doubtless the results of careful somatological, sociological, and other investigations of the various tribes of American aborigines will furnish us ultimately with diverse ways of classifying them. At present, however, the most serviceable classification is a linguistic one, the result of the labors of Major J. W. Powell and the Bureau of American Ethnology, supplemented by the work of Dr. D. G. Brinton.

Linguistic Stocks.— The Bureau of American Ethnology has issued the Powell map showing the extent of the 58 linguistic stocks north of the Mexican boundary line; that is, of families or forms of speech, so independent of one another as to be catalogued as distinct stocks; apparently no more closely related than the Aryan and the Semitic families of the Old World. For South America no such authoritative map is extant. The exact number of such linguistic stocks in America has not yet been determined with certainty, but the following list probably represents the best view of the matter to-day:

1. Adaizan (Louisiana)
2. Algonkian (northeast North America)
3. Alikulufan (Tierra del Fuego)
4. Andaquian (Colombia)
5. Aruan (northwest Brazil)
6. Araucanian or Aucan (Chile)
7. Arawakan (Central and N. E. South America)
8. Atacameñan (S. Bolivia)
9. Athapascan (N. W. Canada, etc.)
10. Attacapan (Louisiana)
11. Aymaran (S. Peru, N. Bolivia)
12. Barbacoan (S. Colombia)
13. Beothukan (Newfoundland)
14. Betoyan (Colombia-Venezuela)
15. Caddoan (Texas)
16. Calchaquian or Catamarcñan (N. Bolivia)
17. Canichanan or Canisianan (N. Bolivia)
18. Carajan (S. Brazil)
19. Carihan (N. E. South America)
20. Cayubaban (N. Bolivia)
21. Charruan (N. E. Argentine)
22. Chetimachan (Louisiana)
23. Chiapanecan (Central America)
24. Chibchan (Colombia and Isthmian region)
25. Chimakuan (Washington)
26. Chimarikan (California)
27. Chinantecan (Oaxaca, Mexico)
28. Chinookan (Washington)
29. Chiquitan (N. Bolivia)
30. Chocoan (N. W. Colombia and Isthmus)
31. Chumashan (California)
32. Churoyan (Colombia-Venezuela)
33. Coahuiltecan (Mexico-Texas, mouth of Rio Grande)
34. Coconucan (S. Colombia)
35. Copehan (California)
36. Costanoan (California)
37. Cunan (Isthmus of Panama)
38. Doraskean or Changuinan (Panama and Nicaragua)
39. Eskimoan (Northern fringe of North America)
40. Esselenian (California)
41. Guahiban (Venezuela)
42. Guaraunian (Venezuela)
43. Guaycuruan (Gran Chaco, Paraguay-Bolivia)
44. Huavean (Isthmus of Tehuantepec)
45. Iroquoian (Ontario-Erie region, with offshoot in S. E. United States)
46. Itonaman (Bolivia)
47. Jivaroan (Peru, Ecuador)
48. Kalapooian (Oregon)
49. Karankawan (Texas)
50. Kechuan or Quechuan (Peru)
51. Keresan (New Mexico, Pueblos)
52. Kiowan (Nebraska-Wyoming)
53. Kitunahan (S. E. British Columbia, N. Idaho)
54. Koloschan (Alaska)
55. Kulanapan (California)
56. Kusan (Oregon)
57. Laman (Peru)
58. Lencan (Central America
59. Lulean (Gran Chaco)
60. Lutuamian (Oregon)
61. Mainan (Ecuador, N. W. Brazil)

62. Mariposan (California)
63. Matacoan (Gran Chaco)
64. Matagalpan (Nicaragua)
65. Mayan (Yucatan, Chiapas, Guatemala, etc.)
66. Mocoan (Colombia)
67. Moquelumnian (California)
68. Mosateñan (Bolivia)
69. Moviman (Bolivia)
70. Muskhogean (S. E. United States)
71. Natchezan (Louisiana)
72. Onan (Tierra del Fuego)
73. Otomian (Central Mexico)
74. Otomacan (Venezuela-Colombia)
75. Palaihnihan (California)
76. Paniquitan (Colombia)
77. Panoan (Peru)
78. Payaguan (Gran Chaco)
79. Payan (Honduras)
80. Peban (Peru)
81. Piman (S. Arizona, N. W. Mexico)
82. Piaroan (Colombia-Venezuela)
83. Puinavan (Colombia-Venezuela)
84. Pujunan (California)
85. Puquinan (Peru)
86. Quoratean (California)
87. Salivan (Colombia-Venezuela)
88. Salinan (California)
89. Salishan (British Columbia, etc., to the south)
90. Samucuan (S. Bolivia)
91. Sastean (California)
92. Serian (N. W. Mexico)
93. Shahaptian (Oregon-Idaho)
94. Shoshonean or Uto-Aztecan
95. Siouan (Carolinas and Missouri Valley)
96. Skittagetan (Q. Charlotte Is.)
97. Subtiaban (Nicaragua)
98. Tacanan (Bolivia)
99. Takilman (Oregon)
100. Tañoan (New Mexico, Pueblos)
101. Tapuyan (S. Central Brazil)
102. Tarascan (Michoacan, Mexico)
103. Tequistlatecan (Oaxaca, Mexico)
104. Ticunan (N. W. Brazil)
105. Timotean (Venezuela)
106. Timuquanan (Florida)
107. Tonikan (Louisiana-Mississippi)
108. Tonkawan (N. W. Texas)
109. Totonacan (Vera Cruz, Mexico)
110. Tsimshian (British Columbia)
111. Tsonekan (Patagonia)
112. Tupian (E. Central Brazil)
113. Uchean (Georgia)
114. Ulvan (Nicaragua)
115. Waiilatpuan (Oregon)
116. Wakashan or Kwakiutl-Nootka (British Columbia)
117. Washoan (Nevada-California)
118. Weitspekan (California)
119. Wishoskan (California)
120. Xicaquean (Honduras)
121. Xincan (Guatemala)
122. Yahganan (Tierra del Fuego)
123. Yakonan (Oregon)
124. Yanan (California)
125. Yaruran (Venezuela)
126. Yukian (California)
127. Yuman (Lower California, Arizona)
128. Yucan (Peru)
129. Yurucarean (Bolivia)
130. Zaparoan (N. W. Brazil)
131. Zapotecan (S. E. Mexico)
132. Zoquean (S. E. Mexico)
133. Zuñian (New Mexico)

Of the stocks enumerated, 51 belong to South America and 56 to North America north of Mexico. The status of investigation is such that the number assigned to South America is approximate only, and may ultimately be considerably increased or reduced. Some stocks, like the Adaizan, Beothukan (exterminated by whites), Chetimachan, and a few of the minor stocks in South America, are extinct or nearly so. A goodly number — including, for example, many of the stocks on the northwest Pacific coast, the Texas-Louisiana country, parts of Central America and the Pacific region of South America — were or are of limited area; others, like the Eskimoan, Athapascan, Algonkian, Siouan, Shoshonean, Arawakan, Cariban, Tupian, etc., are noteworthy by reason of the extent of their domain. Some, like the Kootenay, consist of practically a single language, while others, like the Algonkian, Siouan, Athapascan, Salishan, Aztecan, Mayan, Arawakan, Tupian, Cariban, etc., have developed numerous dialects, sometimes only remotely resembling the mother-tongue. Doubtless, with the perfection of linguistic research, some changes will be made in the list of stocks, or perhaps a method of groups may be devised in which stocks showing certain resemblances other than those of a lexical nature may be classed together. The studies of Dixon and Kroeber indicate the possibility of this for the numerous Californian stocks, and a similar result may be predicted for certain other regions of the continent. As said, all the American Indian stocks are far from being of the same significance, many of them having hardly any historical importance. A few words about some of the most typical and most important must suffice here.

North American Stocks.— The Eskimoan stock is noteworthy by reason of being the first of all the aboriginal peoples of America to be visited by representatives of European culture,— the Norsemen in the 10th century, etc. It is also the only primitive people who, unaided by civilized races, occupy a portion of both hemispheres, for the Eskimo stretch from Labrador to a considerable distance within the borders of northeastern Asia. They illustrate the victory of man over a difficult environment, for they are a merry and sociable people in spite of the inclement and depressing character of their arctic surroundings. They have also a marked sense of humor, as the institution of the nith-song, or settlement of disputes by public judgment of the comparative merits of the two parties in competitive singing, would indicate,— the themes of the singing being the dispute and sarcasm at the expense of the opponent. The Eskimo are also very skilful carvers and engravers of ivory, their spirited drawings of animals, etc., resembling in marked fashion the similar art-products of prehistoric man of the French river-drift, a likeness which has induced some authorities (Dawkins, De Mortillet) to assume a racial connection between these two peoples. Mason has recently suggested that these drawings owe a good deal to the contact with Europeans (introduction of iron tools, etc.), but Boas considers that their close resemblance to the bark and rock piclographs of the Indians forbids the conclusion that these drawings are of other than native origin. The unity of language, and (to a considerable degree) of custom, mythology, etc., among the various Eskimo tribes is remarkable when one remembers the extent of their distribution. The use of the Eskimo dog with the sledge, the kayak, the harpoon, the snow-house (iglu), and the invention of many mechanical devices, show them to be gifted with native intelligence.

The Athapascan stock is notable for the contrasts in culture and diversities of culture-capacity presented by its members. Some of the Athapascan peoples of northwestern Canada and Alaska are among the lowest types of American man, and a few of them have hardly yet come to knowledge of the white man, the advent of the fur-trader being, according to J. M. Bell, a matter of the last two or three years in part of their domain. To this stock belong also the Apaches, once the terror of the civilization of the Southwest, whose depredations, in earlier times, disturbed the peace of the native civilization of Old Mexico. It is fair to say, however, of them that individual Apaches (Dr. Montezuma, for example) shows good capacity for adopting the chief elements of white American culture. Several small tribes of Athapascans are scattered through Washington, Oregon, and California, the most noteworthy being the Hupa, on Trinity River, the "Romans of California," as they have been called. The Navaho, who

THE SNAKE DANCE OF THE MOKI INDIANS.

have assimilated to a considerable extent the culture of the whites, were good agriculturists before the coming of the Spaniards, from whom they adopted the sheep, a fact which modified their environment and their response to it. The contrast between the rude tribes of the "Barren Grounds" of Canada and the Navaho of New Mexico and Arizona is, as Horatio Hale pointed out, one of the most remarkable instances of culture-change by process of environmental variation on record. The recent loan-word *Klondike* comes from an Athapascan dialect.

The Algonkian stock, members of which were found from Labrador to South Carolina, and from the confluence of the Ohio and Mississippi northwesterly to the foot of the Rocky Mountains and the borders of the domain of the Athapascans, are of interest for many reasons. The great area over which they are spread has brought members of this stock into contact with many other Indian peoples,— the Naskopi, Crees, and northern Ojibwa with the Eskimo; the Micmacs with the Eskimo and Beothuk; the Ojibwa and related tribes of New England, New York, and Pennsylvania, the Lenâpé of New Jersey, the Nanticokes, Powhatans, etc., of Maryland, Virginia, and the Carolinas with the Iroquois (who, both north and south, form an *enclave* in the Algonkian territory); the western Ojibwa, etc., with the Siouan tribes in the upper Mississippi region, and in the southern Mississippi country the Illinois and kindred peoples with the Caddoan and other stocks; the Blackfoot in the extreme northwest of the Algonkian area with the Athapascan Sarcees and the Kootenay. The aberrant Cheyennes and Arapaho (recently studied by Kroeber) belong to the Algonkian stock. Another evidence of the importance of this stock is the fact that many other stocks and tribes are known to us by names of Algonkian origin: *Eskimo, Athapascan, Siouan,* and possibly also *Iroquoian* and *Muskhogean; Chipwyan, Assiniboin, Mohawk,* etc. Of all the Indian stocks of North America none have made a greater impression upon the whites (French and English) than the Algonkian. This is seen when we remember that Powhatan and Pocahontas, King Philip, Pontiac, Tecumseh, Black Hawk, etc., the Indians who have appealed most to our historians, novelists, and dramatists, have all been of Algonkian lineage. This stock has also contributed to the vocabulary of spoken and written American-English some 140 words, of which many are hardly felt to be of Indian origin: *Carcajou, Caribou, Caucus, Chipmunk, Hickory, Hominy, Manito, Maskinonge, Menhaden, Moccasin, Moose, Mugwump, Opossum, Pappoose, Pemmican, Persimmon, Powwow, Pung, Raccoon, Sachem, Skunk, Squash, Squaw, Tammany, Terrapin, Toboggan, Tomahawk, Totem, Tump, Tuxedo,* etc. A people who have contributed to such a cosmopolitan tongue as English important words like *Caucus, Mugwump, Tammany,* and *Totem,* deserve more than passing mention. Our civilization owes to them also more material things than these,— tobogganning and lacrosse, canoeing (in large measure) and numerous devices of agricultural and domestic industry adopted by the early colonists from the aborigines. From the Algonkian Indians the whites also learned how to make maple sugar and maple syrup. (See AMERICANS.)

The Iroquoian stocks are famous through the confederacy of the "Five (afterward Six) Nations" and the great "League of the Iroquois" (so sympathetically studied by Morgan). Their physical characteristics at the time of the war of 1861–5 were such that they exceeded the recruits of all other races (white included) in points of excellences demanded by military requirements. The high position occupied by woman among the Iroquois lifts them above many of their Amerindian kindred. The story of the Iroquoian statesman of the 16th century, Hiawatha, and his founding of the League that was to end all war and unite all the nations in one lasting bond of peace is a historical fact, which Longfellow's confusion of the Iroquoian patriot with the Algonkian demi-god Manabozho cannot altogether obscure. In political and social organization the Iroquoian tribes attained a position that was largely *sui generis.* The tale of their long struggle to preserve their independence against the whites will be found in Morgan and Parkman, while the Jesuit Relations contain their reaction to the efforts of the missionaries to convert them to the Christian faith, as well as the account of the fratricidal strife resulting in the extermination of the Hurons. The fame of the Iroquoian tribes (for example, Mohawks) as fierce warriors has caused the general public to neglect them in other respects. Through the researches of Horatio Hale and others it has been shown that the Cherokee of the Carolinas (recently so well investigated by Mooney) belong to the Iroquoian stock, together with several minor tribes in the south Atlantic region. This stock has produced a number of eminent men: Hiawatha (q.v.), Red Jacket (q.v.), Joseph Brant, and Dr. Oronhyatekha (q.v.), the present head of the Independent Order of Foresters; J. N. B. Hewitt, of the Bureau of American Ethnology at Washington, is also of Iroquoian blood. Sequoia, the half-blood Cherokee, who invented the alphabet now in use by his people, deserves mention here likewise. As compared with the prominent part played by them in the French-English and colonial wars, and in the Revolutionary War, War of 1812, etc., the Iroquoian people left little impression upon the culture and the speech of the English in America,— the words from their language which have crept into our own have been originally place-names: *Chautauqua, Concstoga* (horse), *Saratoga* (trunk), etc. To the French of Canada they have given a few more words. In the place-names of the region about lakes Ontario and Erie (Ontario, Niagara, Erie, Cataraqui, Oswego, Cayuga, Seneca, Onondaga, Tuscarora, Oneida, Ticonderoga, Tonawanda, Genesee, Ohio, etc.) the Iroquoian peoples are generously remembered, while their Cherokee kinsmen in the south have likewise left their impress upon the topographical nomenclature of the country. In both New York and Ontario, where considerable numbers of Iroquois still live, with no immediate danger of dying out, but particularly in the latter province on the Grand River Reserve, the pagan and Christianized Iroquois have existed side by side in the same community for so long a time as to make this phenomenon, the details of which have been pointed out by David Boyle, of great value to sociologists. See CANADA, INDIANS OF.

The Muskhogean stock (Choctaws, Chickasaws, Creeks, Seminoles, etc.) as their subsequent career in the "Civilized Nations" of the Indian Territory with the Cherokee has shown, are among the most gifted intellectually of the aborigines of America. Gatschet notes as characteristic of this stock: Their color-symbolism for peace and war, their totemic system, the use of the "black drink," the doctrine of the "Master of Life," sun-worship, mound-building (some regard this stock as having been one of the so-called "Mound-Builders"), the ceremony of the *busk*, etc. This stock has had many intertribal wars, and the Creeks and particularly the Seminoles of Florida are famous for their contests with the whites.

The Siouan stock (Crows, Mandans, Assiniboins, Hidatsa, Sioux, Winnebagos, Omaha, Tutelos, Catawbas, Biloxi, etc.) are noteworthy by reason of their migration from the Atlantic slope in the region of the Carolinas to the trans-Mississippian and Missouri country, where their culture was conditioned by the presence of the buffalo and the adoption (from the whites) of the horse. Their wars with the surrounding tribes, particularly the Algonkian, and their subsequent numerous collisions with the whites (Minnesota massacre of 1862, the troubles in which Sitting Bull figured, etc.), are matter of history. The use of buffalo-skins made it possible for some of the Sioux tribes to develop pictography to a high degree. The researches of J. Owen Dorsey and Miss Alice Fletcher have shown the Omaha in particular to be gifted with a religio-social consciousness of a marked character, reflected in their name-giving and the ceremonies associated with the passage from childhood to manhood, in which individuality is much emphasized. That their capacity for producing men of ability is not confined to those of the primitive type (Sitting Bull) is indicated by the way in which individual members of this stock (Dr. Eastman, La Flesche, the collaborator of Dorsey, etc.) have responded to the stimuli of modern culture. The Dakotan federation is well remembered by the names of the twin States of the Northwest; Minnesota, Nebraska, etc., are terms of Siouan origin; while the minor place-nomenclature of the northwestern States contains a multitude of names from the same source.

The Shahaptian stock is noteworthy on account of the Nez Percés and the famous chief Joseph (still living), one of the most remarkable Indians of any age, whose "retreat" in 1877 has been compared to the celebrated march of the Ten Thousand of old.

The "Pueblos" Indians, as they are called from their village life, have risen in New Mexico and Arizona above the stage of savagery into a state of semi-civilization, representing the triumph of man over the adverse conditions of the desert and the inroads of fierce enemies of the lowest culture. Their relations to the so-called "Cliff-Dwellers" has been the subject of some ethnological speculation. (See PUEBLOS.) The diversity of culture among the Pueblos is not as great as that of speech. Besides the Moqui or Hopi, who belong to the Shoshonian stock, there are found in the Pueblos group three other distinct linguistic stocks,— Keresan, Tañoan and Zuñian. The Pueblos culture has apparently been developed independently in several local centres, and the studies of Bandelier, Hodge, Fewkes, Cushing, etc., have thrown much light on the origins and interrelations of stages of culture largely the reflex of environment.

The Shoshonean or Uto-Aztecan stock offers the most wonderful contrasts in its members of any Amerindian stock. Linguistic and other evidence appears to justify the conclusion that not only certain peoples of the Sonoran country (Cahitas, Coras, Tepehuanas, etc), some of whom achieved a sort of half-civilization in contact with their more cultured neighbors, but the Bannacks, Shoshones, and Utes (even the wretched "Root-diggers") are kith and kin with the ancient Aztecs upon whose civilization Cortes intruded, and the tribes of Nahuatl lineage who carried that culture more or less from central Mexico to beyond Lake Nicaragua. The change from the low type represented by the Utes to the high type of the old Mexicans may have been due in large measure to environment. Intermediate stages are represented by some of the Sonoran tribes. The Mexican or Aztec branch of this stock has furnished to English and other civilized languages a number of interesting and valuable words: *Axolotl, chocolate, coyote, cacao, tomato, ocelot, chilli, copal, chinampa, jalap*, etc. The Moqui group of the Pueblos Indians belong also to the Shoshonean stock.

The Mayan stock (Cakchiquels, Huastecs, Tzotzils, Kekchis, Quiché, Tzendals, Mayas, etc.), creators of the civilization destroyed by the Spaniards in Central America, left, besides graven monuments in large numbers, other evidences of their having invented a system of "writing," which is the nearest approach by any of the aboriginal peoples of America to a phonetic method of record,— the solution of the Mayan hieroglyphics is perhaps *the* question of American archæology. Their calendar-system, nagualism in religion, and the important role of woman in religious and social functions, deserve especial notice. The recent explorations of the Peabody Museum (Cambridge) have resulted in many new discoveries.

Central and South American Stocks.— The Chibchan stock, whose culture varied from that of the savage Aroacos of the mountains of Sta Marta to the civilization of the country about Bogota represent a rise from barbarism independent of that to the south in Peru, etc. There is some reason to believe that the "gold-culture" of the Chiriqui country and allied remains in the same region to the borders of Nicaragua may be due to the Chibchan stock,— the Talamanca, Guaymi, and a few other dialects of Costa Rica, etc., show affinities with Chibchan tongues. Their use and working of gold were of a high order, but neither in architecture nor in pictography could they compare with the Peruvians, the Mexicans, and the Mayas. They had a characteristic hero-legend of Bochica, and a tale of the great flood. The shrine of Lake Guatavita was a famous religious resort. Some of the famous "El Dorados" were in their territory. The Quechuan stock, which is best known through the civilization of the Incas, superimposed upon an older, widespread culture, represents but one phase of higher human activity in the Peruvian area. The extension of Quechuan language especially von Tschudi and Brinton agree in attributing not to the military achievements of this people, which antedated the

A GROUP OF UTE INDIANS.

coming of the Spaniards by only a few centuries, but to intellectual and culture influences millenniums old. The marks of their language can be traced from near the equator on the north to the Pampean tribes on the south. Common in the Peruvian area seem to have been a highly developed agriculture (stimulated, as in the southwestern United States, by the necessity for irrigation and artificial treatment of the soil),—maize, tobacco, potatoes, cotton, etc., the breeding of the llama and the paco, the making of pottery (useful and artistic), metal-working of a fine and ingenious sort, stone architecture more massive and imposing than artistically beautiful, or of the highest order as regards decorative art. The Inca form of government was never probably so far removed from the system common to most of the American stocks as some writers have believed. The Incasic conquest has caused the Peruvians to be styled the "Romans of America," but the analogy is misleading. Beyond the use of picture-writing and the employment of the quipu (knotted colored strings) for purposes of record, the Peruvians had not advanced, and the semi-phonetic system, like that of the Mayas, was not developed by them. Ancestor-worship and sun-worship (state religion) were professed by the Peruvians, but the most far-sighted of their thinkers touched almost upon monotheism. The hero-god of the Peruvians was the sea-born Viracocha, about whom centred a rich and imaginative mythology. The mixture of races in the production of ancient Peruvian culture is indicated by the diversity of cranial type among the skulls from the old burial grounds and mummy-caves. North of the Quechuas, on the coast about Trujillo, were the Yunca-Chimus, etc., whose civilization is represented by the ruins of Gran Chimu and other remains in the valley of Trujillo, which preceded the period of Inca domination. Southeast of the Quechuan culture was that of the Aymaras on the Andean table-lands. To them are usually assigned the ruins of Tiahuanaco, near Lake Titicaca, which in their completeness were probably the most imposing structures raised by the hand of aboriginal man in America,— in architecture they differ in several notable ways from the buildings of Inca origin. Dr. Uhle has very recently sought to show the "succession of cultures" at Pachacamac, Trujillo, and their relations to that of Tiahuanaco. The Peruvian tongues have furnished modern English, etc., many words: *guano, condor, alpaca, pampa, paco, llama, coca, quinine, jerked* (beef), *vicuña*, etc.

In the northern part of the Argentine Republic (Province of Jujuy, etc.) the architectural and archæological remains brought to light by recent investigators (Ambrosetti in particular) indicate the presence of a "civilization,"—village life in a desert environment, offering striking analogies with the culture of the Pueblos Indians of Arizona and New Mexico. This Calchaqui culture is evidently much more than the mere reflex of Quechuan-Aymaran conquest which it was formerly considered to be. Its origin and growth, however, remain to be clearly demonstrated.

The Araucanian stock, whose language has been studied by Lenz, are famous for their long resistance to the Spanish arms (the story of the "conquest" has been written in the last few years by Guevara), part of which gave rise to De Ercilla's epic of 'La Araucana.' To the Araucanian stock belong tribes on both sides of the Chilean Andes and a number of the nomadic peoples of the Pampas, where they seem to be intruders rather than aborigines. Chilean Spanish has borrowed many expressive terms from Araucanian.

The Patagonians, Tzonek, or Tehuelche, famous since the time of Pigafetta as "giants" (many of them exceed six feet and some are said to reach seven). To them belongs the "Setebos" of Shakespeare's 'Tempest.'

The Tapuyan stock of Brazil is looked upon by some authorities as the oldest people of the continent — some would affiliate with them the Fuegians, in this respect — representing a race once inhabiting a great part of South America. The man of the caves of Lagoa Santa and the man of the remarkable *sambaquis* or shell-heaps of the Brazilian coast are by many authorities considered to have related to the Tapuyans. Characteristic modern Tapuyans are the Botocudos, so called from the labret they wear in the lower lip. According to Ehrenreich, some of these ancient men of Brazil show affinities with prehistoric man of eastern Europe.

The Tupian stock (or Tupi-Guaranis, as they are also called), whose language was much used by the missionaries for general intercourse with the natives and is the basis of the *ligoa geral*, or "common language" of the region of the Amazons, were perhaps the highest in culture of the Brazilian tribes, having the elements of agriculture, village life, pottery (well developed and rather artistic), urn-burial, etc., but nothing beyond the Stone Age. Intermixture with both whites and negroes has taken place in the Tupi area, and the rich and imaginative tales of animals, etc., belonging to Tupi mythology have thus been given a wider extension, while negro and white influences have made themselves felt, both on the language and the literature of these people. According to Hartt, the Tupi language has influenced the Portuguese of Brazil quite as much as has the latter the former. Tupi-Guarani speech has furnished to the various European tongues a considerable number of words — to English, *ipecacuanha, jaguar, tapioca, tapir, toucan*, etc.

The Cariban stock were long famous for their cannibalism (the word *cannibal* is a corruption of one of their ethnic names), real and attributive, and their skill in making and using canoes. The shaman, or medicine-man, had great power among them, and they practised the curious and remarkable custom of the *couvade*. Rock-inscriptions and pile-dwellings are found in their territory. Some of them have been reduced to sad straits by the contact of the whites, but some of the Venezuelan tribes of this stock are still good, typical representatives of the American Indian.

The Arawakan stock, through its representatives (the Bahamian Lucayans, the natives of Haiti, Porto Rico, Cuba, etc.), was the first of the aboriginal peoples of the New World (exclusive of Greenland and Labrador) to come into contact with the white race, and likewise the first to come under its devastating influence. Many of the tribes of this stock were of a mild and gentle disposition, good agriculturalists, pottery-makers, workers in stone, wood and gold, and excellent canoe-men (the word canoe comes from an Arawak dialect). They were

users of cotton, and to them we owe the first Indian invention adopted by the whites (*hammock*, both name and thing are Arawak). From the Arawaks, too, the Spaniards first learned the use of tobacco. Like the Caribs they practised the *couvade*. The name of the stock is said to mean "flour-eaters," on account of their use of cassava, which has also passed over to the white. The Arawak and Carib stocks have furnished to English and to the other civilized languages of Europe a large number of important words, the exact ethnic distribution of which is not easy to determine with exactness: *Agouti, anotto* (and French *roucouyenne*), *barbecue, cacique, caiman, cannibal, canoe, cassava, colibri, hammock, hurricane, iguana, macaw, maize, manati, potato, tobacco,* etc. And with these names has gone the use of many of the things indicated and made known for the first time to Europeans. The debt of the Spanish and Portuguese settlers of South America and the West Indies is in these respects very great, for, naturally new fruits, plants, trees, etc., and many of their products came to be known by their aboriginal names or by corruptions of them. Thus a number of "balms" and "balsams" and other medicinal products retain in the pharmacopœia names of American Indian origin — *copaiba, tolu,* etc. Timber-trees, ornamental and dye-woods, have also largely kept their native appellations throughout Central and South America — the list would run into the hundreds. Large also is the catalogue of birds and other animals bearing Indian names.

Original Habitats.— The question of the original habitats of the important aboriginal stocks is one of the most interesting in American ethnology and archæology. The researches of Rink and Boas in particular seem to have demonstrated that the primitive home of the Eskimo was in the region west of Hudson Bay, whence they spread northward and westward to Alaska, etc., and eastward (north and south) to the Arctic islands, Greenland and Labrador. See Eskimos.

The earliest habitat of the Athapascans was in northwestern Canada, to the westward of the home of the Eskimo. From there they migrated over the lake country, across the Rockies to the southward, leaving colonies along the Pacific to northern California, and sending out, through Arizona and New Mexico to the borders of the Nahuatl territory, the important branches of the Apaches and Navaho — the raids of the Apaches often reaching far into Mexico.

The original habitat of the Algonkian stock was, as Brinton and Hale have assumed, "somewhere north of the St. Lawrence and east of Lake Ontario," while that of the Iroquoian lay "between the lower St. Lawrence and Hudson Bay." The final result of the migrations and wars of these two stocks was to leave the Iroquois of the Ontario-Erie country entirely surrounded by Algonkian tribes. From their primitive home the Algonkian sent out numerous branches west, south, southwest, etc., making the extent of territory covered by them very large, and bringing them into immediate contact with many other Indian tribes and with the white settlers over a vast area. The Iroquois (in the Cherokee and the kindred tribes of the south) had branches, which were so separated from their northern kin as to be long taken for non-Iroquoian peoples.

The Muskhogean stock, according to Gatschet, have been from time immemorial inhabitants of the country between the Appalachian Mountains, the Atlantic, the Gulf of Mexico, and the Mississippi. The scene of their earliest development was in the neighborhood of the Mississippi, or possibly even beyond it.

The chief migrations of the Caddoan (Pawnee) peoples have taken place in historical times northward and southward from the Platte River, from which region they expelled in part the Siouan tribes, etc. If their own traditions are reliable, their primitive home lay farther to the south, on the Red River of Louisiana.

The primitive home of the Siouan stock (characteristic Plains Indians since the introduction of the horse) was eastward in the region of the Carolinas. This fact has been revealed by the study of the Tutelo and Catawba languages belonging to this eastern area, and by inspection of the traditions of the various Siouan tribes. The main bodies of Siouan migrants followed the Ohio and the Missouri far to the north and west; the Mandans, Assiniboins, etc., reaching to within the borders of Canada. Other minor bodies traveled to the southwest, their representatives still existing in the Biloxi, etc., of southeastern Mississippi. The Siouan tribes seem to have followed the buffalo in its retreat westward, and their migration from the Carolinas is of considerable sociological interest. At one time their trans-Mississippian habitat included practically all the territory between the Arkansas and the Saskatchewan from the great river to mid-Montana, with the Winnebagoes jutting out on Lake Michigan. Their forays and trade-excursions led some of them from time to time across the Rocky Mountains — the present writer, in 1891, met a friendly party of them far within the Kootenay territory.

The original habitat of the Shoshonean or Uto-Aztecan stock, which embraces the Ute, the Sonoran, and the Aztecan (Nahuatl) peoples, and has representatives from the north of Idaho to the Isthmus of Panama, was probably somewhere in the northwestern section of the United States. The primitive home of the Shoshonean section was "somewhere between the Rocky Mountains and the Great Lakes," and the traditions of the other two branches bring them from the far north, as compared with their present southern abode.

The Mayan stock, creators of the civilization of Central America, according to their own traditions, came from somewhere to the north,— the position of the Huastecan branch of this stock north of Vera Cruz suggests that the Mayan emigrants from the home-land skirted along the Gulf of Mexico from some region considerably to the north.

The Arawakan stock (including the natives of the Bahamas and the Antilles, except the intrusive Caribs) had an extension in South America comparable only to that of the Algonkians and Athapascans in the northern half of the continent,— from the high Paraguay to the Goajiran peninsula in Venezuela, and in its greatest expansion from the Xingù to the Amazon and Orinoco. Its primitive habitat was in some part of the Brazilian interior, probably between the Xingù and the Paraguay, the general trend of their migrations having been northward. The Cariban stock, another very extensive people, who at the time of the Colombian

PICTURE WRITING OF THE OJIBWAY INDIANS.

discovery were to be found in the smaller West Indian islands, and the northern part of the continent from the Essiquibo in Guiana to about the Isthmus of Panama, came originally, as the presence of the Carib Bakairi on the Xingù indicates, from the high interior of Brazil, at the sources of the Xingù and Tapajos.

The Tupian stock were widely extended at the time of the discovery along the Atlantic coast region from the La Plata to the Amazon, with branches scattered along the Paraguay and the Madeira to the foot of the Andes. Their primitive home, Brinton, with reason, assumes to have been in the central highland country to the east of Bolivia. The general direction of the earliest migrations of this stock was therefore southward (down the Paraguay to the Atlantic), after which the Tupi branch followed the coast to the Amazon. The Tapuyan stock, who once occupied the region between the Xingù and the Atlantic coast (from the latter they have been driven by the Tupis), are probably the oldest human residents of part of this area, their tenure of the seacoast reaching far back into prehistoric times.

The Chibchan stock, to which was due the civilization of the Bogota region of Colombia, had their original habitat in the Andean highlands of central or southern Colombia, whence they wandered northwest into the Isthmus of Panama and northeastward up the Magdalena.

The Quechuan stock, authors of the most remarkable of South American civilizations, according to their own traditions spread from vtry small beginnings in the country about Lake Titicaca; but von Tschudi and Brinton, for linguistic reasons chiefly, find the primitive home of this people to have been in the extreme northwest of their characteristic area. The Aymara stock, which some authorities consider to have been a branch of, or perhaps an older member of the Quechuan, had its original habitat to the southeast of the latter. The relation of the Aymaran stock to that which produced the Calchaqui civilization of the northern Argentine is not clear.

Language and Writing.— Although the languages of the American aborigines constitute so many independent families of speech, the vocabularies of which are entirely divergent one from another, nearly all (if not all) of them posseŋs centain general grammatical characteristics which justify us in classing them together as one great group of human tongues. Brinton enumerates as points of resemblance: Development of pronominal forms, fondness for generic particles and for verbs over nouns, and incorporation,— the inclusion of subject or object (or both) in the verb, etc. Most American Indian tongues may be called "holophrastic," from the practice of compressing a whole "sentence" into a "word," the length of which is sometimes very remarkable. As an example may be cited the Micmac Algonkian) *yălcoolemăktâwepokwŏse*, "I am walking about carrying a beautiful black umbrella over my head." This word, according to Rand, is derived from *pokwŏsŏn*, "an umbrella"; *mâktāwāe*, "I am black"; *wolāe*, "I am beautiful"; *yăleā*, "I walk about." From the Kootenay language may be cited: *Nātltlāmkinē*, "he carries the head in his hand" (*n*, verbal particle; *ātl*, "to carry"; *tlām*, composition form of *āaktlām*, "head"; *kin*, "to do anything with the hand"; *inē*, verbal); *hinūpqanāpinē*, "thou seest me" (*hin*, "thou," (subject pronoun); *ūpqa*, "to see"; *āp*, "me" (object pronoun); *inē*, verbal). As typical incorporative languages the Iroquoian and Eskimo may serve. All the incorporative forms of speech in America do not, however, proceed upon identical lines; and some that do incorporate, like Kootenay and Eskimo, often have one or more cases. According to Dixon and Kroeber many Californian languages do not possess the feature of incorporation at all (such are, for example, Maidu, Pomo, Yuki, etc.). As types of incorporating languages less complete than Iroquoian we have Kootenay, Siouan, Aztecan. Some of the Central and South American tongues seem also to have little incorporation. Otomi and Maya appear to be evolving in somewhat the same direction as modern English, away from incorporation and grammatical plethora. Many of the Amerindian tongues are both prefix and suffix languages; others prefer prefixes, others, again, suffixes. Some possess, and some do not, a plural form for nouns; a dual; gender-distinction in pronouns; a high development of demonstratives; reduplication; syntactical cases, etc. A few possess grammatical gender and some exhibit differences in the words used by men and women. In the matter of phonetics the languages of the American aborigines are remarkably divergent, some being extremely harsh, guttural and consonantic, others equally smooth, soft, and vocalic. The absence of certain consonant sounds and the equivalence of certain vowels and consonants characterize some forms of American speech. Euphonic changes are of major or minor importance. Sentence-construction differs greatly in various tongues. The position of the adjective is not always the same. The Haida language has even a distinction like that between our *shall* and *will*. Careful investigation of the many Indian languages, as yet studied imperfectly, if at all, may reveal other interesting linguistic phenomena. How much has been written about and in some of the languages of primitive America may be seen from the bibliographies of Pilling! Our knowledge of them varits from a brief vocabulary of the Esselenian to the exhaustive dictionary of Yahgan compiled by Bridges. The native literature runs from the unrecorded tales of the northernmost Athapascans to the poetry of the ancient Mexicans and Peruvians, some of which has been handed down from pre-Columbian times. The only actually phonetic (syllabic) alphabet now in use among the Indians (except the syllabaries introduced by missionaries among the Athapascans, Crees, etc.) is post-Columbian, — the invention of a half-blood Cherokee. A sort of alphabet has, however, sprung up more recently among the Winnebagos. The development of picture-writing varied very much among the numerous tribes, as may be seen from Mallery's classic study of the subject. Sometimes, as is the case with the Kootenays, ability to draw does not seem to have been accompanied by exuberant pictography. The Walum Olum of the Delawares, the "calendars" of the Kiowa, Sioux, Pima, etc., are special developments of primitive records, the highest form of which is seen in the manuscripts ("books") of the Aztecs and Mayas of a religio-historical character. The pictographic records of the Ojibwa "medicine men" have been studied by

Hoffman, and the rite-literature of the Cherokee by James Mooney. The native literature of primitive America has been the subject of special monographs by Dr. D. G. Brinton. The Spanish-American countries have furnished several writers and investigators of Indian descent.

Religion.— The mythology and religion of the American Indians have received particular treatment at the hands of Müller, Brinton, Powell, etc. Perhaps the most general myth of importance is that of the divine hero, teacher, and civilizer, who after accomplishing his labors, leaves the earth, promising to return at some future time. This myth is found in Mexico (Quetzalcoatl), Yucatan (Kukulkan), Colombia (Bochica), northeast North America (Manabozho, Gluskap, etc.) Somewhat analogous is the myth of the twin reformers of the primitive world among the Pueblo Indians, Navahos, etc. The Iroquoian stock have the myth of the contest of the good and the bad mind. The Algonkians have a myth-cycle of the rabbit, the tribes of the northwest Pacific coast one of the raven and thunder-bird, the Rocky Mountain peoples one of the coyote, the Brazilian Indians one of the jaguar, etc. Some of the tribes are very rich in animal myths and, as Mr. Mooney asserts, the characteristic tales of "an 'Uncle Remus' nature" found among the Cherokee and other peoples have not, as many suppose, been borrowed from the negroes of the South. Even the famous "tar-baby" tales have their independent Amerindian analogues. Flood-legends are widespread in America and vary from the simple, locally colored stories of rude Athapascans to the elaborate conceptions of the civilized peoples of Mexico, Central America, etc. The cardinal points and the number four have developed with many tribes a rich symbolism, with which the chief colors are often connected.

The "medicine men" of the Ojibwa, the Cherokee, the Apache, have been investigated by Hoffman, Mooney, and Bourke, and a large amount of accurate and authentic information concerning shamanism among the Amerindian peoples has been accumulated. The power of the "medicine man" varies much from tribe to tribe,— with some he is a personage of little or no importance; with others he is the controlling influence in secular as well as in religious affairs. The acme of such influence is found among some of the tribes of Guiana and Brazil. These "medicine men" had often their secret societies and "lodges" into which chosen neophytes were admitted with appropriate ceremonies. They had also, with many tribes, the control of the rites to which the youth were subjected at the time of puberty, with others they performed such marriage ceremony as existed. Besides these shamans, there were "prophets" and religious reformers, especially since contact with the whites. The widespread "Ghost Dance," in its more recent outbreaks, has been studied in detail by Mooney. Worthy of note is also the "new religion" of the Iroquois, and the "Shaker" religion of the Indians of Puget Sound. The investigations among the Pawnee by Miss Fletcher and G. A. Dorsey have demonstrated the existence of a relatively high form of primitive religion in a rather unexpected quarter,— their worship of the morning star in connection with agriculture was, however, at one time accompanied by human sacrifice. The mortuary rites of the American Indians, corresponding to diverse ideas of the soul and its future in the other world, varied from simple neglect of the corpse to what is represented in material form by some of the mounds of the Mississippi Valley and the stone tombs of Peru. The mortuary customs of the aborigines of North America have been made the subject of a special monograph by Dr. Yarrow, and the doctrine of "animism" among the South American peoples has been treated at length by Koch. The contemplation of the *totem* (properly Ojibwa *ododema*),— tribal or family mark,— of certain Algonkian tribes has given rise to theories of "totemism," concerning which there is much dispute in the world of science. "Fetishism," as exemplified in the Zuñis, has been investigated with some detail by Cushing. Cannibalism (the word *cannibal* is the corrupted form of a South American tribal name) has been rarer in America than is generally believed. Outside of its occurrence through necessity in ways known to civilized peoples, it was chiefly partial and ceremonial. Epicurean cannibalism flourished along the coast of South America and on some of the Caribbean islands; ritual cannibalism among certain tribes of the northwest Pacific coast, in ancient Mexico, etc. The almost extinct Tonkaways of Texas have the reputation of being the "last of the cannibals," while the Attacapas owe their name to this practice attributed to them by their neighbors. In the legends of the Cree and Ojibwa tribes of the Algonkian stock, a cannibal giant (wendigo) figures, and a horror of human flesh eating is expressed at the present time, whatever may have been the case in the past. From the condition of human bones and other remains in the shell-heaps of various parts of the coast, some authorities have come to the conclusion that cannibalism did exist in prehistoric ages among some of the Indian tribes. Religious ideas approximating to monotheism are attributed by some chroniclers and investigators to some of the more enlightened aboriginal rulers of Mexico and Peru. In these regions of the continent, as also in Central America, architecture and the arts of commemoration and record were at the service of religion. See MYTHOLOGY.

Amusements.— The games of the American aborigines, some of which, like lacrosse, have passed over to their conquerors, are of sociological and religious significance in many instances. Stewart Culin has made a special study of the games of the North American Indians, and rejects the theory favored by Tylor and others, that many of them (for example, Mexican *patolli*), are imports from Asia. The games of the civilized Aztecs seem to be but "higher developments of those of the wilder tribes," and those of the Eskimo are modifications of games found among other aboriginal peoples of America. Among characteristic Amerindian games may be mentioned: The gambling game with sticks, the hoop-and-pole game, the ball-race of the southwestern United States, the ball-games of eastern North America, the woman's game of double ball, foot-races, the snow-snake, etc. Culin holds that back of every game lurks "a ceremony in which the game was once a significant part." The variations in games do not follow linguistic lines. One centre whence games have radiated and where some of their oldest forms are still to be found, is in the southwestern United States, from which their migrations can

be traced north, northeast, east, and south. Interesting modifications arise from conditions of environment.

Arts and Inventions.— The arts and inventions of the American Indians correspond to the extent and variety of their environment. The mass of the inhabitants of the continent at the time of its discovery were hunters and fishers, or agriculturalists of the Stone Age, most of whom had some knowledge of pottery-making. The house followed the lines of climate and culture, from the snow *iglu* of the Eskimo and the rude *wickiup* of the Utes to communal houses of the Mohegans, the Iroquian "long-house," phalansteries of the Pueblan and Central American areas, and the stone dwellings of a more or less pretentious sort of the civilized peoples of Mexico, Central America, and Peru. The cavate lodges and cliff-dwellings of Arizona and New Mexico, the wooden (sometimes underground) houses of the northwest Pacific coast, the skin-tents of the plains tribes and the wigwams of the Algonkians, the earth-lodges of the Mandans, etc., correspond to environmental stimuli. A like variation may be seen in the cradles of the American aborigines, studied by Mason, and in their means of transport on the water,— kayaks, "bull-boats," woodskins and balsas, dug-outs, canoes of pine and birch bark, large and small, and of all varieties of design and finish. In North America the Algonkians and Iroquois, and in South America the Indians of the great Brazilian water-ways, have made themselves celebrated for their skill in navigation. So too has the Eskimo with his kayak and the Peruvian with his balsa. The Algonkian Etchemins are literally "the canoe-men." The seagoing canoes of the fishing tribes of the coast of Alaska and British Columbia also deserve mention. On land some of the American Indian tribes have used the dog (Eskimo in particular) and the sled (the Algonkian toboggan, adopted by the whites for amusement purposes, is a special form), while in Peru the llama has been employed for ages for "packing," but not for draft purposes. The use of the horse and the modifications of primitive culture thereby induced in the Indians of the plains of the Missouri-Mississippi valley, the llanos of Venezuela, the pampas of the Argentine, etc., are, of course, post-Columbian. So, too, the influence of sheep culture upon the Navaho and their primitive industries, and of the cow among certain South American tribes. The only animals domesticated by the Indians whose use amounted to a considerable factor in their social and religious life were the dog and the llama, the latter in Peru and Bolivia only. The other half-domesticated animals and birds are of little importance as culture elements. The domesticated dogs of pre-Columbian America represent several diverse species of *Canidæ*. The absence of such domesticated animals as the cow, the horse, the sheep, etc., in pre-Columbian America accounts for certain limitations of its culture as compared with that of the Old World. Pets, however, bird and beast, were very common, especially in Brazil and Guiana. The disappearance of the wild buffalo and other animals of the chase, since the coming of the whites, has been fateful for some tribes,— the contact with the latter as represented by the various "fur companies," etc., has caused many changes in the life of the aborigines, seldom for the better.

As Mason has pointed out, the Amerindian traps and other devices for the capture of wild animals indicate intellectual skill and marvelous adaptation to the habits and actions of these creatures. The Eskimo harpoon and its appurtenances, the simple and composite bow, the arrow-poisons of some North American and many South American peoples, the manufactures of obsidian and jade in ancient Mexico, cotton weaving and dyeing in the more southern regions, maguey-paper making in Mexico and Central America, stone carving (from Mexico to the Argentine), feather-work (in the southern United States, Mexico, Central America, and parts of South America), gold working (in the Isthmian region, Colombia, etc.), the hammocks of the Venezuelan tribes, the fish-poisoning devices of many peoples of South America in particular, the fine pottery of many regions of the continent, the *quipus* or knotted record-strings of the ancient Peruvians, the primitive drum-telephone of certain Brazilian Indians, the blow-gun (southeast United States and South America), cassava preparation (northern South America), the bolas of the Pampean tribes, etc., represent the diversity of invention and manufacturing skill among the American aborigines. The lamp of the Eskimo and some of the Indian tribes of northwestern North America is *sui generis* (its importance has been emphasized by Hough). Methods of computing time, season, etc., vary from the slanting stick of the Algonkian Naskopi to the elaborate calendar systems of Mexico and Central America. Of musical instruments, the drum, the flute, the pan-pipe, and the "musical bow" were known to the American Indians. Songs and dances to the accompaniment of these were in vogue. Practically all stages of primitive culture were to be found in pre-Columbian America, if we may judge from the tribes now surviving, from the savage Seris to the ancient Mexicans, Mayas, and Peruvians. Moreover, within the bounds of the same linguistic stock, as noted above, there may be found tribes representing a high and a low stage of development; as for example, the Aztecs and the Utes of the Shoshonean stock, the Dogribs and the Navahos of the Athapascan, etc. Some tribes were pre-eminently fishers, others hunters. Many excelled in both, like the Eskimo and some of the peoples of the northwest Pacific coast. Some sort of agriculture was widespread in America — the cultivation of corn, beans, varieties of pumpkin and squash, etc., was known all over eastern North America, and the regions of the southwest, etc.; and typical tropical and semi-tropical and other plants and fruits (potato, tomato, maize, pine-apple, tobacco, varieties of cotton, manioc, sweet-potato, cacao, coca, etc.) were cultivated in the more southern regions of Mexico, Central and South America. The spread of tobacco and maize in North America and of certain other plants in Central and South America indicates agricultural receptiveness on the part of the many tribes concerned. The capacity of the American Indians generally for agriculture has been underrated probably, as both the desert-born cultivation of the Pueblos Indians and the tropically stimulated cultivation of the Indians of South America indicate. The arid regions of the Peruvian coast offer another example of considerably developed agriculture. In America the utilization of the gifts of earth varied from

the seed picking and root digging of the Utes to the market gardens and chinampas of ancient Mexico. How the necessities of agriculture can shape a religious system may be seen from the rites and ceremonies of the Pueblos Indians, the cult of "mother corn," etc. With some tribes tobacco was more or less of a sacred plant, also tht mescal.

Position of Woman.— The relation of women to agriculture gave them a higher standing with certain tribes than would otherwise have been the case. With the Iroquois the position of women was very high and to them was allotted a considerable share in the government, peace negotiations, etc., and female chiefs were by no means unknown,— women were the "mothers of the nation." Among the Mayan peoples of Central America woman's position was also high. Many of the priests were women, and they were also commonly the leaders of their tribes in rebellion against the Spaniards — the most famous was Maria Candelaria, "the American Joan of Arc," who led the insurgent Tzendals in the 18th century. In ancient Mexico and Peru the position of woman was perhaps not quite so high. Among some tribes the position of woman was very low, and her sexual peculiarities added to the disesteem in which she was held, as for example, among the Tacanan Araunas of Bolivia. The Athapascan tribes vary much in their treatment of woman,— with some she is little better than a slave or servant, while with at least one Alaskan people of this stock female chiefs existed at times. The "purification" of women at the period of their menses, and the segregation of girls at the time of puberty, were accompanied with many rites and ceremonies among various tribes from the rude Athapascans to the civilized Aztecs. The curious custom of the *couvade* (imitative child-bed on the part of the husband) prevailed among many Venezuelan, Guianian, and Brazilian peoples. The relations between environment and the share of the sexes in culture has been investigated by Mason; according to whom the zenith of virile Amerindian art is reached in Peru, while in Colombia we find woman as farmer, weaver, and potter. In the Oregon-California region one art, basket-making, reaches its acme of development in the hands of woman. A large female influence in religion is noticeable among the Pueblos Indians. Among some tribes, for example, the Hurons, the weregild for killing a woman was greater than that for a man. Some sort of matriarchal system, with maternal descent, prevailed very commonly in pre-Columbian America; among certain of the Koloschan Indians, for example, a man was considered to be in no sense related to his father, his sole parent being the mother. Besides this extreme form, numerous other varieties occur among the tribes now existing, the system in vogue among the Iroquois, etc., being more complicated and adapted to social needs. The systems of marriage known to the American Indians varied from the absence of any particular rite or ceremony to selection of the wife by the old women of the tribe, as among the Hurons, or the uniting of the couple by the "medicine men." Some of the tribes of the Brazilian forests, ranking very low in culture, are strictly monogamous; while peoples of higher civilization, like the Chibchans, Mexicans, Peruvians, etc., were polygamous or concubinative, or both. Marriage by purchase was found over a large area of America; but here as in other parts of the globe, the "money" received was often rather a compensation to the parents for the loss of their daughter than a real sale of her to a suitor. Divorce, in many forms, is known to the primitive Americans, both by mere word of the husband and according to set forms and rites. Consanguineous marriages were strictly avoided by many tribes; but among a few, such as some of the lowest Athapascans, incest was not condemned. In the matter of the sex-relations, as in many other fields, the American Indians exhibit almost all possible phases from the monogamic chastity of some of the lowest peoples to the unnatural indulgences of the Peruvians. Runaway matches and marriages for love, in spite of the contrary opinion entertained by some authorities, have been by no means uncommon throughout the continent. Suicide on account of unsuccessful wooing by both sexes is also not at all rare. Some peoples, too, have developed love-songs of a romantic order, for example, the *yaraveys* of the Quechuas.

Government.— The systems of government of the American Indians and their tribal organizations range from the simple democracy of the Kootenays and some of the Brazilian Indians to the elaborate state institutions of the ancient Mexicans and Peruvians, which in several respects resembled the corresponding institutions of mediæval Europe or the ancient classic world. The power of the chief, however, seems everywhere to have had limitations, and some tribes distinguished the permanent peace chief and the temporary war-chief. Chiefs were generally elected, either from the body of the tribe or from certain specified families. "Totemism" and secret societies are not found to any extent, if at all, among certain tribes (the Kootenay, for example); while with many of the peoples of the northwest Pacific coast they are perhaps the chief feature of aboriginal society, as Boas has recently shown. Property rights are represented in many stages, from the semi-anarchic Eskimo to the Aztecs of Old Mexico and other peoples of Central and South America. Slavery existed among many tribes, and on the northwest Pacific coast a sort of traffic in human chattels had arisen. See SLAVERY.

Trade and Commerce.— Within the spheres of the culture-centres of Mexico, Central America, Peru, etc., trade and commerce were well developed. The Columbia River region was the scene of a less developed trade; while the southeastern United States, the region of the Great Lakes and country west and south of them, had also their important distributing points. The region of Bering Strait was likewise an Asiatic-American commercial centre.

Education.— With the lower tribes generally, such education as was imparted to the children was given by the father to the boys and by the mother to the girls. Peoples like the Iroquois, the Siouan Omahas, etc., used the instruction of tales, legends, and proverbs. The ancient Aztecs and some of the other semi-civilized peoples of Mexico and Central America had schools for boys and others for girls, in which the duties proper to each sex were taught under the supervision of the priests.

Physical Characteristics.— The physical characteristics of the aborigines of America mingle uniformity with diversity. The skin color, popu-

larly styled "red" or "copper," is designated by Mantegazza, "burnt coffee," and by Brinton "brown of various shades, with an undertone of red." This but varies from rather dark to rather light. Among the lighter tribes have been reckoned the Koloschan Tlinkit, the Bolivian Yurucari, etc., and among the darker the Charmas of the Gran Chaco, the Bolivian Canisianas, and a few other tribes of South and Central America. The hair is generally termed "black," but, as Brinton notes, there is in it "a faint under-color of red," which shows up more in childhood and seems much more prominent with certain tribes than with others. Red hair is known among American Indians, but in some cases (certain South American tribes, for example), its occurrence may be due to infusion of white blood. The eyes of the Indians are, with rare exceptions, dark brown. The stature varies from rather low to rather high, represented on the one hand by some of the shorter Brazilian tribes and on the other by the Patagonian "giants." Among the peoples presenting many individuals of tall stature, may be mentioned the Yumas and Pimas, some of the Muskhogean tribes, some of the Crees, Ojibwa and eastern Algonkians, Pawnees, Iroquois, Siouans, Huaveans, Ramas, some of the Cariban tribes, Yurucari, Cayubabas, Guaycuruans, Patagonians, etc. So far as is known no dwarfish people comparable to the dwarf races of the Old World existed in America, although the skeletons from certain Peruvian tombs prove the existence of a dwarfish element in the general population; and the stature of many individuals among certain Brazilian tribes is so low as to induce some authorities, with Kollmann, to predicate the former existence of a dwarf race. In the relations of trunk and limbs and in the relation of one limb to another many variations occur among the Indians, due to occupation (canoeing, etc.,—and, since the advent of the whites, horse-riding). In primitive America all the chief forms of skull (often with artificial flattening, etc.) are found. Among the dolichocephalic (long-headed) peoples are the Eskimo and Iroquois generally, some of the Muskhogean tribes, Otomis, Aymaras (partly), Tapuyas, and Tupis (largely), etc. Of the brachycephalic (broad-headed) may be mentioned the Araucanians, Caribs, Arawaks, Patagonians, Mayas, many of the tribes of the Pacific coast region of North America, etc. The civilized peoples of Mexico, Central America, and Peru appear to have been of stature below the average and of varied skull form tending to brachycephalic, indicating mixtures of types. In the Columbia River region type-mingling is indicated also by both stature and skull-form. The Peruvian region is another centre of race-mixture, as evidenced by skull-form. The oldest skulls discovered in prehistoric burial-places or in geological *situ* are not distinct from the American types,—the latest found, the "Lansing skull," is quite Indian. The skull capacity of the Indian is below that of the white in general, but many exceptions occur. The brains of the less cultured Indian peoples (Fuegians, Eskimo), show no decided anatomical inferiority to those of civilized Europeans. Great varieties of build and set of body are found among the American Indians, from the half-starved Fuegians to the well-fed and corpulent Iroquois. Small feet and hands are very common. Among many tribes in various parts of the continent handsome men and women of considerable beauty are to be found. In the case of women an admixture of white blood often enhances their beauty.

Race-Fusion.—The intermingling of the American Indians with the intruding white race has been much greater than is generally believed. The extent of this fusion of races varies from certain parts of North America with their classic Pocahontas examples to Uruguay, in South America, where 90 per cent of the population are said to be of mixed blood. The Eskimo of Greenland have intermarried with the whites (Danish fathers, native mothers), so that except in the parts remote from settlements no pure-blood Eskimo exists; and the same is true of a good deal of Labrador, where the contact has been with fishermen of English descent. The Micmac, Abnaki, and related Algonkian tribes of Maine, New Brunswick, etc., have a large admixture of white blood (French fathers, native mothers), and all over Canada and the northwestern United States in the early days of colonization and exploration the French traders, trappers, *voyageurs,* and *coureurs des bois* mingled freely with the native women, particularly those of the various Algonkian peoples of the Great Lakes and the West. The Hudson's Bay Company, by introducing employees of English and Scotch descent into the Canadian Northwest, made possible other *métis,* of which those of Scotch descent on the father's side are said to be healthy and sturdy specimens of humanity, with more than ordinary capacities. As indicated by the present condition of the Iroquois on the reservations in Quebec, Ontario, and New York, some infusion of white blood has taken place from very early times. Here the combination of white mother (often an adopted captive) and native father is more common than is usual in race-mixture. The Cherokee had an admixture of white blood in ante-Revolutionary days, to which Mooney attributes much of their culture-achievement since that time. In Mexico, Central America, and South America generally, as Talcott Williams has very recently noted, the half-breed element is very large indeed, for the native population was never exterminated by the whites as some histories still teach. Of the 40,000,000 inhabitants of South America it has been estimated that less than 10,000,000 can lay any claim to pure white blood. There is reason to believe that the future of some of the South American countries will be as much in the hands of the Indians as in those of the whites. In Mexico, parts of Central America, Colombia, Peru, and Chile, the strain of Indian blood represents able and intellectual aboriginal peoples. In certain parts of South America, and, sporadically in northeastern North America, intermingling of Indians and negroes has occurred, giving rise to the so-called Cafusos, etc., of Brazil, and a few other small groups. The mixture of white-Indian-negro is also found here and there. In some of the Spanish-American countries there is a special vocabulary to designate the numerous degrees of *métissage.* In the Canadian Northwest the half-breeds have taken a prominent part in the development of the country (one noted *métis,* Norquay, was premier of the province of Manitoba), and they are likewise noteworthy in the annals of the northwestern United States. In Mexico and Central America, not alone the *métis* but

the Indians themselves have produced celebrated men. Juarez, the liberator of Mexico, a really great man, was a full-blood Zapotec, and President Barrios of Guatemala a Cakchiquel (Mayan stock).

Treatment by Whites.— The ill treatment of the American Indian by the whites has often been such as to stamp with eternal dishonor the conquering race. Massacres, broken treaties, land-robbing, commercial swindles, etc., mark the path of advancing "civilization," — English, Dutch, French, Portuguese, and Spanish have all been guilty at some time or other. The English in Newfoundland, the Americans in the West, the Castilians in northern Mexico and Yucatan, have exterminated or sought to exterminate whole tribes. We must, however, believe that the accounts of the early chroniclers concerning the "millions" of Indians slaughtered by the Spaniards, were the customary exaggerations of those who sing the victor's deeds. Peru and Mexico, for example, would not contain so many Indians to-day were those stories literally true. Against the centuries of dishonor in the treatment of the Indians by the whites, we may place the efforts of missionaries of all faiths, from the good Las Casas in New Spain to Duncan of Metlakahtla. The Jesuits among the Iroquois and Algonkians in North America, the Moravians among the Eskimo and some of the Algonkians and Iroquois, have all done good work, which only the incapacity or worse of governmental authorities has made null. The missions in California and the "reductions" in various parts of South America (Paraguay in particular) might have succeeded in keeping the Indians gentle and loyal sons of the Church had the good fathers been forever in charge, but the oncome of the more strenuous life of the whites doomed them to helplessness. The story of the Paraguayan experiment is one of the most interesting in the annals of mankind, but also one of the most disheartening. Against such failures a few bright spots may be set, — the Fuegian mission, for example; but even there all is not well. Signs of a better treatment of the Indians still within the borders of the United States are not wanting, and it is to be hoped that the present educational fads with which white children are being experimented upon will be kept far from the Indian schools.

Influence on Civilization.—The contributions of the aborigines of America to the world's stock of civilizing factors and influences are much more numerous and of greater importance than is generally thought. Besides the innumerable place-names in all parts of America of Indian origin, the Algonkian, Peruvian, Brazilian, West Indian, Guianian, Venezuelan, and Mexican words in English, French, Spanish, and Portuguese (whence many of them have spread into all the civilized languages of the world) are able remembrancers of the conquered race. The literature of the Spanish-American countries and of Brazil has been more or less affected by the stimuli of native theme and treatment. Many of the old dances and folk-customs still survive even where Christianity has been at least outwardly accepted and have sometimes been adopted by the descendants of the European colonists. The 'Hiawatha' of Longfellow, and the tales and dramas based upon the deeds, adventures and romantic episodes in the lives of King Philip, Pocahontas, Pontiac, Tecumseh, etc., to say nothing of the novels of Cooper and his successors, indicate that the Aryan mind of the Anglo-Saxon order has found treasure in the Amerindian soil. In Mexico and other parts of Spanish America the cathedrals and other religious edifices, by intention or by happy chance, often occupy sites sacred ages before the Columbian discovery to pagan deities, — so the new religion gathers strength from the old, and the dislocation of faith so common in Protestant countries is avoided to a very large extent. Of more material things, we owe largely to the Indian the paths over which our highways and our railroads run, while many of our cities and towns have only sprung up on the old camp-sites of our predecessors. The great importance of some of these "Indian ways" in the history of the United States has been pointed out by Hulbert. The Indians' knowledge of the great water-ways of the country, of portages and trails through forest and over mountain, has made possible colonization and settlement otherwise utterly out of the question. Indian hunters and fishers, scouts, guides, canoe-men, carriers and packers, in all sections of the American continent, have been indispensable to the progress of white civilization. Nor have Indian slaves and servants been few or without social significance in some quarters; while French, Spanish, and English have at times availed themselves of the services of Indian warriors, — the Iroquois enlisted for the North and some of the Cherokee for the South in the Civil War, and then the government has sometimes set one tribe off against another. In Canada and part of the northwest of the United States, where commingling of the races has taken place, the civilization of the land owes even more to the half-breed, *voyageur, coureur des bois,* etc., than to the Indian himself. (See CANADA.)

Throughout the continent — more especially, however, in parts of South America — devices for hunting and fishing and appliances in woodcraft, primitive agriculture, etc., were transferred to the European colonists during the period of settlement, and many of them are still in active use. Fish-poisoning by narcotics, the use of the blow-gun for killing birds and small animals without damaging the skin, methods of stalking beasts of the chase, certain traps and snares, etc., belong here. In connection with agriculture we have menhaden-manure, guano, etc., the planting of corn and beans or pumpkins together, the burning over of land before tillage, etc. But it is upon the food-supply of the world that the American Indian has exerted the greatest influence. Potatoes (common and sweet, both), maize, and the tomato, now in use by all the civilized world, were first cultivated by him and taken over by the whites after the discovery. Cacao, vanilla, jalap, the kidney bean, several varieties of squash and pumpkin, manioc, Jerusalem artichoke, coca, agave, quinoa, persimmon, and perhaps also the peanut, came to us from the Indians. Maple-sugar and maple-syrup, pemmican, jerked beef, etc., are from a like source. Tobacco, the great narcotic, was one of the first gifts of America to the Old World. Of drinks the American Indian has given us Paraguayan *maté,* "Labrador tea," and several other like concoctions, chocolate, Mexican *pulque,* and a considerable number of other intoxicating beverages from South America.

Many medicines and medicinal plants were made known to the whites by the Indians, and in the era of settlement and colonization the "Indian doctor" (male and female) was not unimportant, — New England, for example, had its "Joe Pye," after whom the "Joe Pye weed" (*Eupatorium purpureum*) is named. The Californian Indians have furnished perhaps the three most important contributions of recent years to the American pharmacopœia. South America, besides numerous locally known remedies, etc., has furnished the world-famous *quinine*, and *ipecacuanha*, while the drugs *cocäine* and *curari* must ultimately be credited to the aborigines of America. Many dye-stuffs and dye-woods were first given to the civilized world by the Indians, both for domestic use and for employment in the larger world of æsthetic manufacture. These dyes range from the poke of northeast North America for dyeing basketry to the famous roucou or anotto of Venezuela, used, among other purposes, for staining cheese. Pottery and other household utensils of Indian manufacture are used throughout Spanish America. The hammock of the Arawak Indians belongs now to all civilized peoples. All that india rubber means, civilization owes to the Indian. Both in small things and in great the American aborigines, through their gifts to the white race, will long be remembered, even if, as some authorities (upon imperfect evidence) believe, they are rapidly passing away. On this point one may cite the remark of Deniker that Humboldt in 1825 estimated the total population of America at 13,000,000 whites, 6,000,000 half-breeds, 6,000,000 negroes, and 9,000,000 Indians, while a computation made in 1895–7 reckoned 80,000,000 whites, 37,000,000 half-breeds, 10,000,000 negroes and 10,000,000 Indians.

There might be mentioned here also the "Chinook Jargon" of the Columbia River region, the "Ligoa Geral" of Brazil, and the minor jargons and trade languages of other sections of the continent, which prove how the Indian has compelled the white man, more or less, to use his language in some form or other for the purposes of friendly or commercial intercourse.

Antiquity of Man in America.— The question of the antiquity of the American Indian culture is difficult to settle satisfactorily. Time must be allowed for the divergence of the original stock into the numerous (more numerous in pre-Columbian eras) tribes and peoples inhabiting America at the time of its discovery, — time for the production of the Eskimo and the Iroquois, the Carib and the Patagonian. Time, again, must be allowed for the development of the Aztec from the primitive Shoshonean, the Mayan from the rude stock of that people, the Chibchan from the savage Bolivian, the Peruvian from the ancient barbarian of equatorial America. Then the civilizations of Mexico, Central America, and South America as such probably took ages to rise and flourish. Town and village life, with all its social and religious implications, the differing architectural monuments of the various centres of American civilization, etc., did not spring up in a day, any more than did the culture of mediæval Europe. The domestication of the dog, the llama, etc., the change of maize, tobacco, the squash, the tomato, the potato, the pineapple, etc., from wild to cultivated plants, require a long lapse of time. Moreover, it is now known that American Indian languages do not now change and have not in the past changed at the fast rate once assigned to them by philologists. So, while one may not believe that America was the original habitat of the human race, he may be certain that very many millenniums have elapsed since the "Red Man" began his career as the autochthone of the New World. There seems every reason to believe that at the close of the Glacial Age man had spread over a considerable portion of both North and South America, and was contemporary with European man of an early epoch. To calculate man's residence in the American environment by years is impossible on present evidence. Dr. Stoll assures us that the linguistic phenomena met with in the Mayan dialects alone require thousands of years for their evolution, and some of the results deduced from the Mayan hieroglyphs by certain investigators imply the existence of civilization of the Central American order for very many millenniums. Perhaps it is fair to say that man has been in America at least 25,000 years and not more than 200,000, and that the civilizations of Mexico, Central America, and South America were probably as long-lived as those of Rome, Greece, etc. They were also in many respects just as typical of human attempt and achievement, for the American Indian was a man as we are men.

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The 'Publications of the Bureau of American Ethnology,' embracing original monographs by eminent specialists, are a lasting monument to the founder of the Bureau, the late Maj. J. W. Powell, to whom all students of the aborigines of the New World owe a debt of deepest gratitude. Among workers not connected with the Bureau, the death of D. G. Brinton in 1899 removed perhaps the most gifted and representative Americanist.

ALEXANDER F. CHAMBERLAIN,
Clark University, Worcester, Mass.

Indicator, in steam engineering an instrument invented by James Watt, to record, graphically and automatically, the pressure in an engine cylinder at every point of the stroke. By means of the diagram that the indicator

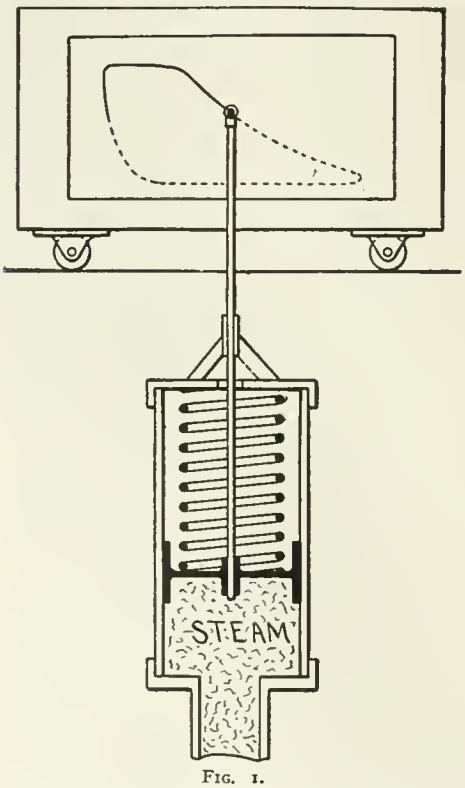


FIG. 1.

draws, it is possible to determine whether the valves of the engine are working correctly or not, and it is also possible to estimate the horsepower that the engine is developing, with considerable accuracy. Commercially, the steam-engine indicator may be had in many forms; but all are based on the same fundamental principle, which will be understood by reference to the diagram presented in Fig 1. The paper upon which the indicator diagram is to be drawn is here supposed to be secured, flat, to a carriage which travels back and forth upon a track; the motion of the carriage corresponding precisely

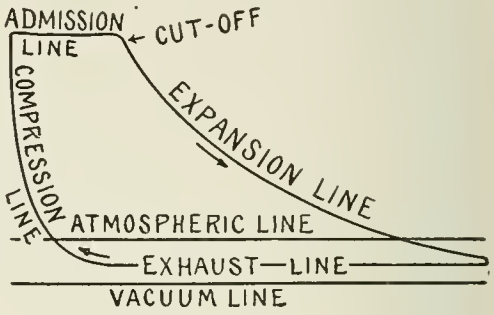


FIG. 2.

to the motion of the piston of the engine. In practice it would be inconvenient to have the carriage travel a distance equal to the whole stroke of the engine, and hence some form of reducing motion is used, so that the motion of the carriage may follow the motion of the engine piston accurately, but with materially reduced velocity. The indicator diagram is draw by means of a pencil-point carried on the piston rod of a small steam cylinder which is situated below the carriage, and which opens freely into the cylinder of the engine from which the diagram is to be taken. The piston of the indicator is pressed downward by means of a spring whose strength is accurately known, so that the increase of pressure corresponding to a rise of one inch in the position of the pencil-point is known. When the indicator is in operation, the pencil rises and falls proportionately to the pressure of the steam in the engine cylinder, and the carriage, with its attached paper, travels back and forth, horizontally, at the same time, keeping pace precisely with the motion of the piston of the engine. Under these circumstances the pencil-point traces a diagram somewhat like that shown in the illustration. In practice, the paper upon which the diagram is drawn is usually wrapped about a cylindrical drum, which rotates back and forth as the instrument works, following the motion of the engine piston just as the carriage here shown is supposed to do. In Fig. 2 an enlarged view of an indicator card (or diagram) is given, together with the technical names of some of its more important parts. The arrows show the direction in which the pencil travels as the diagram is drawn. The «admission line» is the part that is drawn while the engine is in full communication with the boiler, and drawing steam from it. The angle marked «cut-off» corresponds to the moment at which the steam supply is cut off, and the expansion of the steam begins. The «expansion line» is drawn during the expansion of the steam, and on the return stroke, after the exhaust valve has opened, the «exhaust line» is drawn. When the exhaust valve has closed again, the steam remaining in the engine cylin-

der is compressed until the end of the stroke, the indicator meanwhile drawing the "compression line." The "atmospheric line" is the straight, horizontal line drawn by the engine when the connection is broken between the engine cylinder and the indicator cylinder, and the latter is open freely to the air. The "vacuum line" is the line that would be drawn by the instrument under like circumstances, if a perfect vacuum could be maintained in the indicator cylinder. The "vacuum line," of course, must be drawn in by hand. It is parallel to the "atmospheric line," and at a distance below it corresponding to a pressure of about 14.7 pounds per square inch, on the scale to which the diagram is drawn. The diagram shown in Fig. 2 refers to a condensing engine. In a non-condensing engine, the exhaust line would not be lower than the atmospheric line, and would, in fact, be above it, if there were any sensible back-pressure in the engine during exhaust.

For detailed information concerning the indicator and its uses, consult: Pray, 'Twenty Years with the Indicator'; Peabody, 'The Steam Engine Indicator'; also, for less extended treatment, any good book on steam engineering.

Indictment, ĭn-dīt'mĕnt, a formal charge made before a legal tribunal against an accused person. The essential requisites of a valid indictment are,—first, that the indictment be presented to some court having jurisdiction of the offense stated therein; second, that it appear to have been found by the grand jury of the proper county or district; third, that the indictment be found a true bill, and signed by the foreman of the grand jury; fourth, that it be framed with sufficient certainty; for this purpose the charge must contain a certain description of the crime or misdemeanor of which the defendant is accused, and a statement of the facts by which it is constituted, so as to identify the accusation; fifth, the indictment must be in the English language, but if any document in a foreign language, as a libel, be necessarily introduced, it should be set out in the original tongue, and then translated showing its application, 6 Term. 162. The formal requisites of an indictment are, first, that the venue, which at common law should always be laid in the county where the offense has been committed, although the charge be in the nature transitory, as a battery. The venue is stated in the margin thus: "City and County of ——, to wit." Second, the presentment, which must be in the present tense, and is ordinarily expressed in the following formula: "the grand inquest of the State of ——, inquiring for the city and county aforesaid, upon their oaths and affirmations present." Third, the name and addition of the defendant; but in case an error has been made in this respect, it is cured by the plea of the defendant. Fourth, the names of third persons, when they must be necessarily mentioned in the indictment, should be stated with certainty to a common intent, so as sufficiently to inform the defendant who are his accusers. When, however, the names of third persons cannot be ascertained, it is sufficient in some cases, to state "a certain person or persons to the jurors aforesaid unknown." Fifth, the time when the offense was committed should, in general, be stated to be on a specific year and day. In some offenses, as in perjury, the day must be precisely stated, but although it is necessary that a day certain should be laid in the indictment, yet in general the prosecutor may give evidence of an offense committed on any other day previous to the finding of the indictment. Sixth, the offense shall be properly described. This is done by stating the substantial circumstances necessary to show the nature of the crime, and next the formal allegations and terms of art required. As to the substantial circumstances: the whole of the facts of the case necessary to make it appear judicially to the court that the indictors have gone upon sufficient premises, should be set forth; but there should be no unnecessary matter, nor anything which on its face makes the indictment repugnant, inconsistent, or absurd.

According to the rules of pleading in criminal actions at common law there are certain terms of art used, so appropriated by the law to express the precise idea which it entertains of the offense, that no other terms, however synonymous they may seem, are capable of filling the same office; such, for example, as traitorously in treason; feloniously in felony; burglariously in burglary; maim in mayhem, etc. In New York, and in nearly all of the States which have adopted the code system, the common law rules of pleading in criminal actions have either been greatly relaxed or entirely abolished. Many of the statutes of the subject are similar to the New York statute, Code Crim. Pro. § 273, which in substance provides that all common law rules of pleading are abolished, and the forms of pleading prescribed by the code shall be substituted, and § 275 of the same code provides that all an indictment must contain is, the title of the section, specifying the name of the court to which the indictment is presented, and the names of the parties, and a plain and concise statement of the act constituting the crime, without unnecessary repetition. It is also provided in § 283 of the New York Code Crim. Pro. that words used in a statute to define a crime need not be strictly pursued in the indictment; but other words conveying the same meaning may be used.

Indigestion. See Dyspepsia.

In'digo, the name of a genus of plants, and of the blue coloring matter obtained from them. The indigo plants are tall herbs of the pea family, forming the genus *Indigofera,* of which there are several color-yielding species in various warm parts of the world. The one yielding the indigo of commerce, and formerly extensively cultivated, is *I. tinctarium,* which is native to India, grows five feet high, and has bipinnate leaves. The coloring matter most abounds in the leaves, and especially as the time of flowering occurs, and that is the time when the crop is gathered by cutting down the plant, and making immediate use of the green stems or foliage, or by drying them for subsequent treatment. This coloring matter is a chemical substance called *indican,* the glucoside of indoxyl, which is converted by oxidation into indigo. Until the discovery of the sea-route to India the only blue vegetable dye available in Europe was that derived from the woad (q.v.), which was limited and costly; this dye-substance was therefore regarded as one

of the most valuable of new commodities and a large capital was soon embarked in its cultivation in India, Ceylon, China, and other regions, where a profitable industry continued until after the middle of the 19th century. The indigo was obtained by macerating the leaves and stems in vats for several hours. Fermentation arises and the water becomes clear yellow. It is then run off into a lower basin, where it is subjected to incessant agitation and gradually turns green, whereupon the indigo begins to form in flakes and settle. The residuum is then thoroughly boiled, filtered through linen, molded into small cakes and dried. The best quality comes from Bengal and eastern India. Indigo plantations were made with more or less success in Brazil, Central America, and Mexico; and one of the foremost inducements held out to settlers in the southern colonies, from Maryland to Louisiana, was the probability of its successful cultivation there. The experiments never yielded results of much importance, partly because crops of tobacco, cotton, and food-stuffs were more profitable. Since the discovery of cheap methods of forming blue dyes from coal-tar the cultivation of indigo has declined greatly, but still supplies a steady demand from cloth-dyers who wish an imperishable blue of certain tints.

The wild indigo of the United States is any of several species of a closely related genus *Baptisia,* which flourishes especially in the Southern States. The best known is the yellow-flowered false indigo (*B. tinctoria*), or indigo brown, from which country people obtain a blue dye, and a domestic medicine.

Indigo Dyeing.— Before it can be employed in dyeing, the indigo must be brought into solution; and as indigo itself is insoluble, it must be first transformed into a soluble substance, so that it can penetrate the pores of the cloth, where it is subsequently again restored to the form of indigo. To bring the indigo into solution, it is ground up to a soft paste with water, after which it is thrown into vats along with ferrous sulphate, slacked lime, and water. The ferrous sulphate reacts with the lime to form calcium sulphate and ferrous oxid, the latter being immediately oxidized at the expense of part of the oxygen of the indigo, which in its turn is reduced to a substance called indigo-white. This dissolves in the presence of excess of lime, and the fabric to be dyed is dipped into the vat after the liquid in it is clear. On removing the fabric the indigo-white which has penetrated its pores is reoxidized by the air to indigo blue; and by repeating this treatment a shade of blue of any desired depth may be obtained. The dyed fabric is finally passed through dilute acid to remove any adhering lime or ferric oxid. Indigo appears to exist in the plant in the form of a glucoside known as "indican," which has the formula $C_{52}H_{62}N_2O_{34}$, and to be developed from this glucoside in the course of the fermentation by the action of a special bacillus, which closely resembles the bacillus of pneumonia. Indigo is now made artificially, the total production of synthetic indigo being probably about one fourth of the world's consumption. Although artificial indigo-blue appears to have the same chemical formula ($C_{16}H_{10}N_2O_2$) as the natural product, and to be identical with it in every way, it is more expensive than the natural product at the present time. If it could be made more cheaply, it would work as great a revolution in dyeing as did the introduction of alizarin in the place of madder. (See Coal Tar Colors, and the references there given.)

Indigo-bird, a numerous and beautiful North American finch (*Passerina cyanea*), the male of which is dark greenish blue, while the female is grayish brown. They are migratory, but in summer spread over most of the United States, placing their neat nest and unspotted bluish eggs in garden bushes as well as in wild thickets. The male has one of the brightest and most persistent songs of any American bird; and he is easily habituated to captivity.

Indigo-snake. The gopher-snake (q.v.).

In'direct Damages, claims for damages not directly inflicted by the illegal act complained of, but by other causes themselves due to that act. The great historical case is that of the United States claim for many hundreds of millions of dollars' worth of loss, resulting from Great Britain's bad faith or carelessness in letting the Alabama (q.v., and Alabama Claims) escape from her ports to prey on our commerce. It was alleged that aside from the actual loss to our shipping and cargoes, we had been damaged to a far greater extent by the resultant effects, chiefly of three sorts: (1) The prolongation of the Civil War due to the encouragement given to the South and the straitening of the North. (2) The destruction of commercial lines and relations, which took long to recover after the War. (3) The raising of the rates of marine insurance. As these claims exceeded the cost of a war plus the indemnity we should have exacted if victorious, Great Britain refused to consider them; and the commission threw them out altogether as contrary to international law.

In'dium, the name given to a metal discovered by spectroscopic analysis in 1863. The zinc-blende of Freiburg was found by Reich and Richter, after a process of purification, to yield a substance the spectrum of which was different from all known spectra. They hence inferred the existence of a new element. This element has been isolated, but only in small quantities. It is of a silver white color, soft, and marks paper like lead; its specific gravity is 7.421 at 16.8°. The lead indium is related to cadmium and zinc, both of which occur associated with it in nature. The spectrum of indium exhibits two characteristic lines, one violet α and another blue line β; besides these two fainter blue lines are visible if the burner in which the metal is volatilized be fed with hydrogen instead of coal gas.

Individ'ualism is the name often applied to social systems founded on principles opposed to the essential principle of socialism, or to that theory of society which is opposed to state interference in industrial and economic and other relations. In its extreme form it is identical with one phase of anarchism. The word is also applied to social theories involving other and deeper views of individual rights than the mere non-interference referred to above.

Indo-China, the southeastern peninsula of Asia, formerly known as Farther India, including

Anam, Burma, Cambodia, Cochin-China, French Indo-China, Tongking (qq.v.), and other districts.

Indo-Europe'ans, the Aryan race (q.v.). For accounts of the Indo-European languages see ARYAN; INDO-GERMANIC LANGUAGES.

Indo-German'ic Languages, the languages which are ancient and modern varieties of one primeval form of speech, anciently spoken in Central Asia. These languages are sometimes called the Indo-Celtic languages, the Japhetic languages, or more commonly, the Aryan languages. There are three forms of human speech, the monosyllabic, or isolating languages, such as the Chinese, whose words are unchangeable roots, each of which stands separately and is modified by the juxtaposition of other monosyllabic roots; the agglutinating languages, such as the South African, the Japanese, and the American Indian, in which, instead of being isolated, the roots are placed in close association, so as to agglutinate or agglomerate into one word. Some Eskimo words are as long as the longest compound epithet of Aristophanes. The third group are the inflectional languages. The Indo-Germanic languages are inflectional. In these the roots of all words are not necessarily modified, but they may be modified, in order to express certain relations, and the roots are also added to by suffixes and prefixes. The Indo-Germanic languages do not extend over so wide an area as the monosyllabic languages, but are spoken by the most civilized and intellectual peoples of the world. The Indic branches are the ancient Hindu languages, the principal of which is Sanskrit, and the modern Hindu languages. The Iranic or Persian branch includes, Zend, Old Persian, Armenian, Parsee, modern Persian and the dialect spoken by the mountaineers to the northwest of India. The great Hellenic branch was spoken anciently by the inhabitants of Greece, of the west coast of Asia Minor, of the islands of the Ægean, as well as of the south and southwestern coasts of Italy. It is spoken in a modified form in Greece and the Greek islands of to-day. Parallel to the Hellenic is the Italic branch, which includes the primitive Italic languages, Oscan, Etruscan, Umbrian, and Latin, as well as the classic Latin of Virgil and Cicero, which settled into the Italian of Dante and, on being extended over western Europe, grew through many modifications into French, Provençal, Italian, Spanish, Portuguese and Roumanian. Distinct from this branch was the Celtic, which survives to-day in the Welsh and Gaelic dialects. The Teutonic tongues include the Gothic of Ulfilas (4th century A.D.) the Norse languages, the Low German and the High German group. The Sclavonic languages are spoken in Russia and Poland and include the Lithuanian and the Old Prussian. There are several other Indo-Germanic tongues and dialects which philologists have not been able to classify; such are the Etruscan in Europe and certain languages of Asia Minor. Compare: Schleicher, 'Compendium der vergleichenden Grammatik der Indo-Germanischen Sprachen' (1871); Corrsen, 'Ueber Aussprache, Vocalismus, und Betonung der lateinischen Sprache'; and most important Brugmann and Delbrück, 'Grundriss der vergleichenden Grammatik der Indo-Germanischen Sprachen' (1897 *et seq.*).

Induction. It is a familiar fact that an electrified (or magnetized) body causes electrical (or magnetic) disturbances in other bodies in its vicinity, when it is not in direct and visible connection with them, and the process by which these disturbances take place is called "induction." The ultimate mechanism of induction is still somewhat obscure, but something has been learned of its general nature. In the early days of physical science it was believed that bodies can act upon one another even across spaces that are absolutely void, and at the present time it is sometimes convenient to assume them to act in this manner, in forming mathematical equations for the treatment of physical problems. It is no longer believed, however, that this is what actually happens in nature; the phenomena of electric and magnetic induction being now attributed to motions or stresses in the ether which transmits light. (See ETHER.) Newton was of the opinion that induction is an ether-phenomenon, and in the first half of the 19th century Faraday may be said to have established the ether hypothesis upon a substantial experimental foundation. In later years Maxwell developed Faraday's conceptions mathematically, and added much more evidence that was partly theoretical and partly experimental; so that at the present time there are few or no physicists who doubt that induction is a manifestation of some form of activity in the light-bearing ether. Opinion is still divided, however, as to the precise nature of this activity. In fact, we cannot hope to gain any very precise information on this point until much more is known about the constitution of the ether itself.

The charging of a condenser is a phenomenon in electrostatic induction. If the condenser consists of two parallel plates (for example), of a given size and set at a constant distance from each other, and we charge it to a given potential, the quantity of electricity that must be put into it in order to charge it in this manner depends to a considerable extent upon the nature of the dielectric (or insulating material) which separates the plates. If the charge that is required when air is the dielectric is taken as unity, then with plate glass as a dielectric the charge will have to be 8.45 (according to Hopkinson), in order to bring the potential of the condenser up to the same value as before. If the space between the plates is filled with common turpentine, a charge 2.23 times as great as that required with air as the dielectric must be communicated to the condenser. It is evident, from these facts, and from others of the same nature, that electric induction depends, to a large extent at any rate, upon the nature of the medium which separates an electrified body from the other bodies upon which the inductive influence is felt. The constants that are given above are known as the "specific inductive capacities" of the dielectrics to which they refer.

Electrodynamic induction is the basis of practically all of the electrical machinery that has been found serviceable to man. The fundamental fact of electrodynamic induction may be stated as follows: If a closed electrical circuit, such as might be formed by joining the two ends of a copper wire, is placed in a magnetic field, then no current will be produced so long as the circuit is everywhere stationary, and the strength of the magnetic field remains every

where invariable. If the intensity of the magnetic field is increased, a current of electricity will flow around the circuit while the intensity of the magnetism is changing, the intensity of the current being proportional to the rapidity with which the intensity of the magnetism varies. As soon as the magnetism again becomes constant, the current in the circuit ceases. If the intensity of the magnetic field be diminished instead of increased, a current will also be produced in the closed circuit, but it will be opposite in direction to that produced by increasing the magnetic field. Currents produced in this manner are called "induced currents." Instead of varying the magnetic field while the circuit is fixed in position, we may move the circuit about in the magnetic field. If the magnetic field is everywhere uniform in all respects, and the circuit is moved so as to always remain parallel to itself, then no induced current will be produced; but if the circuit is moved from a region where the magnetism is strong to one where it is weak, or *vice versa,* a current will be induced in the circuit, just as if the circuit were kept stationary and the intensity of the magnetism varied. Induced currents are also produced when, instead of being translated from one region to another, the circuit is rotated in a magnetic field, in such a way that the number of lines of magnetic force passing through it is either increased or diminished. In the induction coil the intensity of the magnetic field is varied, while the circuit in which the induced current is to be produced is kept stationary. In dynamos, on the other hand, the magnetic field is maintained sensibly constant, while the circuit in which the induced current is to be produced is rotated or otherwise moved about.

A current moving in a closed circuit produces a magnetic field in the space above it, and this magnetic field, when it varies on account of the variation of the current that produces it, causes the production of induced currents in any closed circuit that may happen to be near. Let us conceive two closed circuits, A and B, to be situated near each other, and let there be a current produced by any means in the circuit A. So long as the current in A is constant, no current will be produced in B; but if the current in A is variable, an induced current will be observed in B, whose intensity depends upon the rate at which the current in A is varying, upon the resistance of the circuit B, and also upon a certain numerical factor, whose value depends upon the sizes and shapes of the two circuits, upon their positions with respect to each other, and upon the nature of the medium (air, oil, or whatever it may be) in which they are placed.

If a pair of circuits, A and B, are near each other, and A is carrying a constant current of intensity C_1, while B is carrying a constant current of intensity C_2, then the displacement of either circuit, relatively to the other, would cause induced currents to flow in both; and hence (in general) neither circuit can be moved without the energy of the system being affected. The difference between the energy of a pair of coils that are near together, and the energy of a similar pair of coils that are conveying identically the same currents but are infinitely remote from each other, is equal to MC_1C_2, where M is a numerical factor whose value depends upon the sizes and shapes of the two circuits, upon their relative positions, and upon the medium in which they are placed. The factor M is called the "coefficient of mutual induction" of the pair of circuits.

The various parts of a single circuit act upon one another inductively, just as separate circuits do; and a circuit that is wound upon a spool, or otherwise coiled so that its parts come near together, possesses greater energy than the same circuit would have, if it was not so coiled. This fact is expressed by saying that every circuit has a certain amount of "self-induction." The energy that a circuit possesses in virtue of its self-induction is proportional to the square of the current that it is carrying, and to a certain numerical constant called the "coefficient of self-induction," whose value depends upon the size and shape of the circuit, and upon the medium in which it is placed. Like the coefficient of mutual induction of a pair of circuits, the coefficient of self-induction of a single circuit can be computed, for certain simple cases, by methods given by Maxwell, in his 'Treatise on Electricity and Magnetism'; but in the general case the computation is exceedingly difficult, and altogether impracticable; so that the values of these coefficients for given circuits are usually determined experimentally, except when a very rough estimate will serve.

The general subject of induction is essentially mathematical in its character, and cannot be properly explained nor understood without the use of the calculus. Consult Nipher, 'Electricity and Magnetism'; Maxwell, 'Treatise on Electricity and Magnetism.' See also the articles ELECTRICITY and MAGNETISM, in this encyclopedia.

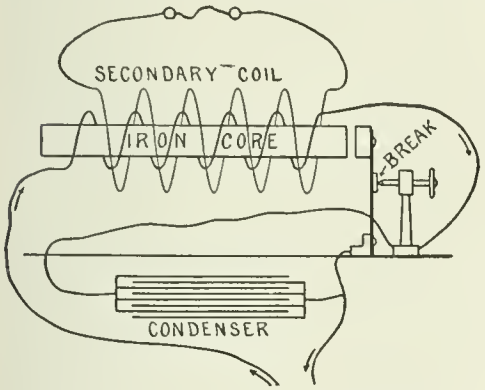
A. D. RISTEEN, PH.D.,
Editorial Staff, 'Encyclopedia Americana.'

Induction Balance, in physics, an apparatus designed for detecting the presence of fragments of metal, or for studying the electrical conductivity of metals. It consists essentially of four coils of fine wire, an electric battery, a circuit breaker, and a telephone. Let the coils be designated, respectively, by the letters A, B, C and D; A being similar to B in all respects, and C being likewise similar to D. Coils A and B are placed in circuit with the battery, and coils C and D are placed in circuit with the telephone. The coils are disposed in pairs, A being placed near C, and B near D. If the current through A and B is rapidly interrupted, an induced current will, in general, flow through C and D, at each make and break; its presence being indicated by the sounds that it produces in the telephone that is in circuit with C and D. It is possible, however, to dispose the coils and their connections so that the current that A induces in C shall be sensibly equal and opposite to that which B induces in D. When the balance is perfect, no sound will be heard in the telephone. If a piece of metal be now brought near the coil A, the intermittent current in A will induce currents in the mass of the piece of metal, and these, in turn, will act upon the coil C, producing induced currents in this coil which are not compensated by similar currents in D. The loss of balance will be at once indicated by the recurrence of sounds in the telephone; and in this way the metal fragment will betray its presence. The induction balance has been used successfully for locating bullets in the human body. When applied for this purpose to President Garfield, however, it failed to give any useful indications,— owing, it is said, to difficulties of

manipulation due to the presence of metal in the mattress upon which he lay. The instrument is so sensitive that if it is balanced with a genuine coin near one of the coils, and the genuine coin is then replaced by a counterfeit imitation, the telephone at once betrays the substitution. The intensity of the sounds produced in the telephone depends not only upon the size and position of the disturbing piece of metal, but also upon its specific electrical resistance; and hence the balance may be used to compare the specific resistances of metals.

Consult Hopkins, 'Experimental Science'; Thomson, 'Recent Researches in Electricity and Magnetism'; Bell, 'The Induction Balance,' in the American Journal of Science for 1883.

Induction Coil, an electrical instrument used for the production of high potentials, and depending for its action upon the fact that induced currents are generated in a circuit, when the strength of the magnetic field to which the circuit is exposed is varied. (See INDUCTION.) The essential features of the instrument are represented, diagrammatically, in the accompanying cut. A soft iron core is surrounded by two



coils of wire, one outside of the other. The outer coil is the one in which the high tension induced currents are produced: it is called the "secondary coil," and is not in direct electrical connection with any other part of the instrument. The inner coil, which is called the primary coil, is wound close to the iron core, and is connected to a battery, so that when the current from the battery is flowing, the primary coil causes the iron core to become magnetised. As is explained in the article INDUCTION, no current is generated in the secondary coil, so long as the magnetism of the iron core remains constant; but whenever the magnetism of the core increases or diminishes, a current is produced in the secondary. A device called a "break" or "interrupter" is therefore provided, so that the magnetism of the iron core may be rapidly established and destroyed. The commonest form of interrupter is that indicated in the cut, which does not call for special explanation, since it is used in electric bells and other simple forms of electrical apparatus. The Wehnelt electrolytic interrupter is greatly in favor among physicists, however, and is now often used in connection with induction coils, especially when they are to be run with the commercial current used for incandescent lighting, where the potential difference that is used is something over 100 volts. In the Wehnelt interrupter the primary coil on the iron core is made of a few turns of relatively thick copper wire, its purpose being solely to effect the magnetisation of the core; but the secondary coil, in which the induced currents are generated, is made of fine wire, and in order to multiply the inductive effect as far as possible, the secondary is made of great length, often containing many miles of wire. In the celebrated Spottiswoode coil the secondary contained no less than 280 miles of wire. The primary coil, being wound directly upon a soft iron core, commonly has a very considerable amount of self-induction, so that when the circuit is broken by the interrupter the current does not suddenly cease, but continues to flow across the interval at the break for an appreciable fraction of a second, as is readily seen by the strong sparking that occurs at the moment of interruption. In order to reduce the sparking as far as possible, a condenser of suitable capacity is provided, so that when the break is made in the circuit, the "after-current" due to the self-induction of the primary can discharge into the condenser, instead of passing across the break in the circuit and causing a spark. The condenser causes the interruption of the current in the primary coil to be much more sudden, and it materially increases the potential that is developed in the secondary coil, since this is proportional to the rate of variation of the magnetism of the core, and is much greater when the magnetism falls off abruptly than when it persists for an appreciable fraction of a second after the break has been made.

The induction coil was brought into something like its present form by Ruhmkorff, and is frequently known, in consequence, by his name. Improvements in the winding of the secondary coil were introduced by Ritchie, of Boston, about 1857. Ritchie's most important improvement consisted in disposing the secondary wire in sections, which were so related to one another that the risk of internal disruptive discharge through the coil itself might be reduced to a minimum. Induction coils are very generally used in studying the discharge of electricity through gases, for exciting x-ray tubes, and for producing high potentials required in wireless telegraphy. Consult Bonney, 'Inductions Coils'; Alsopp, 'Induction Coils and Coil-Making'; Wright, 'The Induction Coil in Practical Work.'

A. D. RISTEEN, PH.D.,
Editorial Staff, 'Encyclopedia Americana.'

Induction, Mathematical. Despite the age-long tyranny exercised by the Aristotelian logic — a tyranny having, at least in the domain of science, scarcely a match except in the case of Euclid's elements — the forms of thought, those diagrammatic representations of the orderliness of the reasoning processes, sustain to-day perhaps even greater interest than ever before (see SYMBOLIC LOGIC). The mathematician's interest in these forms is two-fold, attaching to them both as norms for testing the validity of arguments and as constituting exceedingly subtle matter for mathematical investigation.

Of all argument forms, there is one which, viewed as the figure of the way in which the mind gains certainty that a specified property belonging but not immediately by definition to each element of a denumerable (see ASSEM-

BLAGE THEORY) assemblage of elements does so belong, enjoys the distinction of being at once perhaps the most fascinating, and, in its mathematical bearings, doubtless the most important, single form in modern logic. This form is that variously known as reasoning by recurrence, induction by connection (De Morgan), mathematical induction, complete induction, and Fermatian induction — so called by C. S. Peirce, according to whom this mode of proof was first employed by Fermat. Whether or not such priority is thus properly ascribed, it is certain that the argument form in question is unknown to the Aristotelian system, for this system allows apodictic certainty in case of deduction only, while it is the distinguishing mark of mathematical induction that it yields such certainty by the reverse process, a movement from the particular to the general, from the *finite* to the *infinite* (see ASSEMBLAGE THEORY).

Of the various designations of this mode of argument, "mathematical induction" is undoubtedly the most appropriate, for, though one may not be able to agree with Poincaré (see *Bibliography* below) that the mode in question is *characteristic* of mathematics, it is peculiar to that science, being indeed, as he has called it, "mathematical reasoning par excellence."

The nature of mathematical induction as it is ordinarily understood may be made clear by an example. Perhaps the simplest application of the method is found in the proof of the theorem:

$$(\alpha) \quad 1+2+3+\ldots\ldots+n=\tfrac{1}{2}n(n+1)$$

where n denotes any positive integer whatever. Suppose it ascertained by observation or otherwise that

$$(1) \quad 1+2=\tfrac{1}{2}2(2+1),$$
$$(2) \quad 1+2+3=\tfrac{1}{2}3(3+1).$$

Facts (1) and (2) justify the *suspicion* that (α) may be a fact. The proof by mathematical induction that (α) is indeed true runs as follows: It is *assumed* that (α) is true for some definite but unspecified integer n. Then by adding $n+1$ to each member of the assumed equation, n having the same meaning as in the assumption, one finds that

$$(\beta) \quad 1+2+3+\ldots\ldots+n+n+1 = \tfrac{1}{2}(n+1)(n+2).$$

So it is seen that, if (α) *be* true for *some* integer n, it *is* true also for the *next* greater integer $n+1$. But by (2), (α) is true when n is 3; it is, therefore, true for $3+1$, or 4; therefore, for $4+1$, or 5. The argument is then usually closed by saying "and so on, hence (α) is true for any integer whatever," or by an equivalent speech. The reader will recall that the binomial theorem, the Newtonian expansion of $(a+b)^n$, where n is any positive integer, is justified in essentially the foregoing manner. Numerous other examples of propositions similarly established may be found in the better recent text-books of algebra.

The nature and the role of the foregoing *etcetera*, "and so on," demand consideration. Without it, the argument as stated seems obviously incomplete. But how is the *etcetera* to be logically justified? By reference to some axiom or principle of thought? If so, what? Or can the phrase be in some way dispensed with without damage to the argument?

Before attempting to answer them it may be well to show the inevitableness of the questions by a further analysis. Suppose it established, in regard to some property p (where, for example, p might signify the validity of the binomial theorem for some integral exponent): (1) that p belongs to the integer 1, that is, referring again to the mentioned example, the theorem is valid for the exponent 1; (2) that, *if* p belong to an integer n, it belongs to $n+1$. Propositions (1) and (2) furnish the means of generating, one after another, a sequence of syllogisms by which one proves first that p belongs to 2, then to 3, then to 4, and so on. Note that in order to ascertain by this analytic (syllogistic) method whether p belongs to a specified integer m, it is necessary to determine in advance the same question for each of the integers 2, 3, ..., $m-1$, in the order as written, a process requiring a number of syllogisms which is greater the greater the number m. Accordingly *this* method, of successive deductions, is not available for determining whether p belongs to each in the (infinite) *totality* of integers. Equally powerless to that end is experience (including observation), for this can take account of the individuals of a finite assemblage of objects at most. Either analysis or experience may avail if a sequence be finite, but if it be infinite both must fail. Not less vain is it to invoke finally the aid of induction as the term is understood and employed in the physical sciences, for this latter, resting upon a purely assumed order in the external universe, is confessedly *inductio imperfecta*, and, being such, can yield approximate certainty only.

Nevertheless, despite the inadequacy of the means mentioned, as soon as hypotheses (1) and (2) are admitted and the indicated sequence of deductions is *begun*, "the judgment imposes itself upon us with irresistible evidence" that p is a property of *all* the integers. Why? That is, how justify the "and so on"? It appears to be clear that the answer must be the adduction or invocation of an additional presupposition of formal thought, a presupposition whose formulation shall mark a conscious extension of the domain of logic by affirming as axiomatic that apodictic certainty can and does transcend every limited sequence of deductions or observations. Such presupposition, which may be called the axiom of infinity, is stated by Poincaré, in answer to the foregoing question, "why," as follows: "It is the affirmation of the power of the mind which knows it is capable of conceiving the indefinite repetition of a same act as soon as this act is found to be once possible." The act or operation, which can not indeed be indefinitely repeated, but which by the axiom can be conceived as so repeated, is, in the present case, the construction of the syllogisms of the sequence above mentioned.

The *etcetera* in question is capable of justification without appealing, apparently at least, to the axiom of infinity, namely, by use of the so-called indirect method of proof, the method known as *reductio ad absurdum*. Thus let it be *supposed* that the argument sought to be indefinitely extended by means of the phrase "and so on" does not admit of indefinite extension along the ordered sequence of integers. There will, then, be a first integer, say $m+1$, for which the property p fails. As, by hypothesis, $m+1$ is the first integer for which p fails, p belongs to the preceding integer m; but

since p belongs to m, it also belongs, by (2), to $m+1$. Hence the supposition that the argument does not admit of indefinite extension is false; and the conclusion is obvious. This procedure is convincing, but it is plainly less a natural completion than an "unindicated" fortification of the process it supplements. It is, besides, not entirely clear that the axiom of infinity is not surreptitiously subsumed by it.

By far the most penetrating investigation of the nature of mathematical induction was made originally by Richard Dedekind (see *Bibliography* below). His procedure and result are, in brief, as follows: Let S denote a system of elements (things of any kind) such that there is a scheme or law ϕ of depiction by which S may be depicted upon itself, that is, a scheme by which each element e of S may be thought as corresponding to one and but one element e' of S and so that no two elements of S shall be thought as corresponding to a same element of S. The correspondent e' of e is called the picture or image of e. Every part of S (including S itself as a special case) thus depicted upon itself is named *chain under* ϕ. Denote by A an arbitrary part of S and by A_0 the assemblage of all the elements common to all the chains (in S) that contain A. It is obvious that, S and ϕ being given, there is one and but one A_0 for a given part A of S. A_0, which is easily seen to be itself a chain, is described as the *chain of* A *under* ϕ. Now let Σ denote an assemblage of elements. Dedekind proves the following

THEOREM.—*In order to prove that* A_0 *is part of* Σ *it is sufficient to prove:* (1) *that* A *is part of* Σ; *and* (2) *that, if an element of* A_0 *belong to* Σ, *the image of that element belongs to* Σ.

Dedekind's proof, simplified, runs thus: Let $A_0 = A_1 + A_2$ where A_1 denotes the assemblage of all those elements of A_0 that belong to Σ. By (2), A_1 is a chain, and, by (1), contains A. Hence, by definition of A_0, A_2 has no element, whence $A_0 \equiv A_1$. Such is the beautiful and marvelously fundamental theorem which its author characterizes, perhaps a little extravagantly, as "the scientific basis" of mathematical induction. It is at any rate a basis, and by virtue of it, as shown below, proof by mathematical induction need have no recourse to an *etcetera* consisting of an endless sequence of syllogisms.

It will be instructive to apply Dedekind's theorem to the *completion* of the proof by mathematical induction of the binomial theorem

$$(\alpha) \quad (a+b)^n = a^n + na^{n-1}b + \cdots\cdots$$

for positive integral exponents. Let it be granted that

$$(\beta) \quad (a+b)^1 = a+b,$$

and supposed it established in the usual way that, (γ), if (α) be valid for some integer, as $n-1$, then it is so for the next, n. Denote by S the sequence of integers,

$$S \equiv 1, 2, 3, \ldots\ldots, n-1, n, \ldots\ldots,$$

by ϕ the scheme by which each number in S except 1 is the image of its predecessor, and let A be 1. Then A_0 is S identically. Let Σ denote the assemblage of positive integers for which (α) is valid. The reader will now observe that Dedekind's theorem enables one to prove by a *single* stroke, so to speak, that (α) is valid for all positive integers. For, by (β), (α) is valid for 1, that is, A is part of Σ and (1) is satisfied; and, as A_0, or 1_0, is S, it follows from (γ) that (2) is satisfied; hence S is part of Σ.

With the modern increasing interest in the philosophy of mathematics, mathematical induction has steadily gained in interest and acknowledged importance. Certain questions respecting its presuppositions and field await definitive answers. It is agreed that every argument by mathematical induction is a mathematical argument, no matter what the subject-matter, but there is difference of opinion as to whether every mathematical argument is mathematical induction either in terms or in disguise. Were this converse true, mathematics (see MATHEMATICS) would be definable in terms of this mode of ratiocination. This and kindred questions are considered in the works cited below.

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CASSIUS J. KEYSER,
Adrain Professor of Mathematics, Columbia University.

Indulgence. An indulgence is a partial or total remission by the Church, through an extra-sacramental channel, of the temporal punishment due for sin after its guilt and eternal penalty have been removed by the sacrament of penance. The theological basis upon which the doctrine rests is that all the acts of Christ, the God-Man, were of infinite value, that the acts of the Saints are his acts because vivified by divine grace, and from this treasury of divine, supereminent merit the Church is able, so to speak, to pay the debt of temporal punishment for the repentant sinner.

Certain cardinal principles of Catholic life are requisite to obtain a correct idea of the Catholic doctrine of indulgences. Growth and adaptation have characterized the Christian organism from the Apostolic Council of Jerusalem to the Œcumenical Council of the Vatican. The development of doctrine upon which such explicit emphasis was laid by the late Cardinal Newman, is of prime significance for the student who would institute a comparison between the teaching and practice of the Church in the matter of indulgences at the present day and during apostolic times. We may observe in passing that the principle of doctrinal development is in perfect harmony with the scientific spirit of the present age. Growth and adaptation are now believed to be distinguishing features of every living and progressive organism. We should not, therefore, expect to find the Catholic system of indulgences, in all its complex details, flourishing in the primitive Church. In harmony with the law of development, essential to every organization among men, we believe that the Church's "proud boast of *semper eadem*" is not defeated by calling attention to the richness, variety, and flexibility of the outer forms of its polity and liturgy, or to the varying emphasis given to special dogmas in the course of its history, in response to the needs of particular eras. Unity in diversity is the Church's

most appropriate motto. The doctrine and practice of indulgences, therefore, which obtain throughout the Catholic world at the present time must be sought for only in germ in Sacred Scripture and in the practice of the primitive Church, just as the bole, the branches, and the foliage of an oak tree, "the monarch of the forest," existed potentially in the acorn from which it sprung.

Indulgences being the remission of the temporal punishment due to sin, the interpretation of their true character should start from the Christian idea of the nature and purpose of punishment. It is therefore strange that writers of all schools of opinion concerning indulgences should fail to correlate the two concepts. At the present day the conviction prevails almost universally among non-Catholic students of penology that punishment is exclusively disciplinary and correctional. No theory could be more alien to the spirit of the entire Old Testament or to the mind of the early Christian Fathers. The inflexible and rigorous justice of God making death the wages of sin, appears in almost every page of the history of his covenant with Israel. The New Testament, founded on the atonement by Christ, only mitigates this view by impressing on the minds of men the possibility of vicarious satisfaction for their transgressions. But although Christ's atoning and vicarious sacrifice was all-sufficient in itself, or objectively considered, to satisfy the offended justice of his Heavenly Father, nevertheless the Christian economy of redemption demands each individual's co-operation at every stage in order to appropriate Christ's merits and make them subjective to himself. The opposite view (that is, the belief), that the creature has no active part in his sanctification and salvation, inclines toward Pantheism, robs good works and the Christian sacraments of genuine value, and differentiates the Lutheran from the Catholic position. According to Catholic teaching, the guilt of sin is cleansed from the soul by the application of the merits of the precious blood of Christ through the instrumentality of the Sacraments, whose efficacy, in the case of adults, depends on the subjective disposition of the recipient. The eternal punishment due to sin disappears with the guilt to which it is annexed. But, besides having these supernatural and eternal relations and consequences, sin viewed even within the circumscribed limits of man's natural life on earth, is an act of treason against God in his own kingdom involving forfeiture of all rights to life and all the good things with which God's providence has so bountifully enriched it. This temporal consequence of sin calls for a temporal reparation. The canonical penalties therefore imposed on the Church during the first centuries were intended to pay this temporal debt to the Divine justice, and were not merely disciplinary or correctional; and the sinner, in submitting to them, or in seeking mitigation from them through the intercession of the martyrs, recognized the necessity of his own personal act to satisfy the justice of God, either directly or vicariously by appropriating through the charity of the Church the superabundant merits of Christ and his Saints.

An indulgence granted to the living is an act of jurisdiction, or exercise by the Church of the power of the keys conferred on it in the well-known words of the Gospel of St. Matthew: "And I will give to thee the keys of the Kingdom of Heaven, and whatever thou shalt bind on earth, it shall be bound in Heaven, and whatever thou shalt loose on earth, it shall be loosed in Heaven." Every Church, in so far as it is a visible organization, claims in some degree a power of the keys, that is, the right to admit or exclude members — to determine fellowship. But the antithesis so emphatically expressed in the text between Heaven and Earth proves that the kingdom of Heaven there spoken of is more comprehensive than the visible Church of Christ. It is proclaimed that the power of binding and loosing on earth bestowed upon the apostles and their successors, is ratified in its every act by the supreme tribunal of God in the Church triumphant. In accordance with a well-known principle of Catholic exegesis, the best interpretation of a text of Sacred Scripture is furnished by the universal tradition of the Church from the age of the Apostles to the present time.

St. Paul, in his epistles to the Corinthians, describes how he imposed punishment on the incestuous Corinthian and how he subsequently remitted it. The penalty was not merely an ecclesiastical censure of excommunication inflicted primarily for the purpose of safeguarding the flock of Christ. The Apostle expressly states that the chief motive which actuated him was anxiety for the individual salvation of the transgressor. Nor could it have been (as has been already shown) a mere disciplinary measure to impress upon the sinner the gravity of his crime or to test the sincerity of his repentance. Having no organic relation to confession, whether public or private, and no expressed or implied connection with perfect contrition, it was not a part of any conceivable Christian ordinance for the remission of the guilt and eternal punishment of sin. According to Catholic reasoning, it was therefore an exercise of the power of the keys by the Apostle to remit a temporal debt due to God for the offense; and since, according to universal Jewish and Christian belief, the Divine Justice rigorously demanded either direct or vicarious satisfaction, the Apostle could only concede that "indulgence" by appropriating to the individual sinner the superabundant merits of Christ and the Saints out of the treasury of the Church.

It will be observed that the Apostle of the Gentiles granted the first recorded indulgence in the form of an absolution. Indulgences usually took this form in the primitive Church. The early Fathers frequently refer to their being thus conceded by bishops on the presentation of a "Libellus Supplex" given to the penitent by some Christian martyr on the eve of suffering an heroic death for Christ. It is interesting to note that the present practice of never granting those favors except to persons who are in full communion with the Church, and who have received the Sacrament of Penance, was substantially insisted upon by St. Cyprian. He demands that the martyrs should not grant "Libelli" except to persons who had abandoned their sinful career and given ample evidence of heartfelt contrition and sincere conversion. Indulgences in the first centuries of the Church

having implied a diminution of the period of canonical punishment (the name by which this act of leniency was then known was φλανθρωπια,) (vide Conc. Ancyra, can. 5; Cfr:Hefele, Conciliengeschichte), such expressions as an indulgence of seven years and seven quarantines came into use. An indulgence of seven years means the condonation of as much of the temporal debt due to God for sin as canonical punishment extending over seven years would atone for. Likewise an indulgence of seven quarantines connotes a canonical punishment extending over seven Lents.

We find in the writings of St. Augustine reference to the remission, in return for almsgiving, of temporal penalties imposed for minor ecclesiastical offenses. Thus there gradually grew up the custom of granting indulgences under the form of commutation. Under this form they were especially conspicuous during the period of the Crusades. Every person who confessed his sins in a sincere and contrite spirit, received Holy Communion and joined the Crusade for liberating the holy places from the infidels was declared to need no other penance. "*Iter illud pro omni Poenitentia reputetur*" was one of the decrees of the Council of Clermont, held under Urban II. in the year 1095. The system of commutation for almsgiving afforded opportunity for abuse, as was evident in the practice of "farming out" to laymen the collection of alms in return for indulgence. Thus, for example, in the case of the famous indulgence granted by Leo. X., in 1517, to the Catholic faithful on condition that they would contribute to the completion of St. Peter's basilica in Rome, the right of collecting the money was conferred, in the first instance, on Albert, bishop of Maintz, and then sold by him to an Augsburg banker. Circumstances like these gave occasion to the Protestant party to charge the Church with the "sale of indulgences." Cardinal Pallavicini, the celebrated Jesuit historian of the Council of Trent, does not hesitate to say that if Leo X. had been surrounded by able theologians and enlightened by their counsels he would have proceeded more cautiously in dispensing indulgences. However, it should in justice be recognized that the erection of St. Peter's in Rome, the ancient capital of the Christian world, was an enterprise of the deepest interest to every member of the faithful. Together with the incidental abuses connected with commutations, other circumstances combined to inspire disaffection for the Holy See in the minds of European rulers and their dependents; and, as in the case of every revolution fed by prolonged and deeply-rooted discontent in the minds of those who control public opinion, a spark sufficed to start the conflagration. The life of Luther recently published by the Rev. Heinrich Denifle, O.P., and the abundant controversial literature which it has called forth from the ablest Protestant historians and theologians of Germany, have proved that the first Apostle of the Protestant Reformation was an epoch-maker by reason of conditions, not because he possessed in any high degree the qualities of the *Uebermensch*. Yet the nailing of his ninety-five theses on the doors of the castle church of Wittenburg in protest against the indulgence granted by Leo X., and preached by Tetzel, sub-delegate of Albert, bishop of Maintz, set all Europe aflame and destroyed the dogmatic unity of Catholic christendom.

Opposition to the doctrine of indulgences arose at different times, not because of their alleged novelty or repugnance to the religious sense of the Christian people, but because they did not always approve of the object for which alms were obtained by the preaching of indulgences, or because of the personal defects of those entrusted with their promulgation. It should be distinctly noted that these purposes were not always strictly religious. They were frequently philanthropic, such as the construction of bridges, the erection of hospitals, etc., and in such cases received the unqualified approval of princes and people. In order to comprehend the outburst which Luther was able to evoke against the indulgence granted by Leo X. we must bear in mind, besides the questionable motives that are alleged to have partly inspired the action of that pontiff, also the bitter memories that tarried in the minds of European monarchs after their defeat on the question of investitures, and the death-blow dealt thereby to the feudal system. The entire antipathy aroused, for this and other reasons, against the Holy See in the time of Leo X. found vent in the attack initiated by Luther on indulgences.

An Indulgence may be acquired directly by the living and applied by them, with the consent of the Church, to the souls of the faithful departed. All Catholic theologians are unanimous in the opinion that an indulgence should not be granted without grave and substantial reasons, since the ordinary Christian economy demands that each individual should make personal reparation for the temporal debt due for his sins. Moreover, in order to participate fruitfully in an indulgence, certain conditions and dispositions are necessary on the part of the subject. He must be in the state of grace, have a genuine desire to gain the indulgence, and perform certain acts prescribed by the Holy See.

The application of indulgences to the dead is not a juridical act of the Church, whose jurisdiction is limited to the members of the militant or visible Church on earth. Remission of the temporal debt due to God for sin by the suffering members of Christ's mystical body in Purgatory is communicated to them by the Church by way of suffrage or supplication. In other words, she authorizes the living to join their petitions with hers that God may graciously accept the indulgences which they gain and in the measure in which they gain them, in behalf of the souls of the faithful departed. Indulgences are now dispensed partly by way of absolution and partly by way of commutation. The well-known distinction between partial and plenary indulgences should be understood in an objective sense. The degree in which any indulgence is actually gained or subjectively appropriated by the individual depends on his subjective disposition, according to the theological maxim: whatever is received is received according to the measure of the recipient. The most solemn of all plenary indulgences is that which is granted on the occasion of a jubilee such as that which was proclaimed for 1904 by His Holiness Pius X.

to mark the 50th anniversary of the definition of the Immaculate Conception by Pius IX.

THOS. E. JUDGE, S.T.P.,
Formerly Professor of Mental and Moral Philosophy, St. Patrick's College, Maynooth, Ireland; afterward Professor of Dogmatic Theology in The Saint Paul Seminary, Saint Paul, Minn. Editor of 'The Catholic Review of Reviews.'

Indulgence, Declaration of, the proclamation issued in 1687 by James II. of England by which he sought to relieve his subjects from observing laws opposed to their consciences. As the persons then suffering most from the laws were Roman Catholics, and as the laws would leave them free to worship according to their consciences, the proclamation was opposed by many king's subjects. Seven bishops of the Church of England refused to order their clergy to read the king's proclamation. Charles II. issued two similar indulgences in 1662 and 1672, both of which were unpopular with the people outside the Roman Catholic Church.

In'dus (Sanskrit, *Sindhu*), the chief stream of the northwest of India, and one of the great rivers of the world. It has a length of about 1,900 miles, and drains an area of more than 360,000 square miles. It rises in Tibet on the north of the Himalaya Mountains, nearly 100 miles northwest from the sources of the upper Brahmaputra (q.v.), on the north side of the mountain mass of Kailâs, 18,000 feet above sea-level. In the upper part of its course it takes a northwesterly direction along the northern foot of the main Himalayan range, enters the Kashmir territories, passes through Ladak, below the capital of which, Leh, it receives the Zanskar, farther on the Dras, after which it enters Baltistan. Here it receives, on the right, the Gilgit, from a glacier of the Karakoram, the largest tributary that joins it in the Himalayan regions, and takes the name of Indus or Sind. About 100 miles below this it takes a sudden bend toward the southwest, and after a course of about 180 miles more in this direction it leaves the loftier regions. At the British fortress of Attock in the Panjab — where it is crossed by a great railway bridge carrying the line to Peshawar — it is joined by the Kabul from Afghanistan, and here, 950 feet above the level of the sea, it is nearly 800 feet wide and from 30 to 60 feet deep according to the season. For the rest of its course (about 900 miles) it continues its southwesterly direction till it enters the Indian Ocean. At Kalabagh, 110 miles below Attock, it has a breadth of over 1,400 feet. Arriving in the low-lying country, its waters become charged with mud, and in the rainy season, and by the melting of the snow in the mountains, it overflows its banks. Near Mithankot it receives on the east the Panjnad, or united stream of the Five Rivers of the Panjab. Below the confluence it has a width of over 1,900 yards when the water is low. In Sind it gives off several extensive arms or canals, which are of great value for irrigation; and below Hyderabad it divides into a number of shifting mouths or estuaries, the most navigable of which is at present the Yatho mouth. The delta, formed by the enormous amount of alluvium brought down by the river, has a coast-line of about 130 miles, and the point or head of it at Tatta is 70 miles from the sea. The tide rises to this distance. The Indus loses much water from passing through dry and desert regions, and much is also drawn off for irrigation; accordingly it brings down much less water to the sea than the Ganges. Vessels drawing more than seven feet of water cannot generally enter any of its mouths; but steamers of light draft ascend from Hyderabad to Multan. A railway ascends the valley of the Indus from the important port of Karachi to Peshawar.

Industrial Commission, a non-partisan body authorized by Congress on 18 June 1898, to investigate the subjects of "immigration, labor, agriculture, manufactures, and business" in the United States, with the utmost fairness to both capital and labor, and report to Congress with suggested legislation, as a basis not only for national law and administration, but for uniformity of State laws. It was empowered to administer oaths in order to obtain sworn testimony, and send for persons and papers, as well as (by a supplementary act) to purchase relevant literature up to $1,500 a year. The members were to be five Senators appointed by its president, five Representatives appointed by the Speaker, and nine private gentlemen appointed by the President and Senate, fairly representing different industries and branches of national life. Originally appointed for two years, the term was extended to 15 Dec. 1901, and then to 15 Feb. 1902, the last report being dated the 10th. The actual work was done by the private members, who employed 27 experts on the various lines, and examined nearly 700 witnesses; making a report in 19 volumes, of the highest value from the unmatched thoroughness and authoritativeness of the view on every side of our industrial system brought out, and the competence of the witnesses, who represented all grades, from heads of trusts to presidents of colleges, and from lawyers to heads of trade unions, leaving no field untouched. The commission also digested a vast amount of facts from judicial decisions and official documents. The private commissioners were A. L. Harris, S. N. D. North (successor Albert H. Clarke), Ellison A. Smyth (successor D. A. Tompkins), J. M. Farquhar, E. D. Conger, T. W. Phillips, C. J. Harris, M. D. Ratchford (successor C. H. Litchman), J. L. Kennedy. The experts were on warehouse and grain inspection laws, immigration (two, statistics and labor questions), agriculture (four, distribution, labor, speculation, and taxation), labor organizations, prison labor (two), railroad labor, Asiatic labor, strikes, and arbitration, trusts, transportation (two), railroad legislation, taxation of corporations (two), domestic service, pure-food legislation, mining industries, mining labor legislation, tobacco industries, mechanical progress, besides advisory counsel and expert indexing.

Indus'trial Corporations in the United States, include the large number of trusts, or industrial combinations formed between 1800 and 1903. As the individual or private business firm gradually gave way to the limited partnership, so the limited partnership in turn practically yielded to the general corporate form of doing business, especially in respect to

manufacturing which followed the general tendency of business toward consolidation. This was a natural result of the rapid growth of capital, which consolidated for its own benefit. In this development some of the earlier and larger trusts undoubtedly played a very prominent part, creating a precedent, setting an example, as it were, notably the Standard Oil trust and the Sugar trust, both of which have been in corporate form for some years. They were the pioneers in consolidation of manufacturing interests, but compared with the more recent United States Steel Corporation, with its capital of more than a billion dollars, they are but pigmies. The great majority of these combinations have capitalizations in excess of $5,000,000 each, while only a very few are capitalized at less than $1,000,000. Many of these manufacturing combinations practically control a very large proportion of the entire business of the country in their particular lines and are even extending that control to other countries.

The most notable feature in the increase in the industrial growth of the United States from 1883 to 1903 is in the iron and steel industry, in which the production is nearly six times greater than it was at the beginning of that period. The total quantity of pig iron and steel produced in 1882 was 5,360,015 tons. In 1892 the quantity was 14,084,581 tons, and in 1902 it had increased to 31,255,595 tons. The increase in the production of pig iron in 1892 over 1882 was 98.99 per cent; and in 1902 over 1892 it was 49.18 per cent. The increase in the annual production of steel, however, was much greater in proportion. In 1892 it was 183.38 per cent greater than in 1882, and in 1902 it was 174.34 per cent greater than in 1892. Among the advantages of the corporate form over individual ownership which so largely tend to the advantage of consolidations of capital and the supplying of the demand for greater facilities for its employment in industrial fields is the fact that, while stockholders die, the corporation can go on forever. The ownership of these corporations is divided among hundred of thousands of individual stockholders, who are liable only for the amount of their stock, and which can be transferred without affecting the corporation or its liability and without any trouble. The number of stockholders of four of the largest corporations, for instance — namely, the United States Steel Corporation, the American Sugar Refining Company, the Amalgamated Copper Company and the Standard Oil Company — number about 100,000 persons.

The census of 1900 gave the statistics of industrial corporations (first table below):

In 1902 these figures had materially increased, there being 213 industrial combinations or trusts with a capital of $6,639,019,304, but even these figures are far from the estimates made in 1903 by Moody (Manual of Corporate Securities) who places the total capital at $9,000,000,000, and who states that the railroad consolidations would increase this to $15,000,000,000.

The United States Steel Corporation, the largest of the trusts, and its competition are marvelous examples of the "combination" plan of capital. The following are the figures for 1902 (see second table below):

Industrial Education. — The industrial growth of the country created a demand for higher instruction in commercial subjects which soon led to the establishment of separate institutions devoted exclusively to such instruction. For details see AGRICULTURAL EDUCATION; ARCHITECTURE, EDUCATION IN; COMMERCIAL EDUCATION; CORRESPONDENCE SCHOOLS; EDUCATION: ENGINEERING; INDUSTRIAL; PROFESSIONAL, IN AMERICA; SCIENTIFIC AND TECHNICAL; ENGINEERING, CIVIL; ENGINEERING, MECHANICAL; INDUSTRIAL TERMS; LAW, AMERICAN SCHOOLS OF; MANUAL TRAINING; MEDICAL EDUCATION; PAINTING, EDUCATION IN; SCULPTURE, EDUCATION IN; TECHNICAL EDUCATION; TECHNOLOGY, SCHOOLS OF; TRADE SCHOOLS; ETC.

No. of Co.'s.	Industries	No. of plants controlled	Capital issued	
			Stocks	Bonds
40	Iron and steel companies	489	$763,806,295	$20,614,000
21	Food and allied products	277	277,618,300	12,725,900
14	Chemical products	295	278,357,295	9,294,000
11	Metals other than iron	113	203,505,600	8,565,000
28	Liquors and beverages	258	193,301,158	55,529,142
6	Vehicles (land)	72	189,680,000	10,300,000
4	Tobacco	41	197,184,628	.....
8	Textiles	72	109,514,175	36,944,000
5	Leather	108	184,015,200	13,805,000
7	Paper and printing	119	130,006,500	42,461,217
15	Clay, glass and stone, etc.	203	63,896,858	5,567,500
8	Lumber, etc.	59	39,534,400	275,000
16	Miscellaneous industries	97	238,367,700	332,000
183	Total	2,203	$2,268,788,109	$216,412,759

Summary	Capital Authorized	Capital Outstanding
United States Steel Corporation proper	$1,404,000,000	$1,319,560,000
Underlying securities of 26 controlled properties	90,435,656	68,478,656
Securities of 3 companies controlled in the interest of the United States Steel Corporation	139,250,000	131,250,000
Securities of 4 companies operated in harmony with United States Steel Corporation	118,686,200	86,661,000
Grand total	$1,752,371,856	$1,605,949,856
Securities of 32 of larger competitors of United States Steel Corporation	452,164,600	385,740,100

Industrial Terms. The following list embraces many of the important terms that are used technically in the several commercial industries. Such terms as are usually regarded as self explanatory, as well as those that have no general application, have been omitted. Those that are of more than ordinary importance will be found defined more fully under their appropriate heading.

ABANDONMENT.— A term used in marine insurance to denote that all property saved has been relinquished to the underwriters in order that the insured may claim indemnification for a total loss.

ABB.— In wool-sorting the quality of the wool is denoted by the terms: "fine abb," and "coarse abb."

ABORDAGE.— A term used in marine insurance. If a collision between two vessels happens on the open sea and the damaged ship was insured the persons insuring her must pay the loss, although they are entitled to relief at civil law against the party causing the damage.

ACCEPTANCE.— A term usually used, in marine insurance, in cases of abandonment. It is this process which perfects the rights of the insured in the recovery of his loss.

ACTUARY.— An officer of an insurance company whose skill in the application of the doctrine of chance to financial affairs enables him to make the computations necessary to determine the valuation of contingent liabilities, as shown in the compilation of tables, the computation of risks, etc.

AGREEMENT.— In insurance the contract issued prior to the delivery of the official policy is known as the "agreement."

ANNEALING.— The process of treating substances by heat to remove their brittleness and yet make them tough and inclined to be elastic.

ANNUITY.— A fixed amount paid each year, whether in one sum, or periodically, in installments. When an annuity is continued for a specific number of years it is termed a "certain" annuity. If the period of its continuance is uncertain it is called a "contingent" annuity. When payment has already commenced it is an "annuity in possession," but when such payment does not begin until a specified period has elapsed, or a definite event has taken place it becomes known as a "reversionary" or "deferred" annuity.

AMOUNT OF LOSS.— An insurance term denoting the diminution or destruction of the values of, or of the charge upon, the insured by the direct consequence of the operation of the risk incurred, according to its value in the policy.

ASSESSMENT.— In insurance, an assessment is made (1) as an apportionment in general average upon the articles at risk for contribution for damage and sacrifices purposely made for escape from impending peril, and (2) also upon premium notes given by members of mutual companies as a substitute for the investment of the paid-up stock.

ATICHLOR.— A term used in bleaching to denote the method employed to remove or neutralize the injurious effects of the free chlorine left in some bleached materials.

ARCH.— When a portion of a lode is left standing, in mining, because it is too poor to work or is needed as a support, it is called an "arch."

ASTERISM.— A term in printing, denoting the 3 asterisks sometimes placed before a sentence to call attention to it.

ATTEMPERATION.— Regulating the temperature of the beer-worts in brewing.

ATTENUATION.— The decrease in density of the beer-worts in brewing is termed "attenuation."

AVIVAGE.— A process for clearing and brightening the colors in dyeing.

AVERAGE BOND.— A bond in marine insurance under which the consignees of cargo subject to general average, guarantee payment of their contribution as soon as ascertained in order that their goods may be delivered at once.

BACK.— (a) In metal-mining, the portion of the lode that lies between the level and the one next above it; (b) in coal-mining, the inner end of a heading where work is being conducted; (c) the thickest and best hides are termed "backs" in the leather trade.

BACK-CASING.— A wall of dry brick sunken through sand or gravel in mining.

BACKLASH.— A term denoting the backward suction after an explosion of fire-damp.

BACK-STAY.— In printing, the leather strap used to check the carriage of the press.

BALK.— When a bed of coal suddenly thins out it is termed a "balk."

BAND.— A layer of rock that is interstratified with coal.

BARNEY.— A small car used in mining to push the mine-car up a slope; the pit from which it runs is termed the "barney-pit."

BARRATRY.— In marine insurance, the commission of any fraudulent act in the management of a ship, or its cargo, by which the owners, consignors, or insurers are subject to injury.

BARREL-WORK.— Pieces of native copper too small to be handled as mass-copper, but large enough to be shipped in barrels.

BASTARD.— (a) An impure brown sugar made from the refuse of previous boilings; (b) the large mold into which the sugar is drained is also called a "bastard;" (c) in printing, any type whose face is out of proportion to the size of its body is termed "bastard" type.

BATING.— The process of steeping hides and skins to render them soft and fit for tanning.

BATTERY.— The timber structure that is used to prevent coal from sliding down a shute.

BAY.— In mining, an open space for waste in a long-wall working.

BEAMING.— (a) Winding the warp-yarn on a loom in the manufacture of cloth; (b) working hides with a slicker over a beam in the leather trade.

BEATER.— (a) A machine used in cotton manufacturing to open and clean the cotton before it passes to the carder; (b) a knife used for breaking flax or hemp; (c) the lathe or batten of the loom used in weaving.

BENCHING.— A term applied to the process used in getting the coal after it is holed.

BLACK-LIQUOR.— A crude acetate of iron used, in dyeing, as a mordant.

BLEED.— (a) In bookbinding, to trim the margin too closely; (b) in dyeing, extracting the coloring matter.

BLEU-DE-ROI.— The term used to denote the cobalt-blue color in European porcelain.

BLICK.— The iridescence appearing on gold and silver at the end of the refining process.

BLUE-CAP.— In mining, the bluish or brownish halo which, when it appears around the flame of the safety lamp, indicates a dangerous quantity of fire-damp, is termed the "blue-cap."

BOARDS.— The hard paper-stock inserted between the printed sheets in a press to remove an indentation of impression; often called "press-boards."

BONE.— The term used to define the slaty portions in a coal mine.

BONNET.— The shield used to protect a mine shaft from substance which might otherwise fall into it.

BORDER.— The rim fixed about the bed-plate used in milling to prevent the meal from falling off before it reaches the proper opening.

BRANNING.— A term that is applied both to the process of steeping cloth before or after it is dyed, and to the steeping of skins before tanning.

BROOD.— The term applied in mining to all heterogeneous mixtures found with copper or tin ore.

BRUSH.— An instrument constructed of several small trees, like the birch, and used by farmers instead of a harrow in covering grain, or small seed after sowing.

BUCK.— The breaking of ore into small pieces for jigging.

BUDDLE.— In mining, to wash ore free from earthy matter the water is run over an inclined hutch which is termed a "buddle."

BULLOCKS' HIDES.— The trade name given to the raw hides of cattle.

BULLY-HEAD.— The name by which the sledge-hammer used by miners is popularly known.

BULTOW.— In the fishing industry, the practice of stringing many hooks on one line, used in fishing for cod off the Banks.

BUNCHY.— Used in mining to denote that the ore is irregularly distributed through the lode in small masses, or "pockets."

BUNDLE.— (a) In paper-making, 2 reams of printing, or brown paper; (b) in spinning, 20 hanks, or 6,000 yards of linen yarn.

BUNTONS.— The timbers put across a mining shaft to divide it into compartments.

BUTT.— A hide of sole leather in which the belly and shoulders have been cut off.

CADE.— A term of measurement in the fishing trade, denoting either 500 herrings, or 1,000 sprats.

CAGE-SEAT.— The framework at the bottom of a shaft, so arranged as to reduce the jar when the cage drops upon it.

CALF.— A term applied to a bookbinding in calf-skin. This binding is of several grades: Divinity calf, a dark-brown binding, with blind stamping and no

gilding; half calf, in which the backs and corners only are of calf-skin; mottled calf, a calf binding of pale color in which the decorations have been made by the sprinkling of acid; smooth calf, or plain, undecorative leather; tree calf, a bright, brown calf binding stained by acid to imitate the trunk and branches of a tree.

CANCH.— A term used to denote that part of a floor or roof of a gangway that is removed to equalize the grade because of a fault, or break in the strata.

CANNEL.— A form of weaving that produces a corded or rep tissue.

CAP.— A term denoting certain sizes and shapes in paper: Double cap, 17x28 in.; exchange cap, a fine quality paper, used in printing bills of exchange; flat cap, or full cap, 14x17 in.; foolscap, usually 12x15 in.; legal, or pot cap, 13x16 in., etc.

CARDING.— The disentangling of wool, cotton, or other fibres preparatory to spinning.

CARROT.— In the fur trade, to dress a pelt to preserve it from insects.

CARROTS.— Rolls of tobacco after they have been so prepared that they require only to be ground and sifted to be made into snuff.

CASE.— (a) A shallow wooden tray, the partitions making the small boxes in which the various characters of type required by printers are kept in order for the use of compositors. (b) A book cover that has been made separately from the book for which it is intended.

CASSE-PAPER.— The wrinkled, broken, or otherwise imperfect paper rejected by the trade.

CASSETTE.— The utensil in which chinaware is baked; sometimes called the "coffin."

CAST.— (a) The water used in the preparation of beer. The quantity that is first placed in the mash-tub is termed the "first cast;" that which is subsequently added, the "second cast," "third cast," etc. (b) In bee culture, an after swarm led by a maiden queen.

CERTOSINA WORK.— A term used to denote the inlay of certain light materials — like ivory or satinwood — upon dark woods like walnut.

CHOP.— (a) In milling the product of the first crushing of the wheat; (b) also used to denote the brand and quality of tea imported from China, as "first chop," etc.

CLICKER.— The workman who cuts the uppers and soles for boots and shoes.

CLOG.— The short pieces of timber used in mines to prop the roof.

CLOSING-MACHINE.— (a) A machine that sews heavy cloth or leather with a lock-stitch, alike on both sides; (b) apparatus used in rope-making to twist the already made strands into rope.

COBBING.— In mining, a process of breaking the ore that the better parts may be sorted out.

COCKLE.— (a) A large stove used in the making of porcelain, to dry the biscuit-ware after its glazing preparatory to burning; (b) the kiln used for drying hops.

COLOR.— In gold mining, the particles of gold that are shown when auriferous sand is washed out.

CHASE.— In printing, a square, open framework of iron into which the type forms are fastened to facilitate moving and working on the press.

COMMERCIAL.— A term used to denote the shape and size of paper: Commercial letter, 11x17 in.; unfolded commercial letter, small, 10½x16½ in.; commercial note, 8x10 in., unfolded.

COMPANIONSHIP.— In printing, a number of compositors employed in setting up a quantity of copy under the direction of one leader.

COMPOST.— A mixture of various manuring substances used by agriculturists in fertilizing land.

CONCENTRATOR.— A machine used, chiefly in mining in the United States, to separate the ore from the rock with which it was associated in the lode.

CONSTRUCTIVE TOTAL LOSS.— A term used in marine insurance when the thing insured and damaged, while not entirely a total loss, is so nearly so that it is practically beyond recovery or repair. In such cases a notice of abandonment is served upon the insurers by the owners, after which the "constructive total loss" may be recovered.

CORD.— (a) In fancy weaving, the interval between two vertical lines of the design is termed a "cord;" (b) the same term is used in bookbinding when a book is tied firmly between two boards to assure its drying smoothly. The term "Maitland cord" is used in weaving to denote the cord which extends along the wooden shafts of leaves to which the heddles are secured.

CORDING.— The term denoting the arrangement of the treadles in a loom by which they are made to move in such clusters and time as the production of the pattern may necessitate.

CORE-PIECE.— The yarn running through the centre of a rope to assure its solidity.

CORNER.— The tool used in bookbinding to decorate the corners of a book.

COULH.— (a) The operation, in brewing, of spreading the steeped grain upon the floor to convert it into malt; (b) in paper-making, the act of removing the paper from the mold upon which it has been formed that it may be placed upon the felt.

COUNTER-LODE.— A term used in mining to denote a lode running in such a direction in relation to the main lodes that it crosses or intersects them.

COURSING.— The method of regulating the ventilation of a mine by conducting the air through various doors, stopings, etc.

CRAM.— In weaving, a warp that has more than two threads in each split of the reed.

CRAZING.— In the pottery industry, when the glaze separates from the body and forms blisters.

CREASER.— A tool used in bookbinding to define the width of the bands of a book, and to fix the position of the lines on the backs and sides.

CREEP.— If the pillars of a mine are not sufficiently large, or the roof is not fully supported the pressure of the superincumbent strata sometimes causes an apparent rising of the under-clay. Collieries have been entirely destroyed by these "creep."

CROP.— An untrimmed hide, struck for sole-leather, is termed a "crop," or "crop-hide" in the trade.

CRUTCH.— A term used in soap-making to denote the perforated instrument with which the various ingredients are stirred together.

CUT.— The block upon which a picture is engraved and from which it is impressed in printing.

CUTTER.— Usually applied, in mining, to a joint or crack which crosses a better defined system of cracks in the same rock. In coal-mining "cutting" is the work done in getting the coal into a condition where it may be broken down.

DABBER.— The use of the "dabber" by printers has largely ceased since the introduction of the ink-roller, but the same term is now applied to instruments used by etchers and stereotypers. The former is used to ink the surface of engraved blocks or plates; the latter to dab the back of the damp paper used in the papier-mache process of stereotyping, in order that it may be driven into the interstices of the type.

DARBING.— The term applied to the process in stone-working by which the surface of the stone is covered with small indentations, after having been made uniform.

DAM.— The term applied to the underground wall frequently constructed to hold back water, air, or gas.

DAMPING.— A process used in bleaching to add a certain amount of moisture to a fabric, after it has been starched, that it may be properly finished.

DANDY.— The running-out fire for the melting of pig-iron in tin-plate manufacturing.

DANDY-ROLLER.— The wire-gauze cylinder beneath which the web of water-pulp is passed in paper-making to drain it partially of water.

DASH-WHEEL.— The partially submerged wheel used in cotton manufacturing to wash and rinse calico in the piece.

DECK.— Used in mining to denote the loading or unloading of cars upon the cage.

DECKLE-STRAP.— The contrivance used in paper-making to define the width of the sheet by regulating the flow of pulp.

DECREMENT.— A term used in insurance, usually in the sense of the "equal decrement of life," or the doctrine of annuities upon which assurance companies base their existence. It is the theory that in a given number of lives there should be an equal number of deaths within a given period.

DELE.— A term used in proofreading to direct the compositor or printer to remove a letter, word; or phrase.

DEVIATION.— A term used in marine insurance to denote the voluntary departure of a vessel, without necessity or reasonable cause, from the usual course of the voyage for which she was insured. All unreasonable delays are also involved in the same law, which releases the underwriter from all risks.

DEVIL.— An errand-boy employed in a printing-office.

DIPPING.— A process in ceramics by which a coarse clay body is coated with fine enamel by being plunged into the liquid which constitutes the coating.

DISCHARGE.— The term used in dyeing to denote the process by which white patterns are produced on colored grounds.

DISCOVERY CLAIM.— In mining law, the portion of ground held by reason of the first discovery of its mineral deposits.

DISTRIBUTE.— A term used in printing for the process of returning dead matter (type no longer required)

to the cases; "throw-in" is another term used to define this process.

DOCTOR.— (a) A term in wine-making, used to indicate that the character of the wine has been changed by the addition of another liquor; (b) to alter any commodity for purpose of deception.

DOFF.— A term that has several distinctions in the textile manufacture: (a) The process of stripping the cotton or wool from the cards preparatory to spinning; (b) the act of mending broken threads; (c) the removal of full bobbins to give place to the empty ones.

DOSSIL.— The roll of cloth used to clean the ink from an engraved plate prior to printing.

DOUBLE.— A term used to denote the size and quality of paper: Double medium, a printing paper, 24x38 in.; double royal, a printing paper, 26x40 in.

DOUBLE-DYEING.— A method of dyeing mixed goods by which the wool and cotton are dyed separately with colors that have no affinity for each other.

DOUBLE INSURANCE.— A term used among insurance companies as a synonym for over-insurance. Thus, where divers insurances are made upon the same interests against the same risks in favor of the same assured, in proportions exceeding the value of the subject, the party insured may sue upon all the policies although he is entitled to but one satisfaction.

DOUBLE-MILLED.— A term applied to denote that cloth has been fulled twice to make it finer in quality.

DOUBLER.— (a) A machine for doubling and drawing silk; (b) a still made to intercept and redistill the vapors of distillation; (c) a felting placed between the fabric and the press before printing.

DOWNCAST.— A term used to denote the system of ventilation used in mining, the shaft down which the air passes into the mine being called the "downcast."

DRAFT.— Used in weaving to describe the cording of a loom or the arrangement of the heddles.

DRAG.— (a) A light iron-rod tool with a tapering spiral end, used by miners in cleaning out bore-holes before introducing the charge; (b) the device that guides wood to the saw in saw-milling; (c) also applied in printing to denote the thickened impression on one side of the letters produced by the scraping of the sheet on the type.

DRAWING-PAPER.— A term used commercially to describe a variety of stout papers manufactured expressly for use in drawing. The regular sizes are as follows: Cap, 13x16; in.; demy, 15½x18½ in.; medium, 18x22 in.; royal, 19x24 in.; superroyal, 19x27 in.; imperial, 21¼x29 in.; elephant, 22¼x27¾ in.; columbier, 23x33¾ in.; atlas, 26x33 in.; theorem, 28x34 in.; double elephant, 26x40 in.; antiquarian, 31x52 in.; emperor, 40x60 in.; Uncle Sam, 48x120 in.

DRAWING-ROLLS.— The rolls used in spinning machinery. As they are set in pairs, each of which turns more rapidly than any previous pair, the sliver passes through them in succession.

DRAW-BOY.— Formerly the weaver's assistant; now, a mechanical device used in drawing the heddles to form the pattern of the cloth to be woven. The machine upon which this figure-weaving is done is known as the "draw loom."

DRAWN.— A term denoting the method of freeing substances from all particles of iron and steel by use of a magnet.

DRESSER.— (a) The workman employed in type-foundries to remove all defects from the types in preparing them for sale; (b) the tool, or machine employed to cut and dress the furrows on a millstone; (c) a mallet used by plumbers in closing joints in sheet-lead; (d) one of the picks used in mining.

DRIFT.— A term used in mining to describe the nearly horizontal excavations that are frequently made in working a mine; sometimes called a "drive."

DRILL.— In agriculture, when a field is not sown broadcast, but in rows, it is said to be in "drills."

DRIP-JOINT.— When two sheets of metal used in roofing have been so united that the joint forms a water-conductor the arrangement is known, in plumbing, as a "drip-joint."

DROP-BAR.— A term applied to the bar or roller on a printing-press that regulates the passage of the paper sheets to impression.

DROP-DRILL.— The term denoting an agricultural instrument that is employed to drop the seed and fertilizer into the ground simultaneously.

DROP-FINGER.— In some cylinder printing-presses the rods that are employed to hold the sheets in place until they can be seized by the grippers are termed the "drop-fingers."

DROPPER.— A term used in mining to denote a branch or spur that connects with the main load but that does not materially enrich it.

DROPPING.— A term used to denote a defect in the product of the glassmaker. It is caused by the accidental dropping of the crude glass into the molten glass in the melting vessel.

DROP-ROLLER.— Used in printing to denote the roller that drops at specified intervals to supply the printing ink for distribution.

DROVING AND STRIPING.— A process in stone-cutting by which the shallow parallel grooves are made along the length of the rough-hewn stone.

DRYING-OFF.— A term denoting the process by which an amalgam of gold is evaporated.

DRYING-PLATES.— Used in brewing to denote the series of frames in the malt kiln. They are placed one over the other, and, being covered with woven wire, the hot air ascends through them in such manner as to dry the malt.

DUMP.— Used in printing to denote the act of removing types from the stick to place them on a galley.

DUNG-BATH.— In some processes of dyeing and calico-printing the cloth is subjected to a "dung-bath," composed of warm water, animal's dung, etc., for the purpose of removing the superfluous mordant.

EGG-SHELL.— A term used commercially to denote the thinnest and most translucent of china or porcelain.

ELBOW-PLATE.— A term used in paper-making when the cutter of the rag-cutting machine has been bent to something like an angle in the middle.

ELECTROPLATING.— The process of coating articles with silver or other metal by means of electrolysis.

ELECTROTYPING.— The process of making plate copies of any engraved or molded surface by means of electrical deposition.

ENDOWMENT.— A term used in life insurance to describe a policy in which the face value, with accrued earnings, is payable to the insured at, or after a stated period, or in which the face of the policy is paid to his representatives should he die prior to the expiration of that time.

ENSILAGE.— An agricultural term used to denote the process of preserving fodder, etc., in a green state by storing the materials in silos or pits dug in the ground.

FACE.— In coal-mining, the working, or portion of the seam that is being mined.

FASCET.— A rod, or basket of wire used in carrying the bottle from the mold to the leer in glass-manufacture.

FAT-WORK.— In printing, when copy is particularly profitable to the compositor owing to the fact that it has much open space that may be filled with leads, or that in other ways favors rapid execution, is termed fat-work. To beat, or ink "fat" in printing means that a form of type has been given an excess of ink.

FEEDING.— In printing, a term denoting the method of placing the sheets of paper in such position that they are ready to meet the requirements of the press.

FILATURE.— In silk-culture, a reel by which the silk is drawn from the cocoons.

FILLET.— (a) In weaving, a strip of card-clothing; (b) in dairying, a perforated curb used to confine the cheese-curds; (c) a wheel-shaped tool used in book-binding to impress a line, or decoration upon the covers of books; (d) in printing, a rule fixed with lines that may be used as a border.

FILLING.— The term by which the woof or weft thread of a woven fabric is known.

FILLING CAN.— Used in rope-making to denote the can in which the sliver is condensed and wound after coming from the doublers.

FINE-DRAWING.— The term applied to the finishing process in cloth manufacture. By exposing the cloth to a strong light all the minute holes due to breaks are discovered so that they may be repaired with a needle, by the introduction of sound yarns in the place of those that have proved defective.

FINING-ROLLER.— A cylindrical sieve of wire cloth used in paper-making to retain the coarse fibres and knots so that they cannot pass through with the finely ground stuff.

FIRE-GILDING.— A process of gilding by which the mercury is driven from the amalgam by the heat of a muffle, leaving a fine film of gold.

FIXING BATH.— In tanning, the catechu-bath is followed by another known as the "fixing" bath. It consists of water sufficient to cover the skins, acidified with nitric acid, modified with a little glycerin.

FLESHER.— The tool used in leather manufacture for the purpose of fleshing hides.

FLOAT.— A term used in weaving to denote the passage of the shuttle crosswise above or below the threads but without intersecting them.

FLONG.— The combination of moist tissue paper and paste used in stereotyping by the papier-mache process to form the mold or matrix from composed types or engraved surfaces.

FLOOR.—In brewing, each steeping is known as a "floor" or "piece."

FLOORING.—Used in brewing to denote the operation of spreading the grain on the malt-floor, that it may be kept at an even temperature, to check germination.

FLOW.—A term used in ceramics to denote the flux that is used to make the colors run and blend in firing.

FLURRY.—A term used in calico printing to denote the condition of frothiness which is sometimes developed by the colors during the process of printing.

FLY.—(a) One of the arms of a spinning-frame which revolves around the bobbin to twist the yarn as it is wound upon it; (b) in cotton-spinning, the term is applied to the waste cotton; (c) in weaving, a shuttle with wheels driven through the shed by a jerk; (d) in printing, the mechanism which receives and delivers the separate sheets as they are printed on the press; (e) in piano-making, the hinged board with which the keys are covered when not in use.

FOLIO.—While the word "folio" is used to denote the size of a book it is also applied as a descriptive term for several sizes of paper, each of which is designated by a specific name: Pot folio, 7½x12½ in.; foolscap folio, about 8x12½ in.; flat-cap folio, 8½x14 in.; crown, or post folio, 9½x15 in.; demy folio, 10½x16 in.; medium folio, 12x19 in.; royal folio, 12½x20 in.; superroyal folio, 14x22 in.; imperial folio, 16x22 in.; elephant folio, 14x23 in.; atlas folio, 16½x26 in.; columbier folio, 17¼x24 in.; double elephant folio, 20x27 in.; antiquarian folio, 26½x31 in.

FOOLSCAP.—A term applied to a writing paper varying in size from 12x15 to 12½x16 inches. The term was derived from the water-mark, a fool's cap, which formerly appeared upon all the papers that bore this name.

FOOTLINE.—A term used in printing to denote the last line of a page of type. It is usually left blank, although it sometimes contains the number of the page or the signature on the sheets.

FORWARDER.—A term used in bookbinding to designate the workman whose duty it is to receive the sewed book, put on its back, cover, etc., and prepare it for the finisher.

FULL-FACED.—A term used in printing to describe a type with the thick lines that make it print extremely black.

FURNITURE.—The term "furniture" in printing denotes the pieces of wood or metal that are placed around the pages of type, not only to keep them the necessary distance apart but to assist in fastening them securely in the chases. When the furniture has been systematically cut into various lengths and widths, so that they may be easily combined, the pieces are known as "labor-saving furniture."

FUSTIAN.—The term applied to a short twilled cotton fabric, usually a cloth having a short nap, like corduroy, velveteen, etc.

GAGING-THREAD.—In weaving, a thread introduced temporarily to stop the weft-thread at a specified point.

GALLEY.—An oblong, shallow tray, now usually made of brass, but sometimes of wood, used in printing by compositors as a place to deposit the type they have set. Galleys in which the type may be locked are known as proof-galleys. Standing galleys are inclined frames fitted with cleats on which the type galleys rest. A proof taken from types being held on galleys is termed a "galley-proof."

CASUALTY.—A term frequently used in insurance as a synonym for accident.

CO-INSURANCE.—A form of insurance in which the insured, in view of a reduced rate of premium agrees to maintain insurance upon a certain specified percentage of the total value of his property, failing which he becomes his own insurer for the difference, a fact which makes him jointly responsible with the assuring company in case of partial loss.

GATHERING.—Used in glass-making to describe the method of coiling the molten glass on the end of an iron tube preparatory to the work of blowing.

GIGGERING.—A process in bookbinding by which the burnished lines are rubbed upon the covers decorated in antique fashion.

GIGGING.—The process of finishing cloth by drawing the loose ends of wool in a fabric to the surface to form a nap. After the work of napping is completed the fabric is ready to be finished by shearing.

GILLING.—A term denoting a process for making all fibres level and even in the manufacture of woolen yarns or worsted.

GINGERBREAD-WORK.—A phrase used, somewhat as a term of contempt, in describing the fanciful shapes of the ornamental wood-work and carvings seen upon furniture, etc.

GLANCE.—A term used in mining to designate those ores in which a peculiar lustre and color indicates that they are of metalliferous combination.

GLOSSING.—A term denoting the operation of twisting the hanks of silk, in silk-manufacture, after they have been dyed and dried. This process is sometimes termed "stringing."

GOTHIC.—A term used by American printers to describe a style of square-cut printing-type very similar in appearance to the old Roman mural letter. In England this type is known as the "grotesque."

GRAVEL.—Used in brewing to denote the appearance of the beer when yeast-cells are floating about in it in the form of fine "gravel."

GRIZZLIES.—An arrangement in the mine sluice to receive and cast aside all the large stones brought down by the current during the process of washing the auriferous gravel.

GRAVEYARD INSURANCE.—A term used to designate a method of swindling insurance companies by the substitution of a person of robust health for the bad risk actually insured. Also used to describe other kinds of insurance swindling, or crimes committed in the collection of insurance moneys.

HACKLING.—In flax-manufacture "hackling" is the process of preparing the flax for spinning by the removal of all foreign substances and smoothing and equalizing all the lengths of fibre.

HALF-TONE.—A term used to designate a photographic process in which a screen made either of netting or ruled glass, is interposed between the lens and the sensitized plate, and from the image thus produced, a positive image is made upon the prepared metal plate. This is etched into relief by the use of acids.

HALL-MARK.—A term used industrially to designate any official stamp that has been placed upon an object of trade to denote genuineness.

HARD-CURED.—A term used in the fishing industry to designate that the fish specified has been cured by being thoroughly dried in the sun after salting, a process by which all the moisture has been evaporated.

HARDENING.—A process used in hat-manufacturing, by which the bodies of the hats are rubbed and pressed hard for the purpose of felting the material as well as to diminish the size and render them more dense. A hardening-kiln is a kiln in which the transfer printing process in pottery is completed: The pottery being relieved from all superfluous oils by exposure to a low heat.

HARNESS.—The term applied to the apparatus in a loom by the operation of which the warp-threads are shifted alternately to form the shed.

HARROWING.—A term used in agriculture to describe the process of dragging a many-metal-teethed instrument over plowed land, either to level it and break the clods, or to cover seed that has been sown. A "chain harrow" consists of a congeries of iron rings, instead of the metal teeth, and is employed to separate weeds from the earth and to cover grass seed. In a "revolving harrow" the teeth are arranged on radiating arms that have been pivoted to the draft-gear in such a manner that, by their horizontal rotation, they add greatly to the raking or tearing power of the teeth.

HESSIAN.—A coarse cloth made of a combination of hemp, and jute and used for bagging is known as "Hessian" by the trade.

HIGH-PROOF.—Commercially all highly rectified spirits are termed "high-proof."

HOLLAND.—A term which, while formerly applied only to linens imported from the Netherlands, is now used to designate the glazed and unglazed linen cloths that are made in many places. "Brown Holland" is a cloth that maintains much of the original color of the retted flax-fibre, it having been subjected to but little bleaching or boiling.

HONEYCOMBING.—In cloth-manufacture, a term applied to designate a thin fabric in which the stitches, running diagonally across the material, have been drawn up in such a manner that the spaces between them are puffed or in relief.

HOP-JACK.—A term applied to a vat with a false bottom used in brewing. It is so arranged that it retains the solid substances in the mash-tubs, but allows the wort to flow away after it has been boiled and the hops have been added.

HOPPER.—Used, in milling, to denote the inverted-cone-shaped trough through which the grain passes on its way to the shaking-shoe.

HORSE-POWER.—A term used as a unit of measurement in every industry in which power machinery is used. Although several values are assigned to this unit the prevailing value, both in America and England, is Watt's horse-power, which places it at 7,460 megaergs

per second, or about three-quarters of the actual power of a horse.

IMPOSITION.— The act of laying pages of type, etc., upon a smooth stone slab to secure them in the chases and prepare them for the press.

INDENTION.— A term used in printing to denote that a certain amount of blank space has been left before the line, or a specified number of lines of type. An indenting of every line after the first, with an increasing blank constantly shortening on both sides is termed "diamond" indention. An indenting of every line except the first, that being of full width and so overhanging the others, is termed "hanging" indention.

INFUSION.— A term used in brewing to denote the process of preparing the mash by treating the bruised malt with water at a temperature of from 70° to 75°.

INSURABLE INTEREST.— It is essential to the insurance contract that the insured should have a legal interest in the object for which the insurance was taken. In France the laws annul all policies that exceed the insurable interest of the assured at the time of the subscription.

INSURANCE.— A term used to describe a contract whereby for an agreed premium one party undertakes to compensate another party for loss in a specified subject by specified perils. There are several kinds of insurance companies in operation, but nearly all are either "stock" or "mutual" companies, while the risks covered include, life, accident, fire, health, marine, burglary, live-stock, plate-glass, etc.

JAPANNING.— The process of coating the surface of metal, wood, etc., with varnish which is immediately hardened by exposure to high temperature.

KERFING.— (a) The process of preparing wood for bending without breaking by making a series of small cuts in it with a sawing-machine; (b) in cloth-manufacture, the process of removing the wool by passing it through a shearing-machine.

KIPPERING.— In the fish trade, the process of curing fish by cleansing them, dressing them with pepper and salt, and curing them, either by drying them in the open air, or, artificially, by subjecting them to the smoke of some prepared substances.

LANDROLLING.— A term used in agriculture to denote the process of crushing clods, to make the earth friable, by means of a heavy roller.

LAYER.— The vat in which hides are left to lie in a strong solution of tannin towards the end of the tanning process.

LAYING.— The term is applied to two distinct stages in rope-making: (1) the twisting of three or more yarns to form a strand; (2) the twisting of three strands to form a rope. The machine that performs this operation is termed a "laying machine," the wooden cone placed between the strands to prevent a slack twist is termed a "laying-top."

MANIFOLDING.— A term used in business circles to denote the process of making several impressions of a single letter or document by one operation, as by means of a manifolding-machine, or by the use of carbon paper.

MASH.— Used in brewing and distilling to describe the mixture of ground grain that has been infused in warm water.

MILLING.— (a) The process of manufacturing cereals into flour or meal. There are two methods of milling: (1) low milling in which the grain is ground but once before being bolted, and (2) high milling, in which it is ground repeatedly; (b) in pottery, the operation of grinding and mixing the slip; (c) the process resorted to in tanning to open and soften the pores of hides; (d) in cloth manufacture, the process of felting cloth to thicken it, etc.

PIECE-GOODS.— The trade name for fabrics that have been woven in lengths suitable for retail sale by linear measure.

POINT.— The unit of measurement in types, each point being about one seventy-second of an inch. The various types in use in the United States and their relative sizes in "points" are as follows: Excelsior, 3 points; brilliant, 3½; semi-brevier, 4; diamond, 4½; pearl, 5; agate, 5½; nonpareil, 6; minion, 7; brevier, 8; bourgeois, 9; long primer, 10; small pica, 11; pica, 12; English, 14; two-line brevier, 16; great primer, 18; paragon, 20; two-line small pica, 22; two-line pica, 24; two-line English, 28; four-line brevier, 32; three-line pica, 36; double paragon, 40; four-line small pica, 44, and four-line pica, 48 points.

OPEN POLICY.— In insurance, a policy in which the value of the subject insured has not been fixed, but has been left to be determined in case of loss, or because it has been left open to permit of the addition of other things whenever occasion demands.

QUARTER-PLATE.— A term used in photography to denote the size of a plate. Thus, a quarter-plate measures 3¼x4¼ in.; a half-plate, 4¼x5½ in.; a whole plate, 6½x8½ in.

RECTIFY.— The term applied to the process of removing impurities from alcoholic distillations and to raise its strength to the required proof.

SALT A MINE, TO.— A swindling operation by which a mine is made to seem more valuable than it really is by the surreptitious introduction of ores obtained elsewhere.

SHELLS.— Those parts of the lay in weaving in the grooves of which the reed fits. They are of two classes and are termed "upper" and "under" shells.

SURRENDER.— A term in insurance to denote that the party insured has abandoned all right in his policy in consideration of having received a portion of the premiums already paid to the company. The percentage of premiums returned is known as the "surrender value" of the policy.

TOUTER.— Industrially, a person who makes it his business to solicit trade for a shop.

TONTINE POLICY.— In insurance, a policy in which the insured agrees that no money shall be received by him from the insuring party, either in the form of dividends, return-premiums, or surrender-value, for a specified term of years, but that, instead, the entire surplus shall be permitted to accumulate until the end of that period when it may be divided between those who have kept their policy in force.

TOTAL LOSS.— In marine insurance, total loss may mean that the subject insured has been absolutely destroyed by the peril against which it was protected, or it may mean that the loss by damage, seizure, or other causes has been so great as to be practically absolute. In the latter case it is often termed a "constructive total loss."

VALUED POLICY.— A term used in insurance to show that a policy is one in which the value has already been set upon the subject insured, the insertion of which fact in the policy, with the amount agreed upon, makes proof of damages in case of loss unnecessary.

WAGER-POLICY.— In insurance, a policy in which the insured has no insurable interest, and, being generally regarded as a form of gambling, such policies are not valid except in places where the validity of a wager may be recognized.

WALKING DELEGATE.— A person selected by a trade union or other labor organization to visit similar bodies of workingmen, to interest them in the order, voice their demands upon their employers, direct them in their strikes, etc.

WALL.— Used in mining to denote the surfaces of the rock between which the ore is inclosed. If the vein is inclined at such an angle that the ore is over the miner's head it is termed a "hanging" wall; if it is beneath him it is called a "foot" wall.

WARP.— (a) In agriculture, the operation of fertilizing a poor piece of land by artificial inundation from waters which have large quantities of earthy matter; (b) in weaving, the threads that extend lengthwise in a loom. The roller upon which the threads are wound is termed the "warp-beam;" the machine which treats them with size before they are wound is the "warp-dresser," while the machine which draws the warp threads through the dye beck is termed the "warp-dyer."

WASH.— Used in mining to denote the process of separating the ore from earthy and other matter by the employment of water. The fermented wort from which the spirit is extracted in distilling is also termed the "wash."

WINNING.— The work of developing a mine preparatory to the work of mining is termed "winning" in the United States.

WOOF.— In weaving, the thread that is woven into the warp is also termed the "weft."

Inebri'ety. See ALCOHOLISM.

Iner'tia, a term introduced by Kepler to signify that property of matter in virtue of which it is "inert," so that when a body is at rest, or in a state of uniform motion in a straight line, it preserves its state of rest or of uniform rectilinear motion, unless some agency external to the body acts upon it in such a way as to modify that state. We gain our first conception of inertia by the attempts that we make to move bodies that are at rest, or to stop those that are in motion. Even if they are suspended freely, so that fractional forces are negligible, we find that their state of rest or motion cannot be

modified without the exercise of a certain amount of muscular force; and by abstracting our own personality in the case, we gradually come to the conception of inertia as a physical property inherent in all bodies. Inertia has been popularly described as a "passive resistance" to change of motion; but this expression is objectionable because it is entirely inaccurate. Freely suspended bodies (that is, bodies that are free from frictional forces,) cannot be said to "resist" forces that are applied to them. On the contrary, they yield instantly to the smallest force; but a small force, when exerted upon a given body, for a given length of time, does not produce as great a change of motion as would be produced by a large force acting upon the same body for the same length of time. The conception of inertia shades insensibly into that of "mass"; the mass of a given body being proportional (by definition) to the velocity that is communicated to the body by a force of standard intensity, acting upon it for a standard length of time. (See Mass; Matter; Molecular Theory.)

Infallibil'ity, exemption from the possibility of error. The word is used as applied to arguments, statements, reasoning, or the formation of judgments, and does not include impeccability, or exemption from the error of sin. The infallibility of the Church as believed by Roman Catholics means that "the Church can neither deceive nor be deceived in matters of faith and morals"; and she is limited to the definition of truths already contained in Scripture and tradition. The seat of infallibility rests in the Pope as successor of Saint Peter (Matt. xv. 18), and in the bishops in communion with the See of Rome, whether dispersed or united in a General Council (q.v.). In the acts of the Vatican Council, held in Rome in 1870, the following is the text defining the nature of the infallibility of the Pope: "The Roman Pontiff, when he speaks *ex cathedra*, that is to say, when in the exercise of his office of pastor and teacher of all Christians; he, in virtue of his supreme apostolic authority defines that a doctrine on faith and morals is to be held by the whole Church, by the assistance of God promised to him in the person of blessed Peter, has that infallibility with which it was the will of our Divine Redeemer that His Church should be furnished in defining a doctrine on faith or morals, and that therefore these definitions of the Roman Pontiff, of themselves and not through the consent of the Church, are irreformable." The Greek Church, the Church of England, and the Protestant Episcopal Church which is its representative and in communion with it in the United States, believe that infallibility resides in the universal Church in accordance with Christ's promise of the Spirit that should guide His followers unto all truth. Consult: Allies, 'See of Saint Peter'; Ballerine, 'De Primatu'; 'De Potestate Summ. Pontif.'

In'famy and Infamous Crimes, in common law the first means disqualification from giving legal evidence as a result of having committed the second, the theory being that a person capable of such crimes is incapable of speaking the truth. Both in Great Britain and generally in the United States this disqualification has been abolished by statute, and previous convictions for crime have been considered to affect a person's credibility without impairing his legal capacity to give evidence. Infamous crimes are strictly those which entailed infamous punishments. The fifth amendment to the Federal Constitution speaks of "capital or otherwise infamous crime" and we read in 2 Dane, Abridgement, 560, 570: "Punishments clearly infamous are death, gallows, pillory, branding, whipping, confinement to hard labor and cropping." Infamous punishments include imprisonment in State prison, or penitentiary with or without hard labor, and crimes which entail such punishments are undoubtedly to be considered infamous crimes, in the sense implied in the fifth amendment to the Constitution.

Infancy. The term infancy is used variously by different writers to include a shorter or longer period of the earliest stage of human existence. By most writers it is limited to the first 12 or 14 months, extending to the time when the baby begins to walk and to talk, and so is synonymous with a "babe in arms"; many medical authors would make it include the whole period of the first dentition, or up to about two and a half years. The characteristics of the period are utter helplessness, rapid growth of body, gradual development of muscular functions and great impressibility of the nervous system. In mankind this helplessness is more marked and the period of dependence is longer than in any other of the higher animals. It has been pointed out by John Fiske that the present elevation of man above other animals is due largely if not entirely to this lengthened period of plasticity,—to his prolonged immaturity. Man is born with only a few of the lowest vegetative capacities fully developed, such as digestion, respiration, and circulation; the muscular and nervous functions are latent and only gradually develop; while the higher functions of the mind go on evolving until the fifth decade of life. A long infancy or period of immaturity means a great capacity for development.

Birth and Heredity.— The infant comes into the world with a fixed sum total of vital force, along with certain hereditary tendencies in development toward health and, perhaps, toward disease. These hereditary tendencies are all modified by the physical, social, intellectual and moral status of the child's family and surroundings: in a word, they are vastly influenced by the child's environment. Heredity was formerly regarded as the most important factor in the child's life; but heredity is really only one of three great factors,—the others being the nutrition of the child, and his physical, intellectual and moral environment. During the plastic years of infancy, childhood and adolescence, a bad heredity can frequently be overcome by proper management: on the other hand, the capital of a good heredity can be squandered. Nature always tends toward the normal or healthy, so that there is always the possibility for a bad heredity to be obliterated if only the natural tendency is assisted. More then depends on the nutrition and environment of the infant than upon its heredity.

Nutrition: Breast-Feeding.—The best method of nourishing the infant is nature's way—to have it nursed by the mother. But for various

reasons this is often impossible. Modern life — and especially city life — has in some way rendered a large proportion of women incapable of producing breast milk for their offspring. And the number of these mothers who desire to nurse their infants but cannot is increasing each year. Again, in not a few instances, the infant does not thrive upon the breast-milk, even though it may be abundant. In both these classes of cases some form of artificial or substitute feeding is a necessity. Good wet nurses are so difficult to procure in the United States that artificial feeding is generally preferable unless the baby is premature or feeble and failing: then the services of a wet nurse may be needed to save the infant's life.

Artificial or Substitute Feeding.— The best available substitute for human milk is an adaptation of fresh, clean unadulterated cow's milk. The milk should be diluted and otherwise modified to suit the infant's feeble digestive powers, and it should be given preferably, without being scalded or sterilized. In summer, or when there is any doubt as to the freshness of the milk, the cleanliness of the dairy or the careful handling of the milk, "Pasteurization," or heating the food to a temperature of 155° F. is advisable. Details as to milk modification and Pasteurization can be found in any book on "Infant Feeding." Ready-made infant foods,— the canned or bottled proprietary foods — do not contain the right ingredients for properly nourishing the infant, and their prolonged exclusive use is nearly always followed by some form of malnutrition — especially scurvy and rickets. These proprietary foods contain large proportions of sugar or starch, and so make fat babies, but such infants are generally pale, have feeble powers of resistance, and are prone to succumb to disease of the lungs or of the digestive tract. When the prepared infant foods are used as additions to milk they are less objectionable, and may at times be of advantage.

Weight and Development.— The infant that has been properly nourished before birth and is born at full term weighs on the average about 7½ pounds — boys being somewhat heavier than girls.

During the first few days, while the nourishment from the mother is insufficient, the baby regularly loses from six to eight ounces; but it soon begins to gain, and if the nutrition is normal and the infant remains well, there will be a steady increase in weight throughout the first two years. The gain during the first year is more regular, however, as well as more rapid than that during the second year. During the first three months the increase in weight each week is about half a pound: from the third to the sixth month the weekly gain is somewhat less, from four to six ounces: from the sixth to the ninth month about four ounces, and after the ninth month a little more, usually a weekly increase in weight of from four to six or even eight ounces. By the end of the fifth month the baby that has been perfectly well and is being properly nourished should have doubled its birth-weight and weigh about 15 pounds: at the end of the 15th month it should weigh three times its weight at birth. In many instances the baby will treble its original weight by the end of the first year; but 21 pounds may be considered the average weight for the end of the 12th month. Infants that were very large at birth do not increase so rapidly; while small or premature babies are apt to make a gain that is greater in proportion to their original weight. "Hand-fed" or "bottle" babies should weigh on the average about the same as breast-fed babies,— provided that they have had no disturbance of their digestion; the food must, however, have been perfectly adapted to the infant, and this is often a very difficult problem.

Height and Other Measurements.— At birth the length of the average baby is about 20 inches; during the first six months there is an increase of four to six inches, and during the second six months from three to four inches more; by the end of the second year the height is 32½ inches, a growth of over a foot since birth. By the end of the third year the stature is one half of the adult height. The head grows very rapidly during infancy and early childhood. The circumference of the head at birth is from 13 to 14½ inches; by the end of the sixth month it is 16½ or 17 inches; at the end of the first year 18 inches, and at the end of the second year it is 19 inches. By seven or eight years the circumference of the head almost equals the adult size of 21 inches. This is visible evidence that during the first months and years of life the brain is increasing in volume more rapidly than any other organ in the body,— the head or brain-box expanding to conform to the enlarging brain. The soft spot or "fontanel" usually closes between the 15th and the 20th months. The chest is smaller than the head at birth (13 inches), but its circumference increases rapidly, so that at 18 months that of the chest and the head are equal. After this the chest grows steadily but gradually until puberty, when there is a very rapid increase for four or five years. Aside from the regular increase in weight and measurement, the healthy infant shows other signs of well-being. The baby's flesh is firm, and the skin is satiny and elastic: the color is pink, and the body and extremities are well rounded. Very fat babies are not necessarily stronger or healthier than those that weigh less: as has already been noted they are apt to be pale, flabby and of weak resistance to disease. The healthy baby is happy and playful when awake, and sleeps from 16 to 20 hours out of the 24,— longer the younger the baby. It is desirable that the growing child have a nap during the day up to the time when kindergarten work is begun; with nervous or poorly nourished children the practice should be continued until the seventh or eighth year.

Muscular and Mental Development.— These begin with the entrance of the infant into the world, but are slow in unfolding. At first the grosser movements performed by the muscles working over the larger joints, next more complex movements, and during later childhood and early adolescence the finer movements requiring nice adjustment and delicate co-ordination. Hence it is that occupations or accomplishments requiring great manual dexterity, such as violin or piano-playing, should be taken up early,— "before the hand gets stiff," as the phrase is. The first movements are those of the legs, arms,

and neck: they are not purposeful but merely reflex. By the sixth week the infant can hold up its head, when the back is supported, but very unsteadily until about three months old. At some time in the third or fourth month the infant makes its first voluntary movement, grasping at some object in the range of vision. Within a month or two later the baby can co-ordinate the muscles of the eyes, arm and hand sufficiently to take firm hold. Sitting alone is an accomplishment of the seventh or eighth month, and creeping also begins at about this time, if the baby is ever to creep at all. During the eighth or ninth month the baby begins to stand, having made the attempt for many weeks before; at ten or eleven months the infant can stand alone, and shortly after the twelfth month the first tottering steps are taken. It is some months before the baby is secure upon the feet, the maintenance of the equilibrium requiring nice control of many groups of muscles. Healthy infants differ greatly as to the time when they can walk alone, some walking at as early as ten months, while others may not walk until eighteen months. Very fat babies walk late but, in some instances, an excess of caution seems to be a factor. If a child is far behind in performing any of these muscular functions, a physician should be consulted so that careful examination may be made for signs of rickets or of disease of the brain or of the spinal cord.

Development of Special Senses.— For the first few days the newly-born infant avoids the light, and for many weeks cannot endure a direct bright light. Perception of light soon develops, the color first attracting attention being red. Clear perception of objects comes during the fifth month. Hearing is in abeyance for several days, a baby at birth being practically deaf; but after a week or ten days this function begins, and later hearing becomes very acute, the infant being able to recognize the mother's voice or a footstep at about three months. Loud sounds cause the baby actual pain, so severe are their impressions on the delicate auditory apparatus. The sense of touch (contact) is early developed, especially in the tongue and lips; but sensitiveness to pain is very dull during infancy. Heat and cold are recognized from an early period, the variation of a few degrees in the temperature of the food causing the baby to refuse it. Taste and smell also are present at birth, taste being very discriminating.

Development of Speech.— Speech is very closely related to the higher functions of the brain, and is therefore the last of the simple functions to develop. Usually a baby begins to say "Mamma" and "Papa," with clear knowledge of the meaning, toward the end of the first year. Next names of objects and persons are learned and soon two words are put together. Then verbs are used, and about the end of the second year little sentences are made. Pronouns are regularly the last of all the parts of speech to be used. During the third year speech develops very rapidly, the baby bringing out some new term or expression almost daily. There are great variations in the time when children begin to talk; and for this there are many reasons. Girls generally talk earlier than boys by two or three months: babies that associate in the nursery with other children talk earlier than only children. If, however, a young child reaches the age of two years without attempting to talk, mental backwardness or organic brain disease is apt to be the cause. Tongue-tie is seldom the cause of backwardness in talking, although it does produce imperfect articulation.

Dentition — Teething.— The first teeth appear about the sixth or seventh month, but a perfectly healthy baby may have no teeth until 10 or 11 months old, or on the other hand may cut the first tooth at four months. The regular order is as follows: lower central incisors, upper central incisors, upper lateral incisors, lower lateral incisors — each pair coming at intervals of three to six weeks: at about the fourteenth month the front double teeth (anterior molars) appear in the two jaws, and four or five months later the canines, known popularly as the "eye and stomach teeth." Finally, the last four molars appear sometime between the twenty-fourth and the thirtieth month, and these complete the twenty teeth of the first dentition. Teething babies are apt to be fretful, they have a reduced resistance against disease, and they are prone to slight disturbances of digestion. To attribute most of the ills of infancy to the process of teething is a great mistake; usually some other and better cause for the disturbance can be found if the baby is carefully examined. During the time when the successive pairs of teeth are coming through the gums, the usual food should be largely diluted, so as to prevent any serious indigestion.

Fever.— Sudden high temperature is readily produced in young children by slight causes, inasmuch as the heat-regulating centre in the brain is but poorly developed. Again, the temperature in disease is erratic, and is apt to be higher than in adults suffering from the same ailment. Only persistent high temperature need cause anxiety.

Convulsions.— A characteristic of infancy is the easy excitability of the motor side of the nervous system. Hence convulsions or spasms are much more frequent and less serious than in adults. The immediate cause of the motor explosion may be an overloaded stomach, fright or mental excitement, or the fever of an oncoming disease. Severe earache, intestinal worms or a paroxysm of whooping cough may also serve as an exciting cause. Underlying or predisposing causes are a nervous heredity, malnutrition, or rickets; or there may be organic disease of the brain or the kidneys. The spasm usually begins with a turning of the eyes to one side and twitchings or grimaces of the face: there may be frothing at the mouth; then the arms and legs are rapidly contracted and relaxed; later the body stiffens out, the breathing becomes noisy and labored, the face, — especially the lips — becomes livid. Shortly afterward the body relaxes, the breathing becomes easy, and spasm ceases for the time being — having lasted anywhere from five to thirty minutes. Until the physician arrives certain simple measures are of value. The infant should be undressed, wholly or partially, and put into a warm bath (not warmer than 105° F.) to which a handful of mustard flour

has been added, and the baby should be rubbed all over while in the tub for about five minutes. Then remove from the bath and lay between blankets, putting a warm bottle at the feet and an ice cap or cold compress on the head. If the baby can swallow, a full dose of castor oil should be given. Most convulsions are due to the presence of decomposing food-remains in the alimentary tract, and the spasms usually cease when the stomach and bowels have been thoroughly evacuated.

Linnæus Edford LaFétra, M.D.,
Instructor in Diseases of Children, Vanderbilt Clinic, Columbia University.

In'fant, in law. By the common law persons come to majority at the age of 21 years, until which time they are called in law *infants,* but by common usage in the United States the word minor prevails. Infants cannot, in general, bind themselves by contracts, as they are supposed not to have sufficient discretion and ability for this purpose. But this is their privilege, and their contracts are accordingly held in general not to be void, but only voidable at their election; and they may elect to avoid their contracts during their minority, except such as they may have entered into for necessaries suited to their condition in life, but they cannot confirm them so as to be bound by them until their majority. Infants may possess property, but it must be under the management and control of a guardian. They have not the right of citizens as to voting, and discharging other political functions. But in regard to crimes and punishments, and trespasses and private wrongs, their conduct is regulated by the same laws as that of the other members of the community, in case of their being of sufficient age and discretion to understand their duties and obligations. And for this purpose no general limit can be assigned, as some children are much more intelligent than others of the same age; and it will again depend, in some degree, upon the nature of the offense committed, or the wrong done, whether a child of any given age can be considered legally guilty of it, since some offenses and wrongs can be more easily understood to be such than others. The law, in general, has a tender regard to youth, and does not permit them to be convicted and punished for offenses and trespasses unless it appears clearly that they have sufficient knowledge and discretion to distinguish them to be such. There are exceptions to the incapacities of minors as to contracting, and these exceptions are made for their benefit. Thus an infant not sufficiently furnished with necessary clothes, food, or instruction, by his parent or guardian, and not being under the immediate superintendence of the parent or guardian, may make a valid contract, in respect to those subjects, and such contract may be enforced against him. Infants require the consent of parents or guardians to marry. The jurisdiction in respect to infants is generally vested in either probate or orphans' courts. These courts appoint guardians to take charge of the property of infants, and, in case of the decease of the father, to take charge of their persons; but during the life of the father he has the guardianship and control of the persons of his children until they are 21 years of age.

Blackstone thus defines infant: "Infants have various privileges, and various disabilities; but their very disabilities are privileges, in order to secure them from hurting themselves by their own improvident acts. An infant cannot be sued but under the protection, and joining the name of his guardian, for he is to defend him against all attacks as well by law as otherwise; but he may sue either by his guardian, or by his prochein amy, or alone for wages in the county courts. In criminal cases an infant of the age of 14 years may be capitally punished, but under the age of 7 he cannot. The period between 7 and 14 is subject to much uncertainty; for the infant shall, generally speaking, be judged *prima facie* innocent; yet if he was *doli capax,* and could discern between good and evil at the time of the offense committed, he may be convicted, and undergo judgment and execution of death, though he has not attained to years of puberty or discretion."

Infant Jesus, Daughters of the Congregation of the, is an order in the Roman Catholic Church. It owes its origin to Anna Maroni, a native of Lucca, who having come to Rome entirely destitute, succeeded by her industry in securing a competency. In more advanced years, her charitable feelings prompted her to establish an institution where poor girls should be instructed in such work as would enable them to earn a livelihood. The clergy approved of her plan, and afforded her much assistance, and it was finally established as a regular institution, and in 1673 Pope Clement X. acknowledged the existence of the society, gave it by-laws, and endowed it with sundry privileges, under the appellation of "Daughters of the Infant Jesus." The number of the "Daughters" allotted to each convent was fixed at 33, in commemoration of the number of years Jesus lived upon earth. The novitiate lasts three years; the sisters make vows of poverty, chastity and obedience. Such as may wish to leave the convent are allowed to do so before taking the vows, but, in that case, they are to leave to the convent all they brought to it at their admission. Prayers and fasts are strictly enforced. The regular habit of the order consists of a wide, dark brown dress, and a white hood.

Infanta, ēn-fän'tä, Philippines, a former Spanish commandancia of the island of Luzon, consisting of a narrow strip of territory on the Pacific coast with Nueva Ecija on the north and Tayabas on the south. In 1902 it was made a sub-province of Tayabas, "the inhabitants to enjoy the same rights and privileges as if the said territory had been originally incorporated in the province of Tayabas." The surface is very rough and mountainous and the construction of roads impossible except at heavy cost; several trails lead over the mountains to the central provinces. The forests are valuable, among the trees most important to commerce is the balate, which produces the balate gum. The agricultural methods are most primitive; the chief crops are rice, cocoanut, chocolate and coffee; the most important industry is the manufacture of nipa wine; there was formerly a large manufacture of cocoanut oil in Infanta, but this industry was paralyzed by the hurricane of 1882. Pop. 10,800.

Infanticide, the murder of a child born alive, is a crime of frequent occurrence. The main cause of the crime is shame, induced by a dread of the social disgrace attaching to mothers of illegitimate children; though in many instances infanticide has been the result of violence produced by puerperal insanity. The morbid disposition to kill the newly born has also been observed in certain of the lower animals. The sanctity of human life, from its beginning to its close, is a maxim of modern civilization, and the law treats as a murderer whoever wilfully terminates it at any stage. According to the law of England every woman who employs means to procure criminal abortion is guilty of felony, and liable to penal servitude for life, or not less than three years; and severe penalties are inflicted on those who aid women to procure miscarriage. The concealment of birth is a misdemeanor, and may be punished with imprisonment for two years. In the United States, when a child's death is occasioned by an illegal act, such act is considered either murder or manslaughter according to the circumstances. The crime, however, is rarely punished, and in large cities many cases occur each year which are never reported to the authorities.

Infanticide was prevalent in Greece and Rome. In modern times many barbarous peoples are guilty of wholesale child-murder. Among some of the Pacific Islanders and aboriginal Australians there is a great destruction of infant life. The Hindus used to destroy female children without compunction. In China infanticide is said to be very common.

Infantry ("the juveniles," probably at first the knights' pages), foot soldiery, as distinguished at once from cavalry and artillery. In all ages this has naturally formed the numerical bulk of armies, but its tactical importance has varied greatly with circumstances. The name cannot be given to the mere unorganized fighters of barbarian *mêlées;* it implies some organization, and at least the rudiments of tactics. The first large armies were the Egyptian and Assyrian, continued by the Persian: the social system was aristocratic, and the large plains ideal for the utility of cavalry; hence the infantry was rather an auxiliary, to complete a rout after the mounted lords and the chariots had broken the ranks, than the main fighting body. The first development of infantry as the chief reliance was naturally in the small Greek states, whose independence rested on their citizen soldiery, and whose rough territory made cavalry evolutions difficult. Cavalry was therefore used mainly to guard flanks and to skirmish; the Spartans for a long time would not use it at all. The infantry was divided into classes according to armor; hoplites (with heavy defensive armor, long spear and dagger), psiloi and peltasts (very little armor, light barbed javelins to throw), and gymnetes (sharpshooters, light-armored and with slings or bows). The battle formation was the famous phalanx, whose one basic principle was the value of mass and momentum, and which was irresistible either for attack or defense against barbarians who lacked firmness in the ranks. It was commonly a rectangular block eight ranks deep, so that only the first two or three could use their spears at the same time, the rear ranks serving only for instant reinforcement and for impact; the men were from 18 inches to 6 feet apart, according to conditions of defense or attack; the phalanx had usually 2,000 to 4,000 men, but sometimes as high as 10,000 or more. Sometimes the formation was the triangular wedge. The first great improvement was by Epaminondas, who made the ranks 50 deep, and by the enormous impact crushed the Spartan phalanx at Leuctra. This was the Napoleonic principle of concentration at the critical point, most of the Spartan army being allies with no heart in the fighting, and kept at bay by a few skirmishers. Nevertheless, the step was backward except for immediate necessities, as it increased the main vice of the phalanx — its immobility, which made it break up dangerously on bad ground, and gave little power to change front or execute flanking movements. In later tactics the larger ones were subdivided into companies of 120 with a distance equal to the front, forming an approach to the legion; and the latter was copied also in the formation by lines, increasing rapidity of movement and flexibility on difficult ground, as well as power of extension and so of flanking. The Macedonian *sarissa* or long pike doubled the number of ranks which could thrust at once over each other's shoulders. But the whole system went down before the Roman legion, which essentially maintained its position till the Empire too went down. It consisted normally of 1,200 each of hastati (spearmen), principes (veterans), and velites (light troops), 600 pilani (veteran reserves), and 300 equites or cavalry. It was divided into three lines and 30 maniples or companies, and combined solidity with ease of maneuvering.

In the Middle Ages, till the general use of gunpowder, the feudal system insured the degradation of the infantry, as it depended on the fighting power of the knight, and consequently lavished all the care and expense on perfecting his armament. But even without this, the same result would have come, for without good field artillery, and with only bows and arrows at their best, the heavily armed man was invulnerable, as the Spanish conquests in the New World amply prove. Hence the logical result was the extension of defensive armor till some new missile force came in. But the cost of this was so great — a full suit of steel armor cost about $2,000 — that only the richer even of the knights could afford them, no king could raise money to equip a standing army, and the aristocracy would combine to refuse him money for such a purpose; and the rank and file were scattered and slaughtered in face of a charge of a small number of mailed knights. The defeat of the French knights by the English bowmen was that of a disorderly and insubordinate mob, by a splendid archery which slew their horses and pierced the cheaper armor. But gunpowder at once changed the whole situation. A serf with a $10 hackbut could stand out of reach and kill a knight with his costly armor; and a sovereign could collect and arm a great force of these and use them to put down his unruly vassals. Hence armored knights and horses began to decrease, and standing bodies of foot soldiery with firearms to increase. The change in battle array was correspondent: theretofore, even the ablest commanders had maintained the great depth of 10 ranks, traditional from classic times. Gustavus

Adolphus reduced this to six, deploying to three under fire; while Tilly and Wallenstein and the other imperial commanders kept to the old phalanx formation. Breitenfeld (1631) and Lützen (1632) were won by this and Gustavus' light artillery. The introduction of the bayonet about 1650 led to a reduction to four ranks. But the greatest single improvement was due to Leopold of Dessau early in the 18th century: he instituted the chief reforms usually credited to Frederick the Great, and formed the armies with which Frederick won his victories. He reduced the ranks to three, making it possible for all to fire, trained them to maneuver with great precision, and wrote the drill-book which is still the basis of all European and American manuals. Frederick's infantry organization, in regiments of two or three battalions, each 500 to 600 strong, was copied by all the other nations; and the general principle of open order, made necessary from the destructiveness of artillery on close masses of men, and possible by the confidence in each other bred by civilization, is still retained. Broadly, the difference between ancient and modern infantry is that between mass and mobility.

For obvious reasons — cheapness of maintenance, universal availability of men untrained in horsemanship, ability to march and maneuver on all sorts of ground, less liability to be crippled by loss of the animals, etc. — all modern armies consist mainly of infantry; and the nominal horse troops are most often dragoons, or soldiers mounted merely for quickness of movement, but who fight on foot. The quantities of other arms, as cavalry, artillery, engineer corps, etc., are based on the infantry numbers. The proportions vary in different armies and in different functions of the same army, according to nature of service: more or less cavalry and artillery being used according to need of concentration, or action in dispersed bodies. Forces like the United States Western troops a generation ago, for instance, in small squads on detached duty, would have different proportions from a great Continental army in the midst of a campaign. While there is no one system of infantry tactics which can be universally applied, the same cause which has made the change just spoken of has thus far continued to act with steadily increasing force. Artillery continues to grow in power and in range; the danger-line grows ever farther from the enemy; it is nearly impossible, and would be murderously losing, to charge in close column across the 2,000 yards which is now the average range. The system adopted is called "extended order," which means a considerable space between the men, and small bodies acting separately in a charge; each making a rush for some cover not so far off that they will be blown in reaching it, or will be decimated in the attempt. A certain relation between companies and regiments is kept up, to avoid destruction in detail and enable combined action, but precise parade alignment is not attempted. This involves not only the mutual confidence of civilized men, but some of the independent judgment of those who have not had initiative crushed out of them by red tape: the greatest of modern tacticians and commanders have expressed a preference for intellectual quality over mere numbers, even in the rank and file. In the United States, the extended order was first introduced in the Revolution.

For the organization of the line in this country, see ARMY OF THE UNITED STATES. In addition to this, a few facts may be given: The general orders of 19 May 1877 fixed the strength of the infantry at 9,575 men, in 25 regiments. The pay ranges from $3,500 a year for the colonel to $13 a month for the private. The appointments are made from the United States Military Academy, from the ranks after two years' service and severe examinations, or from civil life if there are no eligibles in the others. The arms are the Krag-Jorgensen and the new Springfield magazine rifle, with knife-bayonet. The equipment is knapsack, haversack with implements for meals, canteen, blanket wrapped in piece of shelter tent, and waist-belt with cartridges.

Infec'tion, the introduction of disease-producing micro-organisms in the body. Infection may result in a number of different ways. Micro-organisms may be introduced by means of direct injury. When a person falls and cuts the hand, the bacteria of pus-production or of tetanus may be so introduced, and blood-poisoning or tetanus may develop. Many infections come by means of the intestinal tract. Thus typhoid is commonly obtained from milk or drinking-water. The intestinal worms, tapeworm, roundworm, are contracted in this manner, and a number of other parasites, particularly the trichina, may come from infected food taken into the alimentary canal. Infection may also occur by means of the air-passages. The bacillus of tuberculosis is most often taken into the body in this way, and finding suitable soil, it causes the development of the dread disease. The bubonic plague is frequently contracted through the disease-germ entering the air-passages. At the present time it is deemed not unlikely that a number of infectious diseases, notably influenza, diphtheria, scarlet fever, measles, whooping-cough, are contracted through the respiratory tract by infection with the exciting cause. Occasionally direct contact seems necessary for infection, as in gonorrhœa and syphilis. In malaria, and probably in yellow fever, the active agent that causes the disease is introduced into the body by the bite of an insect, the mosquito. In malaria one particular genus (*Anopheles*) serves as an intermediate host in the developmental history of the parasite, in a manner analogous to the history of the development of a number of the intestinal worms. It is not unlikely that a large number of diseases may be disseminated by the bites of insects of one kind or another. In all the infectious diseases the element of a real, live, and active contagion should never be overlooked. Infectious diseases do not spring out of nothing. There must be some sort of contact in order that a person become infected. A most important part of the treatment of all infectious diseases is the protection of other people by proper care of all one's own excretions during sickness. The doctrine so frequently taught by some that sickness is ignorance is an important half-truth. But for the ignorance of people concerning the proper care of those afflicted with infectious diseases with reference to the protection of others, measles, diphtheria, scarlet

fever, whooping-cough, typhoid fever, consumption, and a number of other maladies would be entirely eradicated from civilized communities.

In'fidel, in modern parlance, one who deliberately rejects the Christian faith after obtaining knowledge of it. In former times a man might be an infidel who had never heard of Christianity. *Infidelis* in ecclesiastical language means "unbelieving," and is applied to unevangelized heathen as well as doubters and apostates. Thus in the Roman Catholic Church a bishop *in partibus infidelium* merely means a bishop whose diocese is set in heathen countries.

In'finite, a term in metaphysics, which means a reality which has no limit or boundary, in time or space. The idea of the infinite is as old as the Ionian philosophy, when Anaximander (610 B.C.) declared that the one in the many, the basis of being in Nature, was *το ἄπειρον*, the infinite. The reality of infinitude has been the source of much controversy, and the tendency of many modern philosophers is to deny it. "An infinite number," says Bosanquet, "would be a number which is no particular number, for every particular number is finite. It follows from this that infinite number is unreal." On the other hand F. H. Bradley states the contrary, in the clearest terms, "We may be asked whether Nature is finite, or infinite. . . . if Nature is infinite, we have the absurdity of a something which exists; and still does not exist. For actual existence is, obviously, all finite. But, on the other hand, if Nature is finite, then Nature must have an end, and this again is impossible. For a limit of extension must be relative to an extension beyond. And to fall back on empty space will not help us at all. For this (itself a mere absurdity) repeats the dilemma in an aggravated form. But we cannot escape the conclusion that Nature is infinite. And this will be true not of our physical system alone, but of every other extended world that can possibly exist. . . . Every physical world is, essentially and necessarily, infinite."

It seems as if Aristotle had a clearer and more logical view of infinity, *το ἄπειρον* than many modern Positivists, such as Bosanquet. He says, *λειπεται οὖν δυνάμει εἶναι το ἄπειρον.* He means of course, that, with regard to finite human intelligence, the infinite remains unrealized, although logically it could be realized, and of course, when we speak of infinite time, or infinite creative change in nature, we speak of something which potentially exists, but is only gradually becoming actual.

Infinity is also applied to the divisibility of matter. This is termed "infinite fission." If an atom is divided into two parts, and each of these is again divided into two parts, the mind cannot conceive of any individual fragment resulting from this division as incapable of being divided.

Professor Royce of Harvard has undertaken the task of vindicating the concept of the actual Infinite against the charge of self-contradiction. He is controverting Mr. F. H. Bradley of Oxford, who while he admits "we cannot escape the conclusion that Nature is infinite," expresses also his belief that such an assertion is a contradiction in terms. Professor Royce accomplishes this vindication by proving the following theses:

1. The true Infinite, both in multitude and in organization, although in one sense endless, and so incapable in that sense of being completely grasped, is in another, and precise sense, something perfectly determinate. Nor is it a mere monotonous repetition of the same, over and over. Each of its determinations has individuality, uniqueness, and novelty about its own nature.

2. This determinateness is a character which, indeed, includes and involves the endlessness of an infinite series; but the mere endlessness of the series is not its primary character, but simply a negatively stated result of the self-representative character of the whole system.

3. The endlessness of the series means that by no merely successive process of counting, in God or in man, is its wholeness ever exhausted.

4. In consequence, the whole endless series, in so far as it is a reality, must be present, as a determinate order, but also all at once, to the absolute experience. It is the process of successive counting, as such, that remains, to the end, incomplete, so as to imply that its own possibilities are not yet realized. Hence, the recurrent processes of thought reveal eternal truth about the infinite constitution of real Being,—their everlastingly pursued Other; but themselves,—as mere processes in time—they are not that Other. The true Other is, therefore, that self-representative system of which they are at once portions, imitations and expressions.

5. The Reality is such a self-represented and infinite system. And herein lies the basis of its very union, within itself of the one and the many. For the one purpose of self-representation demands an infinite multiplicity to express it; while no multiplicity is reducible to unity except through processes involving self-representation.

6. Nevertheless, the Real is exclusive as well as inclusive. On the side of its thought the Absolute does conceive a barely possible infinity, other than the real infinity, a possible world, whose characters, as universal characters, are present to the Absolute, and are known by virtue of the fact the Absolute thinks.

This brings metaphysics face to face with the notion of a Supreme Being, who is infinite or absolute. With the mystics God is infinite love, joy and wisdom to his human children. The Hindus taught that God was the infinite universe, the Other, the reality. "That (that is, the Universe) art thou," was their dictum. Christianity teaches that "God is of infinite power, wisdom and goodness," of which qualities the best of men have but a finite endowment.

The term "infinite" was introduced into geometry by Kepler in his 'Nova Stereometria Doliorum; accessit Stereometriæ Archimedeæ Supplementum.' Thus he considered a circle as formed by an "infinite" number of triangles, having their vertices at the centre, and their bases at the circumference. A cone likewise, he taught, was composed of an "infinite" number of pyramids, having their vertices at the vertex, and standing on an "infinite" number of triangular bases, bounded by the circular base of the cone. In this sense infinite means incommensurable, not to be expressed by a finite mathematical formula. Consult: Bradley, 'Appearance and

Reality'; Royce, 'The World and the Individual'; Bosanquet, 'Logic'; Couturat, 'L'Infini mathematique.'

Infin'itive, the indefinite mode in which the verb is represented without a subject. As the verb expresses an action, or a state, it generally belongs to a subject whose action or state is expressed; but if we wish to express the mere idea of this action or state we use the infinitive, which, therefore, in many languages is employed without further chance as a substantive — for instance, in Greek and German — only preceded by the neuter article; but as the verb expresses an action or state under certain conditions of time, the infinitive can also express the action or state in the present, past, or future, though these conditions are not expressed in all languages by peculiar forms. Some languages express it by some grammatical contrivance, as is the case in English, where it is denoted by *to* prefixed to the general uninflected form of the verb, as *to love* = Latin *amare; to have loved* = Latin *amavisse.* The infinitive may be regarded as the point of transition from a verb to a substantive, and is often used as the subject of a proposition.

Infinitesimal Calculus. See CALCULUS, INFINITESIMAL.

Infin'ity, and the Infinitesimal. See INFINITE.

Inflammation, a term long used to indicate the phenomena that follow mechanical, chemical, or physical injuries to living tissues. These changes have been described for centuries as rubor (redness), calor (heat), dolor (pain), and tumor (swelling), which are the phenomena particularly seen on surface inflammations. At the present time the idea is becoming fixed that inflammation is a conservative process, the phenomena attending nature's effort to rid the tissue of harmful substances. In the normal process of repair of an injury there are changes which closely resemble the milder types of inflammation; but when to a mechanical, chemical, or physical injury there is added a growth of micro-organisms, the reply on the part of the body-cells differs from the ordinary repair of injury. The changes witnessed depend upon the strength and kind of invading micro-organism and the particular tissue invaded. The first change is *hyperæmia,* a suffusion of the part with blood from capillary dilatation; following this the liquid part of the blood, the serum, is poured out into the tissues and offers its resisting powers to the poisonous substance. If these measures be insufficient, the white blood-cells called phagocytes congregate in the tissues, destroying the invading organisms, by actually consuming them and neutralizing their toxic products. During this struggle there is more or less death of the cells, called "degeneration"; large masses "slough"; the remnants of the cells and the phagocytes killed form the thick fluid called pus. When an inflammation goes on to the formation of pus, it is spoken of as *purulent* or *suppurative.* Certain poisons cause a peculiar reaction on the part of the tissues, characterized by the formation of new tissue that is unable to carry on the function of the part. This tissue is the same as the connective tissues, and the process is called *productive inflammation.* The poisons that continue to act for a long time are particularly apt to cause this reaction, and the inflammation is called *chronic* because of its permanency. Catarrhal inflammations are these same processes when they occur in mucous membranes; the appearance of these catarrhs, however, is different, owing to the peculiar structure of mucous membrane and to the fact of the epithelial covering offering excellent resistance to invasion. When death of cells occurs they can readily be cast off. Croupous inflammation is the term used to describe those in which there is considerable destruction of the superficial layers of the mucous membrane, which, with the fibrin of the blood, forms a coating or "false membrane" on the surface. Granulation tissue (q.v.) is the name applied to the tissue formed during the repair of an injury. Names are given to certain types of inflammation having a characteristic appearance to the naked eye, but microscopically there is nothing absolutely distinctive in these except their arrangement. Particular examples of these are tubercular and syphilitic inflammations.

The majority of the diseases of the body that we recognize as entities are due to inflammation in some tissue or organ, but the picture depends on the various changes in the functions of different parts of the body. The kind and virulence of the generated poison, together with the reaction on the part of the body-tissues, makes the complete picture that we seek to recognize. The treatment of inflammation is, in large part, the practice of medicine and surgery. Efforts to help the tissues combat against invasion are made with more success as knowledge is gathered of the peculiar invading forces and the natural modes of defense. It is not that we wish to combat the inflammation *per se,* but rather to make it unnecessary by helping it to a successful issue. The actual destruction of the bacteria by drugs introduced into the body is of little use, for they would be apt to cause as much destruction of the body-cells as of the invading cells; but their toxines, which cause the actual damage, we are learning to neutralize by the administration of artificially prepared antitoxins, and by placing the body and its special tissues under the most favorable conditions for developing its natural forces of resistance.

In exposed parts of the body, where antiseptics may be applied, the toxic germs may be killed, and various measures that change the blood-supply may be advantageous. Where death of tissue takes place, nature may require help in its removal. It has long been the rule to evacuate pus wherever it is formed, unless its escape from the tissues is easy.

The treatment of chronic inflammation is entirely different, as this is a process where actual structure is changed beyond repair in many instances. The all-important question is whether the tissue can carry on its proper functions; for if it can, the body need not suffer. The inflammatory process is arrested in its progress by the removal of the irritating cause, by improving the blood-supply of the part and the vitality of the body generally. These constitute the measures in general applied for the cure of chronic inflammations, it being understood that the endeavor is to place the tissues in such a condition that they may carry on their functions for the good of the whole organism; and the failure of these measures shows either that they are at

fault or that the tissue-change has gone too far. Inflammation of any part is indicated by adding the suffix "itis" to the name of the organ or tissue. See Bronchitis, Colitis, Laryngitis, Meningitis; etc.

Dudley D. Roberts, M.D.,
Brooklyn, N. Y.

Inflexion (Latin, *inflexio,* a bending), that process in grammar which modifies words when placed in relation to other words in a sentence. Pronominal and predicative roots are combined to form one word in the Semitic and Aryan tongues, which are therefore called inflexional, a process impossible in monosyllabic languages like the Chinese or in languages of the agglutinate order like those of the Turanian family. In grammar, cases, numbers, persons, tenses, etc., are known as inflexions, and in many instances the original affixes can be readily recognized. The Semitic and Aryan families of languages, which admit of phonetic corruption both in the root and the terminations, are called organic or amalgamating languages. The pronominal termination varies according to the person or number. Thus the Sanskrit *mi, si, ti,* the endings of the three persons singular of the present of the verb, are perhaps from the personal pronouns *ma, sva, ta,* and the persons of the plural indicate the plural number by the form of the pronominal affixes. The plural of masculine and feminine Greek and Latin nouns of the third declension is probably a contraction of the duplication of *sa,* the pronoun of the third person. The verbs *i,* to go, *as* and *fu,* to be, supply the inflexions of certain tenses of the verb, there being also a pronominal termination varying according to the person. In English the common auxiliary verbs am, do, have, shall, will, may, can, asserting respectively existence, action, possession, obligation, volition, liberty, power, assume the function of inflexions, and are themselves inflected to denote past time. In French the same inflexional law exists, the connection between the auxiliary and the root being closer than in English. *Aimer-ai,* I have to love, that is, I shall love, is compounded of the infinitive *aimer,* to love, and *ai,* I have, the first person present indicative of *avoir.* The same is the case in Italian and Spanish.

Inflores'cence, Infructescence, botanical terms referring respectively to methods of flowering and fruit-bearing. The flowering shoot, says Strasburger, frequently bears only a single flower, which may then be either axillary or terminal. In many cases, however, the metamorphosis of the generative region, which results in the production of flowers, has led to the formation of a special system of fertile shoots termed an inflorescence or, after the fruit is formed, an infructescence. (See Flowers; Fruit.) Such inflorescences are wanting or ill developed among the Gymnosperms, while in the Angiosperms they are often well differentiated, constituting unities of a higher order. The modifications exhibited by the fertile shoots of such an inflorescence are due, partly to a difference in their mode of branching, partly to the reduction or the metamorphosis of their leaves. These changes are the result of an adaption to pollination, in the endeavor to aggregate the flowers and at the same time render them more conspicuous by the reduction of the foliage-leaves. Sometimes the whole system of fertile shoots is converted into an attractive apparatus, as in the *Araceæ,* where the axis and the subtending leaf of the inflorescence have assumed the function, usually exercised by the perianth, of enticing insects. Viewed from a purely morphological standpoint, two types of inflorescences may be distinguished, the Botryose (racemose, monopodial) and the Cymose (sympodial).

Influenza, la grippe; an epidemic catarrhal fever, now believed to be due to a very minute bacillus that can be found in the various secretions. Epidemics of this disease have been traced back as far as the beginning of the 16th century, and since 1741 many such epidemics spreading over portions of Europe have been described. There are so many different types of the disease, and so many parts of the body may be distinctly attacked by it that it somewhat baffles close definition. The epidemics vary much in severity as well as in type. During the last decade it has become almost constantly present over portions of the United States, in some years being much worse than in others.

So great is the variation of its symptomatology that no standard description can be given, and the types are classified according to prominent features. After one to four days of incubation, the disease usually sets in abruptly with chilliness or true rigor; this is followed by a fever (which may be constantly low or may run very high), headache and general aching, and a degree of prostration out of proportion to any discoverable cause. The respiratory form is characterized by inflammation of the nasal, the pharyngeal, the laryngeal, the tracheal, and the bronchial membranes. Starting in the nasal mucous membrane, the inflammation is apt to involve the other membranes in the order given. It is quite common for the lungs to show small spots of bronchopneumonia. There is frequently nothing to distinguish such an influenza from similar acute catarrhs of the respiratory passages except the known presence of an epidemic and the disproportionate prostration. The gastro-intestinal form is characterized by nausea, vomiting, abdominal pain and profuse watery discharge, with prostration sometimes amounting to collapse. The typhoid form is characterized by the sudden development of rather high fever (with or without severe aches and pains), general apathy, or even a low muttering delirium. The fever runs from a few days to two weeks, and may very closely resemble typhoid. The nervous form is characterized by severe pains throughout the entire body, prostration, moderate fever, but no definite affection of any part or organ. The meningeal form is characterized by headache, fear of light, pain and stiffness of the muscles of the back of the neck.

Complications and extension of the inflammation to other parts are common. Pneumonia complicating influenza is rather apt to be very severe, and in some epidemics the mortality rises very high. Pleurisy is quite common. Great disturbance of the heart's action is seen in some cases, and the poison may actually attack the lining membrane of its chambers. Less commonly there is inflammation of the eye, ear, brain, liver, intestine, or kidneys. The skin is sometimes affected, showing a general blushing rash, herpes (small painful itchy blisters), or bloody patches. A very common sequel is great

nervous depression, either an inability to make bodily or mental exertion or "low spirits," even amounting to true melancholia. Unless influenza is epidemic, differential diagnosis may be very difficult, but hasty refuge in a diagnosis of "grippe" is far too common; in doubtful cases search should be made for the specific bacillus and considerable reliance placed on the presence or absence of the characteristic symptom, extreme weakness.

For the disease there is no specific treatment; the infecting organism must continue to grow until the natural defenses of the body overcome it; as yet no means has been discovered of killing the bacillus in the body or overcoming its poisons by an antitoxin. Careful isolation of the affected individual will prevent the spread of the disease to other members of the family, and much can be done for the patient's relief. Useful measures consist in securing thorough action of the bowels, keeping up the nutrition by simple, easily digested foods, and the administration of drugs such as phenacetin, acetanilid, caffeine, and bromides to relieve the distressing pains or nervous tension. The nervous exhaustion which is apt to follow is best treated by a period of mental rest, nourishing diet, and little or no bodily exertion.

DUDLEY D. ROBERTS, M.D.,
Brooklyn, N. Y.

Infor'mer, a person who sues for a penalty against those who have infringed any law or penal statute. To encourage the apprehending of certain felons, guilty of offenses not so much criminal as bordering on criminality, many English statutes, from 1692 downward, granted rewards to such as should prosecute to conviction. The penalty in whole or in part inflicted in the case of a successful conviction, and immunity from certain troublesome parish offices, were the inducements held out to informers. In many cases this practice has been resorted to in modern statutes. In the United States one who informs the government of the whereabouts of smuggled goods, counterfeit money, etc., is rewarded by a fee of ten per cent of the net value of the confiscated goods. In criminal law an informer is said to turn state's evidence (q.v.).

Infu'sion, in pharmacy, an aqueous solution of a medicinal substance obtained by treating with water, usually without the aid of boiling. The water may be either hot or cold, varying with the object to be obtained. According to the directions of the United States Pharmacopœia, infusions are generally prepared by pouring boiling water upon the drug and macerating in a tightly closed vessel until the liquid cools. The active principles are in this manner extracted more rapidly and, as a rule, in much larger portions than if the solution is colder. Heat is not advisable if the active principles are volatile. If an infusion is desired of a greater degree of concentration than that obtained by the process of maceration, it is frequently prepared by percolation, in which operation the drug is sliced or broken up into small fragments, packed in a percolator, and the water, either hot or cold, is passed through. Infusions are sometimes made with the aid of other liquids than water, but this is the exception rather than the rule. Infusions do not keep well, and therefore they should be made extemporaneously and in small quantities. In household medicine, infusions are very widely employed. These may be made at home or made by the pharmacist. It is essential to remember that if they are made in hot weather in large quantities they must be sterilized.

Infusion of saline solution into the blood-vessels is a very important procedure in medicine. It is employed largely in the treatment of shock, and in severe hemorrhage, especially following operations or childbirth. The solution that is used is known as a normal salt-solution, and consists of about one teaspoonful of common salt to a pint of water. This solution should be boiled carefully for one half to three quarters of an hour, the amount of evaporating water being made up as the boiling proceeds, and after being made it should be kept in large bottles provided with cotton plugs for stoppers. In severe cases of hemorrhage, infusion has often saved life, as it provides a body of fluid on which the heart and blood-vessels can act. The salt-solution is usually introduced into one of the large veins of the arm at a temperature of one to two degrees above that of the body-temperature. See BLOOD; TRANSFUSION.

Infuso'ria, Protozoa of the classes *Flagellata* and *Ciliata,* originally so-called from abounding in organic infusions. While the term is now restricted to the ciliate protozoans, it often includes the flagellate protozoans as well. The latter are represented by the monads. These are exceedingly minute round or pear-shaped animals, which move by one or two lash-like processes called flagella. They contain a nucleus and contractile vesicles. Some of them are fixed by a stalk, and are provided with a collar, as in *Codosiga,* out of which the flagellum projects. One of the simplest monads (*Heteromita*) is obtained by placing a cod's head in water at a temperature of about 70° F. In a few days the water will swarm with these monads. The young germs will live in boiling water, but perish at a temperature of from 212° to 268° F., while the adults are destroyed at 142° F.

In the ciliate infusoria the body is more or less flattened and covered with cilia (*Paramecium,* etc.). They have on the under side of the body a slightly defined mouth (or cytostome), which is permanently open, and the food is swept into it by the action of the cilia around it. The mouth leads into a funnel-shaped throat or cytopharynx, which ends in the protoplasm of the body. The food-particles swept into this throat and pressed into the protoplasm form a small enlargement which finally sinks farther in forming the "food vacuole," which, by the flow of the protoplasm, is carried about the body, while the digestible portions are absorbed and the waste matter is cast out at a fixed point,—a sort of vent (cytopyge). The fresh-water forms have contractile vesicles, and in certain species the animal possesses so-called stinging rods (trichocysts), which are very minute and are placed vertically to the surface of the cortex; by some students they are supposed to be tactile rather than stinging structures. What correspond to the muscular fibres of the higher animals, cause the quick convulsive movements observed in these creatures. Two important organs are present in all ciliate in-

fusoria, that is the nuclei. The larger nucleus (macronucleus) is an oval, rod-like or spiral body, which appears to control the processes of feeding and motion. The other nucleus (micronucleus) is much smaller and is concerned with reproduction. Reproduction occurs usually by self-division, and more rarely the infusorians contract into a ball and divide into spores, which grow to become adults. The periods of fission are at times interrupted by the process of conjugation, which only differs from sexual reproduction in the fact that two individual infusorians meet and fuse together and then separate, the result being a process of fertilization which leads to a complete new formation of the nucleus, and thus to a new organization of the animal. (For a more detailed account see Hertwig-Kingsley's 'Zoology' 1903.)

The more specialized infusoria are *Stentor* and *Vorticella*. The former is large enough to be seen without a lens. It is purplish, and under the microscope shows itself to be a beautiful creature. It is trumpet-shaped, with a spiral tract of thicker cilia around the mouth-end. The most highly organized infusoria are the bell-animalcules (*carchesium*, etc.), which are compound bell-shaped forms, forming colonies with forked branched stalks. The nucleus is sausage-shaped, and near it is the micronucleus. They form a white mass like mold on the stems and leaves of aquatic plants. Some of the infusoria are parasitic in the digestive and circulatory organs of the higher animals. Consult: Stein, 'Organismus der Infusions-Thiere' (1859–83); Saville Kent, 'Manual of the Infusoria' (1880–2); M. Hartog, 'Protozoa' (Vol. I., Cambridge Natural History, 1903); Ray Lankester, 'Treatise on Zoology' (1902); Hertwig-Kingsley 'Zoology' (1903).

In'galls, John James, American lawyer: b. Middleton, Mass., 29 Dec. 1833; d. Las Vegas, New Mexico 16 Aug. 1900. He was graduated from Williams College in 1855, and was admitted to the bar in 1857. In 1858 he moved to Kansas and established a law practice there. He was secretary of the territorial council in 1860, and of the State senate in 1861, and in 1862 was elected a member of the senate. In 1873 he became a member of the United States Senate, and was re-elected in 1879 and 1885. He was president pro tem. of the Senate from 1887–91. In 1891 he was again a candidate for senator, but was defeated by the Farmers' Alliance. From that time till his death he devoted himself chiefly to lecturing and writing.

Ingalls, Rufus, American soldier: b. Denmark, Maine, 23 Aug. 1820; d. 15 Jan. 1893. He was graduated from West Point in 1843, fought in the Mexican War and in 1854–5 was a member of Steptoe's expedition to the Northwest. At the outbreak of the Civil War he defended Fort Pickens, then became quartermaster of the Army of the Potomac, and was present at many of the important engagements, and at the close of the war had attained the rank of major-general. In 1867 he became quartermaster of the military division of the Atlantic, quartermaster-general of the United States army in 1882 and was retired in 1883.

Ingelow, ĭn'jĕ-lō, Jean, English poet and novelist: b. Boston, Lincolnshire, 1820; d. Kensington, London, 20 July 1897. Her first published work appeared anonymously in 1850 under the title 'Rhyming Chronicle of Incidents and Feelings.' It was followed by 'Allerton and Dreux: or the War of Opinion' (1851), a story, and 'Tales of Orris' (1860); but not till the publication of 'Poems,' in 1863, did Miss Ingelow become famous. This volume won the enthusiastic praise of critics and the instant approval of the public, and passed through 23 editions. The most widely appreciated poems in it are 'The High Tide on the Coast of Lincolnshire'; 'Songs of Seven'; 'Divided'; and 'Supper at the Mill.' Later volumes were: 'Studies for Stories' (1864); 'Stories told to a Child' (1865); 'A Story of Doom, and Other Poems' (1867); 'Mopsa the Fairy' (1869); 'Off the Skelligs' (1872), her first long story; 'The Little Wonder Horn' (1872), a new series of stories told to a child; 'Fated to be Free' (1875); 'Sarah de Berenger' (1880); 'Don John' (1881); and 'John Jerome' (1886). A third volume of verse, 'Monitions of the Unseen' was published in 1885. Her works have been even more popular in America than in her native country.

Ingeman, Bernhard Severin, Danish poet and novelist: b. Torkildstrup, on the island of Falster, 28 May 1789; d. Sorö 24 Feb. 1862. He was educated at the University of Copenhagen, and it was while a student there that he published his first 'Poems' (1811–12), of a dreamy, melancholy nature, showing the influence of German romanticism, and displaying the unhealthy state of his body and mind. In 1814 he published a long allegorical poem, 'The Black Knights,' which showed a marked advance. The next six works which he produced were plays, the tragedy 'Blanca,' brought out in 1815, being the most popular and successful, though 'The Miraculous Child Reinald' (1816) was undoubtedly the best. 'The Subterranean Ones, a Story of Bornholm,' his first prose work, was written in 1817, and the following year he started on a tour of the Continent, returning in 1819. On his return he wrote his 'Stories and Miraculous Tales,' which was published in 1820, followed in 1821 by a comedy, 'Magnetism in a Barber's Shop,' which, however, was unsuccessful, and thereafter he confined himself to prose work. In 1822 he accepted the chair of Danish language and literature at the Academy of Sorö, and then began his voluminous writings on historical subjects, his novels probably being inspired and copied from the Waverley novels, by Scott. The subjects and characters were taken from Danish history, and, while they were to a great extent inaccurate, were possessed of such strong nationality that they became of great interest. Among these historical romances were 'Valdemar the Victorious' (1826); 'Erik Menved's Childhood' (1828); 'King Erik and the Outlaws' (1833); 'Prince Otto of Denmark and his Time' (1835). From 1837–9 he wrote a collection of 'Evening and Morning Songs,' which became very popular on account of their great beauty of religious expression. From this time until his death his writings were mainly religious, and the last of his works, 'The Apple of Gold,' was published in 1856. His collected works in 41 volumes were published in Copenhagen (1843–65).

Ingenhousz, Jan, Dutch physician and scientist: b. Breda, Holland, 1730; d. Bowood, the

seat of the Marquis of Lansdowne, England, 7 Sept. 1779. He studied medicine, and after practising in his own country for several years removed to London in 1767. In 1769 he was appointed aulic councilor and body physician to the Austrian Empress, Maria Theresa, and to Joseph II. After serving for 10 years in that capacity he returned to London, where he began his scientific researches, later becoming a fellow of the Royal Society, and publishing in their 'Transactions' several treatises and essays. Among these were 'Experiments on Vegetables, Discovering Their Great Power of Purifying the Common Air in Sunshine, but Injuring it in the Shade, or at Night' (1779); 'Anfangsgründe der Electricität' (1781); 'Essay on the Food of Plants and the Renovation of Soils' (1796). Dr. Ingenhousz is credited with being the discoverer of the use of carbonic acid for medicinal purposes, and he also invented the plate electrical machine.

Ingersoll, ing'gėr-sŏl, **Charles Jared,** American statesman, lawyer, and author; son of Jared Ingersoll (q.v.): b. Philadelphia 3 Oct. 1782; d. there 14 May 1862. After finishing his collegiate course he studied law, was admitted to practice, traveled in Europe, and became attached to the American embassy to France. In 1812 he was elected to Congress, taking his seat in May 1813. In 1815 he was appointed United States district attorney for Pennsylvania, an office which he held until 1829. Shortly after he was elected to the legislature of Pennsylvania. He was a member of Congress 1841–7 as representative of one of the districts of which the county of Philadelphia was then composed. He was the author of the poems 'Chiomara' (1800), and 'Julian' (1831); and of 'Inchiquin — the Jesuit's Letters on American Literature and Politics' (1810); 'Historical Sketch of the Second War between the United States and Great Britain' (1845–52); etc. Consult Meigs, 'Charles Jared Ingersoll' (1896).

Ingersoll, Ernest, American naturalist: b. Monroe, Mich., 13 March 1852. He studied at Oberlin College and in the Lawrence Scientific School and Museum of Comparative Zoology of Harvard University, where he was a pupil of Agassiz, and in 1874 and 1877 was connected as naturalist with the Hayden survey. He was also an expert on the United States fish commission, and later became known as a popular writer and lecturer on scientific subjects. In 1901 he was lecturer in zoology at the University of Chicago. Among his works are: 'Nests and Eggs of North American Birds' (1880–1); 'Oyster Industries of the United States' (1881); 'Knocking 'Round the Rockies' (1883); 'Country Cousins' (1884); 'The Crest of the Continent' (1884); 'Down East Latch-Strings' (1887); 'Wild Neighbors' (1897); 'The Book of the Ocean' (1898); 'Nature's Calendar' (1900); 'Wild Life of Orchard and Field' (1902); and also 'The Ice Queen,' and several other popular juvenile tales.

Ingersoll, Jared, American politician: b. Milford, Conn., 1722; d. 1781. Upon the passage of the Stamp Act he was appointed, in 1765, a stamp agent in Connecticut, and accepted the post by the advice of Franklin. This subjected him to the personal abuse and insults from which all colonial stamp agents suffered, and finally he was forced to resign; later, in 1770, becoming an admiralty judge. He wrote and published a pamphlet called 'The Stamp Act' (1776).

Ingersoll, Jared, American lawyer: b. Connecticut 1749; d. Philadelphia 21 Oct. 1822. Having been graduated at Yale College in 1766, he went to London, was entered of the Middle Temple, and passed five years in the study of law. The American Revolution breaking out while he was still in London, he espoused the cause of the colonies, although the son of a loyalist. He went from London to Paris, where he remained for 18 months, making the acquaintance of Franklin. Returning home, he took up his residence in Philadelphia, where he won almost immediately a prominent position as a lawyer. In 1787 he was chosen one of the representatives of Pennsylvania in the convention which framed the United States Constitution. Twice attorney-general of the State, he was United States district attorney for Pennsylvania, and was in 1812 the federal candidate for Vice-President of the United States.

Ingersoll, Joseph Reed, American lawyer and politician: b. Philadelphia, Pa., 14 June 1786; d. there 20 Feb. 1868. After graduating from Princeton in 1804, he took up the practice of law in Philadelphia. He was a Whig member of Congress from 1835–7, and again from 1842–9. In 1852 President Fillmore appointed him minister to England, a post which he held for only a year. He wrote 'Secession a Folly and a Crime,' which appeared just previous to the outbreak of the Civil War; also a 'Memoir of Samuel Breck' (1863).

Ingersoll, Robert Green, American lawyer, lecturer and author: b. Dresden, N. Y., 11 Aug. 1833; d. Dobb's Ferry, N. Y., 21 July 1899. He received a common school education and was admitted to the bar in 1854. He soon became prominent in the courts and in Democratic politics. In the Civil War he recruited the 11th Illinois cavalry and entered the army as its colonel. On 29 Nov. 1862, while trying with a force of 600 men to intercept a Confederate raiding party, he was captured by a force of 10,000 men, but was soon paroled and given command of a camp in Saint Louis. He soon afterward resigned. After the war he became a Republican, and was made attorney-general of Illinois in 1866. He was a delegate to the Republican National Convention in 1876 and placed in nomination for President James G. Blaine, whom he termed "the plumed knight." His nominating speech gave him national reputation as an orator, and he afterward lectured frequently. He was an agnostic, and in his lectures attacked the Bible and the beliefs of the Christian religion. He was prominent in politics for several years, and had he not given such frequent expressions to his agnostic views he would doubtless have been honored with high offices. He took up his permanent residence in New York city in 1882 and practised law there till his death. His most famous lectures include 'Some Mistakes of Moses'; 'The Family'; 'The Liberty of Man, Woman, and Child'; 'The Gods'; and 'Ghosts.' His publications include 'Lectures Complete' (1886); 'Prose, Poems and Selections' (1888); and 'Great Speeches' (1887). A complete collection of his works was published in 1900.

Ingersoll, Canada, town in Oxford County, Ontario, on the Thames River and the Grand Trunk railway, 10 miles northeast of London. It is the marketing centre for a rich grain and fruit-producing section, and has an important trade in lumber, grain, cheese, and general country produce. It has manufactures of iron products, machinery, agricultural implements, woolen goods, woodenware, lumber, and creamery products; banks, and weekly newspapers. Pop. (1901) 4,573.

Ingham, Benjamin, English evangelistic leader: b. Ossett, Yorkshire, 11 June 1712; d. Aberford 1772. He received his education at Batley School and at Queen's College, Oxford, whence he graduated B.A. in 1733. In 1735 he was ordained, and, becoming associated with John Wesley, went with him to Georgia, remaining two years. In 1737 he went with the Wesleys on a visit to the Moravians in Germany, and became so strongly attached to their doctrines that he broke with the Wesleys and founded in Yorkshire several congregations of what were known as "Moravian Methodists," but more commonly as "Inghamites." He endeavored to unite in this organization the chief doctrines of the Moravians and Methodists, and so successful was he as bishop or general overseer that in a few years there were 84 of these congregations in England. He moved to Aberford about the time of his marriage with a sister of the Earl of Huntingdon in 1741, and succeeded in converting the whole surrounding neighborhood to his faith. In 1759, however, the greater part of his followers deserted him and went over to Sandeman, and in 1760 Ingham himself joined the Sandemanians and the Inghamites disappeared.

Ingham, Charles Cromwell, American painter: b. Dublin, Ireland, 1797; d. New York 10 Dec. 1863. He was a pupil of William Cunning at the Dublin Academy, came to New York in 1817, was there a founder of the National Academy of Design (1826), and its vice-president in 1845–50. De Witt Clinton and Lafayette were among his subjects. His works include: 'Day Dreams'; 'The White Plume'; 'The Death of Cleopatra.'

Ingham, Samuel Delucenna, American politician: b. Bucks County, Pa., 16 Sept. 1779; d. Trenton, N. J., 5 June 1860. He was for some time in the Pennsylvania legislature, and was then sent to Congress, 1813–18, and again 1822–9. In the interim he was appointed prothonotary of the courts of Bucks County, but resigned in 1819 to become secretary to Gov. Finley. On 6 March 1829 President Jackson appointed him secretary of the treasury, a position he continued to hold till 1 Aug. 1831.

Ingleby, Clement Mansfield, English author and Shakespearean critic: b. Edgbaston, near Birmingham, 29 Oct. 1823; d. Ilford, Essex, 26 Sept. 1886. After graduating from Trinity College, Cambridge (B.A. 1847; M.A. 1850) he entered into partnership with his father, but in 1859 gave up his law practice and moved to Ilford, where he began writing for the magazines on scientific and metaphysical subjects. His best known works are his Shakespearean studies, among which are 'The Shakespere Fabrications' (1859); 'Shakespere Controversy' (1861); 'Shakespeare's Centurie of Prayse, etc.' (1874); 'The Still Lion' (1874; new edition 1875, entitled 'Shakespere's Hermeneutics'); 'Shakespere: the Man and the Book' (1877–8). He also wrote 'Outlines of Theoretical Logic' (1856); 'An Introduction to Metaphysics' (1864–9); etc.

Inglis, ĭng'lĭz, **Charles,** American Anglican bishop: b. New York 1734; d. Halifax, Nova Scotia, 1816. He was ordained priest in England, and in 1765 became assistant minister at Trinity Church, New York. A stout loyalist, he refused to omit from the service the prayer for the king and royal family, and upon the occupation of New York by Washington retired for a time to Long Island. In 1777 he was chosen to the rectorship of Trinity, and in 1783, at the evacuation of New York by the British, went to Halifax in the emigration of the United Empire loyalists. He was consecrated in 1787 bishop of Nova Scotia (with jurisdiction over the other North American provinces), and was the first missionary bishop of the Church of England. He published sermons and pamphlets.

In'got, a small bar of metal formed by casting it in molds. The term is chiefly applied to the bars of gold and silver intended for coining.

Ingraham, ĭng'grȧ-ȧm, **Duncan Nathaniel,** American naval officer: b. Charleston, S. C., 6 Dec. 1802; d. there 16 Oct. 1891. He entered the navy as midshipman in 1812, and became a captain in 1855. While in command of the sloop-of-war St. Louis he arrived at Smyrna 22 June 1853, and was informed that Martin Koszta, Hungarian by birth, but entitled to the protection of the United States, was a prisoner on board the Austrian brig of war Hussar, then lying near the St. Louis. Ingraham went on board the Hussar, had an interview with Koszta, and learned that he had resided a year and 11 months in New York, where he took the usual oath of allegiance to the United States in July 1852, and was in possession of a legalized copy of a declaration of his intention to become an American citizen; that he had come to Smyrna from New York on business; that on the afternoon of 21 June he was seized by a party of armed Greeks, employed by the Austrian consul-general, carried on board the Hussar, where he was held in close confinement. Ingraham accordingly, on 2 July, at 8 A.M., demanded of the Austrian commander the release of Koszta by 4 P.M., declaring that he would otherwise take him by force. At 11 o'clock the Austrian consul-general proposed to deliver Koszta into the hands of the French consul, to be held by him subject to the disposition of the consuls of the United States and Austria, and not to be delivered without their joint order. As this proposition gave sufficient assurance of the personal safety of Koszta Ingraham accepted it, and the Hungarian was set at liberty. The conduct of Ingraham was fully approved by the government, and Congress by joint resolution, 4 Aug. 1854, requested the President to present a medal to him for his conduct on this occasion. In 1860 he resigned from the United States navy, entered the Confederate service and became a commodore.

Ingraham, Joseph Holt, American novelist: b. Portland, Maine, 1809; d. Holly Springs, Miss., December 1866. After a brief experience

of mercantile life he became teacher in Washington College, Natchez, Miss., and in 1836 published his first book, 'The South-West, by a Yankee.' Thenceforth he produced in rapid succession 'Lafitte'; 'Burton, or the Sieges'; 'Captain Kyd'; 'The Dancing Feather'; and other romances of small literary merit, some of which attained a large circulation. He subsequently entered the Episcopal ministry and was rector of a parish and of St. Thomas's Hall, an academy for boys, in Holly Springs, Miss. He still continued to write, publishing 'Prince of the House of David' (1855) and the 'Pillar of Fire' (1859); 'The Throne of David,' which were widely popular, but nearly worthless from a literary point of view.

Ingraham, Prentiss, American soldier and author: b. Adams County, Miss., 22 Dec. 1843. He was educated at Jefferson College (Miss.), also studied medicine at the Mobile Medical College, entered the army of the Confederate States in 1861, fought later with Juarez in Mexico, with the Austrian army in the war with Prussia, and in the ten-years' war for independence in Cuba. Subsequently he entered a literary career, and published a great quantity of fiction, including: 'Without Heart' (1878); 'Zuleikah' (1887); 'Red Rovers on Blue Waters' (1890); 'The Vagabond' (1891); and 'The Wandering Jew of the Sea' (1891).

In'gram, John Kells, English educator and author: b. County Donegal, Ireland, 7 July 1823. He was educated at Trinity College, Dublin, and was appointed professor of oratory and English literature there in 1852, Regius professor of Greek in 1866, and librarian in 1879. At one time he was vice-provost of the college, and also held the presidency of the Royal Irish Academy. His 'History of Political Economy,' originally printed in the 9th edition of the 'Encyclopædia Britannica,' was separately published in 1888 and widely translated. He further wrote: 'A History of Slavery and Serfdom' (1895); 'Sonnets and other Poems' (1900); 'Human Nature and Morals according to Auguste Comte' (1901), and other works.

Ingres, Jean Dominique Auguste, zhŏñ dō-mē-nēk ō-güst ăñg-r, French historical painter: b. Montauban 15 Sept. 1781; d. Paris 14 Jan. 1814. Placed in the school of David he made such rapid progress that at 20 he had gained in two successive years the first and second prizes of the Academy of Fine Arts, In 1806 he departed for Italy, where he passed nearly 20 years, abandoning, under the influence of a close study of Raphael and the old masters, the dry, classic style acquired from David. His works are numerous, and comprise generally serious historical and classical subjects; in the great exhibition of 1855 at Paris an entire salon was appropriated to them. Many are in the Louvre, on the ceiling of one of the apartments of which is painted his 'Apotheosis of Homer.' He painted the portraits of many distinguished personages, from Napoleon I. downward. The art of Ingres is adjudged to hold a middle place between the classic and the romantic schools.

Inhala'tion, in medicine, a mode of applying remedies directly to the respiratory tract. Either steam alone, steam charged with drug-vapors, or drugs finely subdivided in sprays, are breathed into the air-passages as deeply as possible. This method of medication is useful only in relieving inflammations of the upper air-passages and possibly the trachea and larger bronchi. The air in the smaller bronchi is not changed by breathing, but by the diffusion of gases, so that substances in aërial suspension are deposited on the surface before reaching the smaller divisions of the bronchial tubes. Steam does not penetrate far, but is cooled, and deposits moisture as far as the trachea. The old-fashioned croup-kettle and many devices for carrying out the same idea are used for the first stages of laryngitis. Many substances, such as tincture of benzoin, etc., are added to the boiling water, but render it no more efficacious. Instead of conducting the steam directly to the mouth and nose by a funnel or tube, it may be well to place the patient in a simply enclosed tent, formed of bedclothes, and to allow the steam to charge the confined air. This method is particularly advisable for infants and older children.

Inher'itance, in law, a perpetual or continuing right to an estate invested in a person and his heirs. There are nine "canons of inheritance"; three may be quoted: (1) That inheritance shall, in the first place, descend to the issue of the last purchaser in *infinitum;* (2) That the male issue shall be admitted before the female; (3) That where two or more of the male sex are in equal degree of consanguinity to the purchaser, the eldest only shall inherit, but the females all together.

Inheritance Tax, an assessment laid upon those made heirs of property, either by distribution or descent. Sometimes this assessment is confined to collateral heirs, when it is called collateral inheritance tax. The raising of public funds in this way has been sanctioned by legislation from the beginning of Roman law, and in England and other countries is a large and steady source of revenue, although such taxes have been stigmatized by certain economists as "death duties." During the Civil War taxes of this kind were made part of the internal revenue system of the United States, but abolished soon after the struggle ended. The rate and method of assessment vary in different countries, and in different States of the Union. The English inheritance tax ranges from a 1 to a 10 per cent assessment, in accordance with the amount of the inheritance and the degree of relationship of heirs. In the United States lineal, collateral and succession inheritance taxes have been instituted in several States, as a source of domestic revenue. In Connecticut the assessment on inherited property is 5 per cent on all sums and values above $1,000. In Delaware the assessment ranges from 1 to 5 per cent, according to the amount of property left, and the degree of relationship. In Illinois, 1 per cent on values over $20,000 to lineal descendants; 2 per cent to 5 per cent on all amounts to collateral relations. In Maryland, 2½ per cent on all legacies and successions. In New York, 1 per cent on all property over the amount of $10,000 to lineal heirs, 5 per cent on all amounts over $500 to collateral relatives. In Ohio, 5 per cent on all values over $500. In

Virginia, 5 per cent in every case. Several States leave untaxed the property descending or distributed to the lineal descendants, and place assessments of varying percentage on the amount or value of the legacy which falls to collateral heirs. These are California, Maine, Massachusetts, Minnesota, New Jersey, Tennessee, West Virginia. Inheritance laws have in the United States occasioned much discussion and litigation, but their justice and utility have been testified to by experience and the decision of the law courts. The economists of the present and other periods have seen the scientific propriety of such legal provisions, and have noted the uniformity with which they deal with all classes of the financial community.

In'ia, a genus of toothed cetaceans similar to dolphins, but placed on structural grounds in the allied family *Platanistidæ*, with the freshwater dolphins of the Ganges and the La Plata. The single species (*I. geoffrensis*) is called bouto and tucuxi, and is found in some of the upper tributaries of the Amazon, and in the lakes near the Cordilleras. It measures about eight feet in length, has a long cylindrical snout with stiff hairs, and a very slight dorsal fin. It feeds chiefly on fish, and is hunted for the sake of its oil.

Initiative. See REFERENDUM.

Injunc'tion, a writ issued by a court of equity, bidding, or forbidding, a person or persons to do a certain thing. The injunction originated in Roman law, and was anciently known as an interdict, a name it still bears in Scottish practice. It was introduced as a remedy for some of the abuses of common law, and as a preventive, when evasion of common law provisions seemed possible. It is to-day one of the most potent of the legal remedies of an equitable character which stand on the statute books.

There are three main divisions in the purposes for which a writ of injunction is issued. A writ may be prohibitive, protective, or restorative. In the first place it may forbid the commission of certain acts of a civil nature which are charged with injustice. Second, it may be so framed as to protect such civil rights of an individual or a corporation as seem to be threatened. Third, it may order the restitution or restoration of such rights as have unlawfully been taken away from an individual or a corporation. These characters of the writ have been clearly expounded by Blackstone, as follows:

"This writ may be had to stay proceedings at law, whatever stage they may have reached; to restrain alienations of property *pendente lite*, and tenants for life and others having limited interest from committing waste. It may be granted to restrain the negotiation of bills of exchange, the sailing of a ship, the transfer of stock, or the alienation of a specific chattel, to prohibit assignees from making a dividend, to prevent parties from removing out of the jurisdiction, or from marrying, or having any intercourse, which the court disapproves of, with a ward. The infringement of a copyright or a patent frequently calls for the exercise of this beneficial process; which may also be had to restrain the fraudulent use of trade marks, or of the names, labels, or other indiciæ of the makers or vendors of goods and merchandise, and in a large class of cases, far too numerous to be mentioned here."

The first two kinds of injunction are most commonly used, and a familiar example of the prohibitory writ is that which orders the abatement of a nuisance. A railroad which lays tracks without first gaining the right of way may be compelled by injunction to remove them. By such a writ patent rights, copyrights and trade marks are secured from infringement, or proceedings in a court of law are stayed. Sometimes a court of equity issues an injunction prohibiting litigants within its own jurisdiction from prosecuting a suit in another jurisdiction; for example, a United States court may restrain creditors for suing in State courts for the enforcement of their claims against a bankrupt, and reserve the disposition of his estate to its own jurisdiction. A court of equity only issues a writ of injunction when a remedy of law appears inadequate to give the wronged party the complete relief to which he is entitled. Thus in recent cases the courts have issued writs forbidding labor agitators and others from inducing or coercing workingmen, in such a way as to bring on a strike to the injury and damage of employers, who might thus be induced to sacrifice their rights in order to escape ruin or irreparable loss.

An injunction in the United States may be preliminary or perpetual. A preliminary writ is sometimes styled interlocutory, as it is issued *pendente lite*. The preliminary writ may be made perpetual, if, after arguments made and heard, the court decides that the grounds advanced for the continuance are valid, and have been so proved by evidence. Failure to obey an injunction is punishable as a contempt of court (q.v.) Consult Beach, 'Treatise on the Law of Injunctions' (1895).

Injunction, Government by. See GOVERNMENT BY INJUNCTION.

Injunction, Theatrical, a term applied to a mandate issued by a court of equity, to compel or prevent the performance of some act for which money damages would not properly compensate the injured party. Relief by injunction in matters pertaining to theatricals is probably more frequently sought than in any other business or profession, and precedents in law established in this class of cases has become of considerable importance. At first, courts of this country and England refused to grant injunctions against actors for the purpose of compelling them to perform their contracts, a learned justice saying: "The Court could not regard as law the old adage that 'a bird that can sing and will not sing must be made to sing.' " But latterly, when the service of an actor became recognized and it was made to clearly appear that an actor or singer, by intelligence, education and other artistic accomplishments and talents, was of extreme importance to one who had invested money in the production of a play or opera, it was held that a court of equity would by injunction enforce a covenant in a contract. But this has simply gone to the extent of compelling a fulfilment of the contract, or forcing the artist to remain idle during its term. The services of every actor will not be enjoined. He must actually possess some exceptional merit, so that his services may be

termed special, unique and extraordinary, and it must be shown they cannot be fulfilled by any other person without injury to the employer. In the case of Lumley *v.* Wagner, the courts of England enjoined Johanna Wagner, a prominent prima donna of the early 50's from appearing at Covent Garden Opera House, London, in violation of her contract with Lumley; and then for the first time the British courts asserted their authority over contracts of actors, and granted an injunction forbidding her rendering professional services for any but her original employer.

In the United States, the Federal courts recognized the right of a manager to have the exclusive services of his employee, and in McCall *v.* Braham an injunction was granted which prevented Lillian Russell from violating her contract. In the State courts, the case of Augustin Daly *v.* Fanny Morant Smith (49 How. Pr. 150), Superior Court Justice Freedman also appreciated the fact that the ancient rule had been abrogated and the modern one compelling actors to live up to their agreements, as other individuals, was there enforced. The contract must unquestionably be fair. The rights of both parties to it must be equal. In other words, if the contract gives the manager the right to terminate it by giving notice before the expiration of the contract, a like right of termination must also be given the actor; and as stated before, the actor's services must be special, unique and extraordinary. In this latter connection, it seems uncertain where to draw the line. In the case of Carter *v.* Ferguson the court refused to grant an injunction to Mrs. Leslie Carter against William J. Ferguson, an actor, saying that his services were not so special and unique as to warrant a court of equity's interference. In Charles Hoyt *v.* Loie Fuller, the court granted an injunction against the dancer, holding that a serpentine dance in the performance of which she became famous, warranted the court's interference by injunction. In George Edwardes, the London manager, *v.* Cissie Fitzgerald, the New York Supreme Court granted an injunction against Miss Fitzgerald, on the theory that a certain wink of her eye used in a play was of special merit, and a drawing card. In Harris *v.* Sparks, an injunction was granted against John Sparks, the Irish comedian, the ground being that his portrayal of an Irish character was special, unique and extraordinary. While in the still later case of Shubert Brothers *v.* Aimee Angeles, imitations given by the performer were considered so special, unique and extraordinary as to warrant the granting of an injunction. Each case, however, must be determined by its own peculiar circumstances. In the most recent case — Harrison Grey Fiske *v.* Tyrone Power — the court refused to grant an injunction against Tyrone Power, although his ability as an actor was exploited in the newspapers; on the ground that his services were not so special, unique and extraordinary, as to justify an injunction. But in guarding the rights of an actor, the courts will see that no advantage has been taken of him by the manager, and that the manager for whom he is to perform is of such financial responsibility as to insure the salary of the actor. In the case of Rice *v.* D'Arville, Edward E. Rice, the theatrical manager, sought to restrain Camille D'Arville from performing for others; but on the defense that Rice was insolvent and indebted to her on a previous contract, Justice Oliver Wendell Holmes, then of the Massachusetts Supreme Court, would not compel her to perform for Rice.

Injunctions in the theatrical profession are not confined to actors and actresses, but are often invoked to prevent the piracy of a play or the use of a name. Where a play, or a scene from a play, has been copyrighted, the Federal courts alone have jurisdiction of the matter, and will by injunction prevent anybody from performing or producing it as their own. When there has been no copyright the common law protects the work, so well as its title; and the use of a similar name, or a name which is apt to deceive the public into the belief that it is the one already used by an author, will likewise be enjoined. A recent instance is the case of Charles Frohman *v.* Arthur Fraser, where the use of the title "Sherlock Holmes" was enjoined, this name having been adapted by William Gillette as the title of a play, notwithstanding the name had been used by A. Conan Doyle as the title of his novel. In that case the court held that Mr. Gillette having first used the name in connection with a theatrical production was entitled to all emoluments arising from it. Notwithstanding the numerous attempts to avoid the principles of law applicable to this class of cases, it matters not whether it is the actor who is involved or the theatrical manager, the American courts are humane, equitable, just and careful, and invariably zealously guard the interests of those engaged in the theatrical profession, so well as those engaged in any commercial business. See INJUNCTION; GOVERNMENT BY INJUNCTION; COURT; EQUITY; CHANCERY; CONTEMPT; LAW; etc.

Ink, a colored liquid used for writing and printing. They are of various classes, as writing and copying, black or colored, India, printing and lithographing inks.

For long ages past the best black writing-ink has been made by mixing together solutions of nutgalls and of ferrous sulphate of iron, known as green vitriol, and holding in colloidal suspension, by aid of a gum, the colored substance produced. The gallo-tannic acid present in a freshly prepared solution of galls, upon exposure to the air, changes gradually largely into gallic acid, and the protoxide of iron changes into peroxide. The color of this changed product is much deeper than that of the original mixture. It has been found that the permanency of the writing is greater if the ink is used before this conversion is fully completed. The change is held in check by having present in the ink a slight amount of some free volatile acid such as hydrochloric. The trace of acid also serves to hold the iron color in the state of colloidal suspension or solution. The moulding to which such an ink is liable is checked by adding to it a trace of some antiseptic, such as carbolic acid. All known commercial substitutes hitherto used for nutgalls in black writing-ink produce a fluid somewhat inferior to that from nutgalls.

An exhaustive scientific investigation of the chemistry of ink to determine the best ingre-

dients and the proportions to be used of the same for the producing of the most permanent black writing-ink has been made in Germany by Osw. Schluttig and Dr. G. S. Neumann, and published in their work on 'Die Eisengallustinten,' issued by Zahn & Jaensch of Dresden in 1890. Their conclusions were followed in preparing the specifications for the official "Standard Record Ink" required under the laws of Massachusetts to be used on all the public records in that state. The same specifications have since been adopted by the U. S. Treasury for the ink used in that department. This ink has also been adopted by the Danish government for its official records. The specifications, which were prepared by Dr. Bennett F. Davenport of Boston, as ink expert for the State of Massachusetts, it is to be noted are for the required quality of the ink, and not for the compounding of it. The specifications are as follows:

It must be a gallo-tannate of iron ink, not inferior in any essential quality to a typical standard for comparison which has been properly prepared after the following formula, in which all the ingredients are of the quality prescribed by the United States Pharmacopœia, and the per cent of true acid present in the sample of tannic acid used has been determined by the Loewenthal and Schroeder method.

Take of pure, dry Tannic Acid, 23.4 parts by weight; crystal Gallic Acid, 7.7 parts; Ferrous Sulphate, 30.0 parts; Gum Arabic, 10.0 parts; diluted Hydrochloric Acid, 25.0 parts; Carbolic Acid, 1.0 part; Water, sufficient to make up the mixture at the temperature of 60° F. to the volume of 1000. parts by weight of water.

Inks submitted will be subjected to the following tests, as compared with the typical normal standard ink described above: (1) A fluid ounce allowed to stand at rest in a white glass vessel, freely exposed in diffused daylight for two weeks to the light and air, at a temperature of 50° to 60° F., protected against the entrance of dust, must remain as free from deposit upon the surface of the ink or on the bottom or sides of the vessel. (2) It must contain no less iron, and must have a specific gravity of 1.035 to 1.040 at 60° F. (3) It must develop its color as quickly. (4) After a week's exposure to diffused daylight the color must be as intense a black when used upon the standard record paper, and it must equally resist changes from exposure to light, air, water, or alcohol. (5) It must be as fluid, flow as well, strike no more through the paper, nor remain more sticky immediately after drying.

To such an ink a slight amount of some one of the water soluble coal-tar colors is usually added to give the desired initial color to the ink when used in writing.

Cheaper grades of black writing-ink are produced by substituting for the nutgalls other tannin containing substances, or by using logwood. In these other iron salts, or salts of other metals are sometimes used, as of copper, aluminum or chromium. For special purposes some of these have certain advantages. For copying, for instance, the ink made from logwood with alum cake and chromate has the highest efficiency known. This ink, however, fades out after a few years' exposure to the open air and daylight.

Within modern times colored liquid solutions have come much into general use as inks, made up with aniline and other dyestuff colors. They are easily and cheaply made, flow nicely from the pen, and allow of a great variety as to choice in coloring, but none of them have the permanency of the ancient nutgall iron ink on exposure to light and air.

The usual basis of commercial marking inks, for use on textile fabrics, is some salt of silver. The permanent color of this ink is developed through the action of light, heat or some chemical, after the ink has been applied. The usual basis of India ink is an exceedingly finely divided solid carbon, mixed with a size to hold it in suspension when the ink is prepared for use by being ground up with water. The usual base used for printers' ink is a linseed-oil varnish. To this the desirable color is imparted by the use of lampblack, or some other coloring substance.

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BENNETT F. DAVENPORT, M.D.,
Expert on Written Documents, the Writing, Ink and Paper.

Ink'berry, or Winterberry, a shrub (*Ilex glabra*) of the holly family which grows upon the Atlantic coast of the United States. It is a fine evergreen, two to four feet high. Its stems are slender and flexible, and its leaves, about an inch in length, are lanceolate in form, of leathery texture, and present a shining upper surface. It bears small, very black berries. Formerly its bark and leaves were used medicinally, especially in fevers. For bouquets and decorative purposes it is much valued, and finds a ready market in large Eastern cities.

Inkerman, ĭnk-ĕr-măn', Russia, a village on the site of a ruined town in the Crimea, at the head of the harbor of Sebastopol, 35 miles by rail southwest of Simferopol. It gives its name to the sanguinary battle fought on the heights overlooking the town, on 5 Nov. 1854, when the Russians unexpectedly attacking the British camp were repulsed with great slaughter, losing in killed 3,000 and in wounded 6,000, the loss of British and French allies being 850 killed and 3,500 wounded.

Inlay'ing is the art of ornamenting flat surfaces of one substance by inserting into them pieces of some other substance. Various kinds of metal or wood, or pearl, ivory, etc., are employed in this process, which is now applied chiefly to the production of ornamental articles of furniture. When wood of one color is inlaid with others of different colors, as in ornamental devices in flooring, it is generally called marquetry, the various pieces of wood being usually disposed in regular geometrical figures. The art of inlaying iron or steel with other metals, as gold or silver, is called damascening. Buhl and reisner work, once highly prized, have lost much of their celebrity. The former took its name from Buhl, an Italian resident in Paris in the reign of Louis XIV., and the latter was designated after Reisner, a German who not long after settled in the same city. Buhl for the most part inlaid brass on tortoise-shell, Reisner a dark wood on a tulip-wood ground. The usual instrument for cutting out veneers for inlaying is a fine saw, mounted in a bow or arched handle, and worked in short quick movements. Three or four veneers are sometimes cut simultaneously in this way. Inlaying with stone, in which the Florentines have long excelled, is called *pietra dura,* and differs from mosaic in having the holes not cut through the ground, which is commonly of black marble, but only to a regulated depth.

The best work of this kind is now produced at St. Petersburg, the art being stimulated by encouragement from the Russian government. An Indian variety of inlaying, in which the inlaid metal occupies more of the surface than that which forms the ground, is called *Kuftgari;* and in another variety, *Tutenague* or *Bederywork,* small pieces of silver are hammered into spaces previously cut in the ground, which consist of one part of copper to four of pewter, and is thus both hard and easily cut. See Mosaic.

In'man, Henry, American artist: b. Utica, N. Y., 20 Oct. 1801; d. New York 17 Jan. 1846. From early boyhood he manifested a taste for art, and in 1814 Jarvis, the portrait painter, offered to receive him as a pupil, and he was bound an apprentice for seven years. Upon the conclusion of his apprenticeship he devoted himself to portrait painting. Among his most characteristic portraits are those of Chief Justice Marshall and Bishop White. He painted also landscape, genre, and history. In 1844 he visited England, where he was the guest of Wordsworth, whose portrait he painted, and at whose suggestion he executed his 'Rydal Water,' near the poet's residence. During his residence in England he also painted portraits of Dr. Chalmers, Lord Chancellor Cottenham, and Macaulay.

Inn, a river of Europe which issues from a lake at the foot of the Rhætian Alps, flows northeast through the deep and narrow valley of the Engadine, in the Swiss canton of the Grisons, enters the Tyrol at Martinsbruck, passes Innsbruck, Hall, and Kuffstein, and shortly after enters Bavaria. At Mühldorf it turns east till it receives the Salza, where it begins to form the boundary between Austria and Bavaria, and joins the right bank of the Danube at Passau, after a course of over 300 miles.

Inn and Innkeeper. In Great Britain inns are houses where travelers are furnished, for the profit of the provider, with everything they have occasion for while on their journey, and may be set up without license by any person, provided he refrains from selling excisable liquors, which of course require a license. Hotels, public-houses, taverns, victualing-houses, and coffee-houses are all inns when the keepers of them make it their business to furnish travelers with food and lodging; otherwise they are not. In the United States there are no inns, but hotels in cities and taverns in rural districts. See Hotels in America; Taverns.

Innate Ideas, certain notions or conceptions declared by many philosophers to be given to the mind of man when he first receives conscious being. Their existence has been much disputed by philosophers. The term innate, as applied to ideas, was first used by Descartes. As his definition failed in precision, the doctrine of Descartes was assailed by Hobbes and Locke. As afterward more strictly stated by himself, his views were as follows: An innate idea is not one that presents itself always to our thought, for there could be no such idea; but we have within ourselves the faculty of producing it. He has nowhere given an enumeration of the ideas that he considers innate, though he attaches particular importance to that of infinity, which he makes the foundation of his proofs for the existence of God. What the followers of Descartes designate innate ideas, those of Cousin term universal, necessary and absolute. Some of the greatest names in European philosophy are associated with the discussion of this theory, or of cognate theories, as Clarke, Newton, Malebranche, Kant, etc.

Innes, ĭn'ĕs, Alexander Taylor, Scottish jurist: b. Tain, Ross and Cromarty, Scotland, 18 Dec. 1833. He was educated at Edinburgh University, was admitted to the Scottish bar in 1870, appointed advocate-depute in Scotland in 1881, and served under later Liberal governments. Among his works are: 'The Law of Creeds in Scotland' (1867); 'Church and State: A Historical Handbook' (1890); 'Studies in Scottish History' (1892); a life of Knox in the 'Famous Scots' series (1896); 'The Trial of Jesus Christ' (1899); and 'The Law of Creeds' (1902).

Inness, George, American painter: b. Newburg, N. Y., 1 May 1825; d. Bridge of Allan, Scotland, 3 Aug. 1894. His art education began in boyhood and when 16 years of age he learned map engraving. He first attempted nature sketching in 1843, when he showed such promise that he was admitted into the studio of Regis Gignoux, New York; but soon opened a studio for himself and through the liberality of a patron was enabled to visit Europe. After spending 15 months in Italy and one year (1850) in France he finally made his home at Eagleswood, near Perth Amboy, N. J. He is looked upon as the first among American landscape painters, and was not only a clever and imaginative interpreter of the scenery among which he lived, but a man of intellect, a thoughtful yet bold theorist on art subjects and an incisive critic. He had a keen appreciation of American scenery, and the sky and atmosphere of the eastern States were sympathetically portrayed with an earnestness that recalls the sentiment of the Fontainebleau-Barbizon school. His early paintings are distinguished by conscientious care for detail, vivid perception of color, and the panoramic breadth of a bold and unconventional originality. After 1878 his style had ripened, and his technique grew simpler and less highly elaborated. He was willing to sacrifice all cleverness of touch in handling detail for the sake of portraying the emotion, or transitory effect of light and cloud in a landscape, the perturbation of storm or wind, the pageant of sunset, or the magic calm of a moonlight scene. In such productions his command of color was very remarkable. His pictures are much prized by connoisseurs, and when offered for sale command high prices. Five of them are in the Metropolitan Museum of Art, New York. Among the finest are: 'Under the Greenwood'; 'Close of a Stormy Day'; 'Pine Groves of Barberini Villa'; 'An Autumn Morning'; 'Autumn Gold'; 'The Edge of the Forest'; 'Passing Storm'; 'Moonrise'; 'Winter Morning, Montclair, New Jersey.'

Inness, George, Jr., American painter: b. Paris, France, 5 Jan. 1854. He is the son of George Inness (q.v.), the landscape painter. He was a pupil of the elder Inness at Rome in 1870–4, of Bonnat at Paris in 1875, began to exhibit at the National Academy in 1877, and became a member of the National Academy of

Design in 1899. In 1899 he obtained a gold medal at the Paris Salon. His manner is forcible, and skilful in color. His work includes landscapes and animal subjects, among them: 'The Pride of the Dairy' (1878); 'Pasture at Chemung'; 'A Mild Day' (1887); and 'Morning on the River' (1902).

In'nocence. A wildflower. See HOUSTONIA.

In'nocent, the name of thirteen popes, as follows:

Innocent I., Saint: b. Albano; d. 12 March 417. He succeeded Anastasius I. as Bishop of Rome in 402. He supported Saint Chrysostom (q.v.) when the latter was driven from his see of Constantinople through the machinations of the Empress Eudoxia. Rome was pillaged by Alaric in 410, during his pontificate. He is commemorated by the Roman Catholic Church on 28 July.

Innocent II. (GREGORIO DE' PAPI, or PAPARESCHI, grā-gō-rē'ō dā pä-pē pä-pä-rĕs'kē): b. Rome; d. 23 Sept. 1143. He was elected pope in 1130 by a part of the cardinals, while the others elected Peter of Leon, who took the name of Anacletus. Innocent fled to France, where he was acknowledged by the Council of Etampes, by Louis VI., and soon after by Henry II. of England; also by the Emperor Lothaire, who conducted him in 1133 to Rome, where he occupied the Lateran, while Anacletus occupied the Castle of Crescentius, the Church of St. Peter, and a large part of the city and maintained himself against Innocent until his death in 1138. He held the second Ecumenical Council in the Lateran, which condemned Arnold of Brescia and his heresy, declared all the decrees of Anacletus null, and excommunicated Roger of Sicily, who had supported the latter. Roger, however, obliged Innocent to acknowledge him as king, absolve him from excommunication, and invest him and his heirs with Apulia, Calabria, and Capua.

Innocent III. (GIOVANNI LOTHARIO CONTI, jō-vän'nē lō thä'rē ō kōn'tē): b. Anagni, Italy, 1161; d. Perugia, Italy, 16 July 1216. On the death of Celestine III. (1198) he was unanimously elected at the age of 37. Innocent, in the vigor of manhood, endowed by nature with all the talents of a ruler, possessed of an erudition uncommon at that time, and favored by circumstances, was better qualified than any of his predecessors to elevate the Papal power. By his clemency and prudence he gained over the inhabitants of Rome, obliged the imperial prefect to take the oath of allegiance to him, and directed his attention to every quarter where he believed that a Papal claim of property or of feudal rights existed. He concluded treaties with many cities of Tuscany for the mutual protection of their liberties and those of the Church, and soon obtained possession of the ecclesiastical states in their widest extent. He excommunicated Philip Augustus, king of France; laid the kingdom under an interdict in 1200 because Philip had repudiated his wife Ingeburga, and obliged the king to submit. He was still more decided in his treatment of John, king of England, who refused to confirm the election of Stephen Langton as Archbishop of Canterbury. Innocent laid the kingdom under an interdict, and in 1212 formally deposed him. John was finally obliged to submit, resigned his territories to Rome, and received them as a Papal fief from Innocent. All Christendom acknowledged the Pope's spiritual sovereignty; two Crusades were undertaken at his order, and his influence extended even to Constantinople. Innocent was one of the greatest Popes and rulers. It has been said of his rule, as of that of Gregory VII., whom he most resembles, that in those times the power of the Pope was salutary as a bond of union for Europe, in which the still firmer bond of a common civilization and knowledge did not, as at present, exist. In 1215 he held a council, the fourth Lateran and twelfth general which passed the decree making confession and communion obligatory at Paschal time. Frederick II. was acknowledged as German emperor, and the Franciscan and Dominican orders were confirmed.

Innocent IV. (SENIBALDI DI FIESCHI, sā-nē-bäl'dē dē fē ĕs kē): d. Naples 7 Dec. 1254. He became Pope in 1243 and was perpetually at feud with the German emperor Frederick and his successors.

Innocent V. (PIETRO DI TARENTASIA, pē-ā'trō dē tä-rĕn-tä'sē-ä): b. 1225; d. Rome 22 June 1276. His pontificate lasted only from 20 January to 22 June of the year 1276.

Innocent VI. (ETIENNE D'ALBERT, ā-tē-ĕn dăl bār): b. Brissac, France; d. 12 Sept. 1362. His pontificate extended from 1352 to 1362, and during this period the Papal residence was at Avignon.

Innocent VII. (COSMO DE' MIGLIORATI, kōs'mō dā mē-glō-rē-ä'tē): b. Sulmona, Abruzzi, Italy, 1366; d. Rome 6 Nov. 1406. He was Pope from 1404 till his death, but was opposed by the antipope, Benedict XIII., who held his court at Avignon.

Innocent VIII. (GIOVANNI BATTISTA CIBO, jō-vän'nē bät-tēs'tä chē'bō): b. Genoa 1432; d. 25 July 1492. He became Pope in 1484 and was for some time at war with Ferdinand of Naples and held the sultan Bajazet's brother Zelim a prisoner.

Innocent IX. (GIOVANNI ANTONIO FACCHINETTI, jō-vän'nē än-tō-nē'ō fä-chē-nĕt'tē): b. Bologna, Italy, 1519; d. 30 Dec. 1591. He occupied the papal chair only from the 29th of October preceding his death.

Innocent X. (GIOVANNI BATTISTA PAMFILI, jō-vän'nē bät-tēs'tä päm-fē'lē): b. Rome 7 May 1574; d. 6 Jan. 1655. In 1629 he was elevated to the cardinalate and became Pope in 1644. Under him the temporal and spiritual power of the papacy was greatly increased. In 1651 he condemned the Treaty of Westphalia and he formally condemned Jansenism in 1653.

Innocent XI. (BENEDETTO ODESCALCHI, bā-nā-dĕt'tō ā-dĕs-käl'kē): b. Como, Italy, 1611; d. 12 Aug. 1689. He served in his youth as a soldier in Germany and Poland, took orders later and rose through many important posts, until he was elected Pope in 1676, on the death of Clement X. He was eminent for his probity and austerity; zealously opposed nepotism and simony, and restrained luxury and excess. He condemned the New Testament of Mons and several other Jansenistic works. He also anathematized sixty-five propositions drawn from the works of modern Casuists and condemned

Molinos and the Quietists. He determined to abolish the right of asylum exercised in Rome by foreign ambassadors; but Louis XIV. would not yield to so just a claim, occupied Avignon, and imprisoned the papal nuncio in France; in consequence of which the authority of the Pope received a severe blow by the IV. Propositiones Cleri Gallicani in 1682. These disputes were highly favorable to the English Revolution, as it induced the Pope in 1689 to unite with the allies against James II., in order to lower the influence of Louis XIV.

Innocent XII. (Antonio Pignatelli, ăn-tō-nē'ō pēn-yä-tĕl'lē): b. Naples 13 March 1615; d. 27 Sept. 1700. He became archbishop of Naples, a cardinal in 1681 and Pope in 1692. During his pontificate Louis XIV. and the French bishops revoked the Declaration of the French clergy, and submitted to the judgment of the Holy See in the matters in dispute during the pontificate of Innocent XI.

Innocent XIII. (Michelangelo Conti, mē-kĕl-ăn'jē-lō kōn'tē): b. Rome 15 May 1655; d. 7 March 1724. In 1695 he was made archbishop of Tarsus, and became a cardinal in 1707. He was also made bishop of Viterbo in 1712 and succeeded Clement XI. in the papal chair in 1721.

Innocents, Feast of Holy, variously styled Innocent's Day and Childermas, a festival generally observed on the 28th, but in the Eastern Church on 29 December, in commemoration of the massacre of the children at Bethlehem, "from two years old and under," by the order of Herod, with the purpose of destroying among them the infant Saviour. The Church of England at the Reformation retained it in its ritual among its anniversary festivals. St. Cyprian refers to these children as martyrs, as does St. Augustine with still greater explicitness. It is to them that the hymn of Prudentius, 'Salvete Flores Martyrum,' is addressed.

Innocents Abroad, The, a famous book of travels by Samuel L. Clemens ("Mark Twain"). In a vein of highly original humor this widely-read book records a pleasure excursion to Europe, the Holy Land, and Egypt, in the sixties. Descriptions of real events and the peoples and lands visited are enlivened by more or less fictitious dialogue and adventures.

In'novators, a name applied in Great Britain to educational reformers who, in the 19th century, succeeded in having corporal punishment abolished in public and private schools. The novels of Charles Dickens, particularly 'Nicholas Nickleby,' and 'Oliver Twist,' had much to do with the origin of the reform movement.

Inns of Court are certain societies in Great Britain exclusively invested with the right to call to the bar. The colleges of the English professors and students of common law are called inns, the old English word for the houses of noblemen, bishops, and others of extraordinary note, being of the same signification as the French *hôtel*. The opinion is, that societies of lawyers, which before the Conquest held their chief abodes for study in ecclesiastical houses, began to be collected into permanent residences, soon after the court of common pleas was directed to be held in a fixed place,—a stipulation which occurs in the great charters both of King John and Henry III. In these houses exercises were performed, lectures read, and degrees conferred. The inns of court are governed by masters, benchers, stewards, and other officers, and have public halls for dining, readings, etc. In London the four inns of court are: the Inner Temple and Middle Temple (formerly the dwelling of the Knights Templars, and purchased by some professors of law more than three centuries since): Lincoln's Inn and Gray's Inn (anciently belonging to the Earls of Lincoln and Gray). Each inn is self-governing, and all have equal privileges.

Innsbruck, ĭns'brook, or **Innspruck** (ancient Œnipontum; locally called Schpruck), Austrian town and capital of the Tyrol, beautifully situated 59 miles north of Munich, on the banks of the Inn, near the confluence of the Sill, and almost in the centre of the valley of the Inn (Innthal), the sides of which are enclosed by mountains several miles distant, but so lofty (7,000 to 8,500 feet) as apparently almost to overhang the town. In consists of the town proper, situated on the right bank of the river, and of five suburbs. It is for the most part well built. The houses are generally of a limestone breccia, and from four to five stories high, and built in the Italian style. The buildings most deserving of notice are the Hofkirche, containing the tomb of the Emperor Maximilian I., one of the most splendid monuments of the kind in Europe, though he himself is not interred in it; and the tomb of Hofer; the Church of St. James, with a painting by Lucas Cranach; the Jesuits' church, considered the handsomest in the town; the Capuchin church, with good paintings; the new palace, built by Maria Theresa, a very extensive edifice, with gardens which stretch along the side of the Inn, and form an excellent promenade; the old palace, in which the Archdukes of Tyrol and several of the German emperors used to reside; the university, founded in 1677, and re-established in 1826, well endowed, provided with a library, botanical garden, and cabinet of natural history, and attended by about 1,000 students; a gymnasium, and several other important educational establishments; and the museum, called Ferdinandeum, rich in all the productions both of art and nature within the limits of the Tyrol. The manufactures include woolen, silk, and cotton tissues, gloves, glass, etc. As the capital of the Tyrol, Innsbruck is the place of assemblage for its states, and the seat of superior appeal, civil, and criminal courts, and of many important public offices. Many of the spots in the immediate vicinity have become memorable for the noble exploits which the Tyrolese peasantry performed in the war of Independence. Pop. (1890) 23,325.

Innuits, ĭn'ū-ĭts. See Eskimos.

I'no, daughter of Cadmus and Harmonia, second wife of Athamas, king of Thebes, drew upon herself the anger of Hera by nursing Dionysus, the son by Zeus of her sister Semele. In order to favor her own children she projected the murder of her stepchildren, Phryxus and Helle, who saved themselves by flight. Hera, still more highly incensed, made Athamas, the husband of Ino, mad, and he dashed his eldest son by Ino, against a rock. Ino fled with

her youngest son, Melicertes, and threw herself with him into the sea. Ino and Melicertes were made sea deities at the prayer of Dionysus. Ino was worshipped under the name of Leucothea.

Inocarpus, ĭ-nō-kär'pŭs, a genus of leguminous plants, having unifoliate leaves and yellow flowers in axillary spikes. *I. edulis* is the South Sea chestnut, native of Tahiti. It is a large tree, with luxuriant foliage, the delicate evergreen leaves being six inches or more in length. It furnishes seeds or nuts much valued in the South Sea Islands, the inhabitants gathering them while green, and mashing them for food.

Inocula'tion. See INFECTION; VACCINATION.

In'osit ($C_6H_{12}O_6$), (from Greek *is, inos,* a nerve, a muscle), a saccharine substance found in the muscular tissues of the heart, as well as liver, brain, kidneys, etc. It appears both in health and, to an abnormal amount, in disease. It exists also in a number of plants, such as foxglove, potato, kidney-bean, acacia, asparagus, cabbage. See GLUCOSE.

Inouye Kaoru, kä-ō'roo ē-nō-oo'yā, **Count,** Japanese statesman: b. in Choshiu 1839, pupil of Yoshida Shoin. With Ito (q.v.), in 1862, he went secretly to Europe, and returning in 1864 became an unswerving exponent in Japan of the ideas lying at the root of Western civilization. Surviving the wounds made by reactionary assassins, he has, since 1868, served his country in various high positions, as the mikado's minister at home and as envoy abroad, especially in Korea. As minister of the interior he began the rebuilding of Tokyo from wood to brick. His famous memorial of 1873 called for moral improvement. For seven years, as head of the foreign office, he was active in treaty revision. He was created a peer in 1885, and again called to the office as minister of the interior in 1892, and retains the emperor's confidence as one of the surviving "elder statesmen," whose word in Japan is law. See KATSURA.

Inquiline, ĭn'kwĭ-lĭn, a term applied in zoology to animals which live as tenants within the nests or homes of other animals. The use of the term is almost entirely confined to entomology and then often restricted to the cases in which the rightful and the intruding tenants are closely related. Similar cases among other animals are commonly designated as commensalism (q.v.), but these and similar terms are used rather loosely. Examples of the inquiline relation occur among the termites, ants, and bees, but are known especially among the gall-flies (*Cynipidæ*); indeed, one entire division, comprising more than 500 species, is named *Inquilinæ,* because of the predominance of this mode of life. These insects differ but little in structure from the true gall-flies, but they lack the power to produce galls and consequently deposit their eggs within those of other species. They infest certain species of galls, as those of the blackberry and some oak-galls, in large numbers and sometimes more than one kind occur in a single gall. Perhaps the most remarkable feature of these inquilines is their frequent close resemblance to the insect which produces the gall which they infest.

Inquisi'tion, a tribunal or system of tribunals instituted by the Roman Catholic Church for the discovery, examination, and conviction of heretics and their punishment by the secular arm. Under the successors of Constantine in the Roman Empire the repression of heresy, or rather the enforcement of the decrees of church councils and synods, was a function of the imperial government, which inflicted temporal penalties upon the propagators of religious beliefs that contradicted the creeds approved by the State. When the reigning emperor was a favorer of Arianism or any other of the heterodox creeds, the orthodox bishops and their flocks were persecuted: when he was of the orthodox party the heterodox sects were put under the ban. In executing the decrees of the councils the imperial officials, called in the laws of Theodosius and Justinian "inquisitors" (*inquisitores*), were assisted by the bishops; but the tribunals were the ordinary secular courts, and judgment was rendered in the name of the State, not the Church. But in the 12th century, when the supremacy of the ecclesiastical power was universally recognized in western Europe, the initiative in the work of repressing heresy was taken by the Church as of course, and the discovery, trial and conviction of the offenders were functions of the ecclesiastical power solely: the secular power simply executed the judgments of the church tribunals. Boniface VIII.'s definition of the respective powers and the mutual relations of church and state was not proclaimed till the close of the 13th century; but had a similar definition been promulgated in the 12th century it would have expressed the universal sentiment of princes and peoples at the time. The celebrated bull, *Unam Sanctam,* defines that "Both swords, the spiritual and the temporal, are in the power of the Church; yet the one is to be wielded for the Church's behoof, but the other by the Church herself: the one by the hand of the priest, the other by that of the king and the soldier, though at the will and sufferance of the priest *ad nutum et patientiam sacerdotis.* And sword must be subordinate to sword — *oportet gladium esse sub gladio,* and the temporal authority subject to the spiritual power — *temporalem auctoritatem spirituali subjici potestati.*"

The first step toward the establishment of courts of inquisition would seem to have been taken in 1179 when the third council of the Lateran issued a decree of excommunication against the adherents of the heretical sects of southern France, who are charged not only with holding abominable heretical tenets but also with practising "unheard-of cruelties against the Catholics," demolishing the churches and massacring widows and orphans. The council grants "an indulgence of two years to those who shall make war on them." This decree was re-enforced by the Council of Verona (1184) over which Pope Lucius III. presided, and at which the Emperor Frederic I. assisted: the Council directs the bishops to bring to trial persons accused of heresy and to inflict fit punishment on the guilty. The fourth Council of the Lateran (1215), held in the reign of Innocent III., imposed on the bishops the duty of making a visitation of their dioceses twice or at least once a year either personally or by delegates to see that the Church's laws be enforced. Bishops are authorized to bind the

inhabitants of a district by oath to search out heretics and bring them to trial. By the Council of Toulouse (1229) in the pontificate of Gregory IX. the search for heretics (*inquisitio hæreticæ pravitatis*) was systematized. The bishops are to name for each parish two or three respectable laymen who shall take oath zealously to search out heretics and to deliver them up to the *baillis*. Whosoever knowingly conceals a heretic loses all his goods. If heretics are discovered on the estate of a land-owner, he incurs the penalties: the house of the heretic shall be torn down. Heretics who recant have to seek a new abode, and must wear on their clothing two crosses of different colors until the Pope or his legate permits them to assume the ordinary garb. Whoever abstains from use of the sacraments is held suspect of heresy. A person convicted or suspect of heresy is debarred from the practice of medicine. Lest the ordinary church authorities should be remiss in carrying out this system Gregory IX. named (1232) as "pontifical inquisitors" monks or friars from outside, chiefly Dominicans; shortly after the pontifical inquisitors were chosen from the order of the Dominicans exclusively. Thus the duty of inquisition was taken out of the hands of the bishops and was discharged by officials responsible only to the Pope; from the judgments of the inquisitorial tribunals there was no appeal but only to the Holy See: in 1263 Urban IV. appointed an inquisitor-general for Provence, as a means of lowering the flood of appeals to Rome. The institution passed from southern France into the other provinces of that kingdom and into Italy, Germany and Poland. The Inquisition in England was directed by the metropolitans and their suffragans without being responsible to any inquisitor-general: but as long as Lollardism disturbed the peace of the Church the search for heretics was prosecuted rigorously: bishops and archdeacons were required twice a year to make inquisition of suspects: any man might be compelled under penalties to inform against persons suspected of heresy; the statute *de haeretico comburendo* was enacted by the Parliament in 1396.

In Spain the Inquisition, as set up in 1481 by Ferdinand and Isabella, was as much (or more) a political as an ecclesiastical institution: the officials from highest to lowest were appointed by the sovereigns and its action was directed by them without responsibility to the Holy See: Ranke calls the Spanish Inquisition "a royal tribunal furnished with spiritual weapons"; Llorente admits as much. The number of persons put to death under sentence of the Inquisition in Spain is put by Llorente at 31,000 from first to last, that is during 330 years. But Llorente made it impossible to check his statements by burning the original documents. Ranke impeaches his honesty; Prescott says that his estimates are "most improbable." Catholic historians call attention to the fact that not only heresy, but many other offenses against the laws were judged by the courts of inquisition in Spain, viz: polygamy, seduction, unnatural crimes, smuggling, witchcraft, sorcery, false personation, etc. At the time when the Inquisition flourished, persecution for heresy was a universal practice amongst all Christian peoples, and the methods of punishment inflicted were general throughout Europe. Protestant England persecuted as harshly and vigorously as Catholic Spain, and in both countries denial of the state religion was equivalent to treason.

Insane Asylums, Cottage System, or Village Plan. A form of construction for insane asylums and charitable institutions, much in vogue at the present time, in which large and imposing buildings are replaced by detached cottages. The cottages vary in size from those which will accommodate six to a dozen patients to larger ones which will accommodate 20 or more. They are usually constructed either in groups or along streets and avenues as a village. In the former, the several groups are given up to a particular industry as a farm group, where the patients are employed at farming, and others, as the garden, the brick yard, shop industries, etc., all of these being a part of one institution on a single large estate. In the village plan the institution is laid off in streets and avenues, and has the appearance of an ordinary village, each cottage having a flower garden in front, shade trees, etc. In either plan, there is conveniently located near the centre of the plant an administration building, a hospital for the sick and those requiring special care, a bakery, a laundry, and other utility buildings. The cottages may be constructed of wood or other material, and the cost of construction is small as compared with the old plan of asylum construction. It is, besides, more homelike, more convenient for administration and permits of indefinite expansion. Some of the best known institutions constructed on this plan are Alt-Scherbitz near Leipsic; Gabersee near Munich, Germany; the Saint Lawrence State Hospital at Ogdensburg, N. Y., and the Craig Colony for Epileptics at Sonyea, N. Y.

Insanity, a disease of the brain characterized by disorder or derangement of the mental faculties. This is its strictly pathological or scientific definition. Therefore, according to this definition, any disease of, or accident to, the brain whatsoever, provided such disease or accident caused any derangement of the mental faculties, howsoever trifling or temporary, would furnish an example of insanity. Thus a blow on the head causing unconsciousness, or a fever giving rise to delirium, is an example of an affection of the brain characterized by disorder of the mental faculties. Practically, however, the term insanity is limited to a group of affections of the brain which is more distinctly fixed, and the members of which it will be the object of this brief sketch to define.

Causes.— The causes of insanity are many and various, and the chief of these are the following: Heredity, infection, poisoning, traumatism or injury, overwork or exhaustion, and mental and moral shock or strain. Of importance also are age, sex, race, and nationality.

Of all these causes the most important undoubtedly is heredity. As Krafft-Ebing, the German alienist, has well said, there is no ground, except in tuberculosis, upon which heredity shows itself more distinctly than in the case of mental disease. Statistics have been compiled by various authors to show as nearly as possible the exact prevalence of heredity in insanity, but the results have not been altogether in harmony. In fact, it is extremely difficult to determine this factor in many cases

in which it has been active, and this is so for two reasons: in the first place many patients and their friends conceal or deny a hereditary taint, and in the second place not a few patients and their friends, are really ignorant of their family histories beyond a generation or two. How many persons can tell accurately of what their grandparents died? The more this subject of heredity in insanity is investigated the more reason there is to believe that its importance has been underestimated rather than the reverse. And yet as a factor in causation it is much more common in some forms of insanity than in others — a fact which will be emphasized later in this article. Some authorities have limited heredity to the direct line of descent, ignoring collateral lines; but obviously this restriction cannot be maintained. And yet, if the attempt is made to trace a neurotic taint through collateral lines, the difficulty is greatly increased. the subject is vastly broadened, and, from the medico-legal standpoint, the inquiry becomes greatly involved. In mental heredity, moreover, it is not so much the particular disease that is passed on from parent to offspring, as it is the predisposition; and this predisposition, often called neurotic, is not the result entirely of insanity in the ancestry, but may be shown by a family history of other grave nervous disorders, such as epilepsy, hysteria, neurasthenia, and imbecility. This is a fact not sufficiently apprehended by the laity.

Infections of various kinds may act as causes of insanity. The most important of these is syphilis, and this acts especially to cause that form of insanity known as general paresis. The various infectious diseases, such as typhoid fever, septicæmia, smallpox, cerebro-spinal meningitis and, in minor degree, some others, may cause mental alienation. Post-febrile insanity may follow typhoid fever; and puerperal insanity may be due in part to a septic infection.

Poisons of various kinds may be very active causes of insanity. Chronic lead poisoning may give rise to a well-known form of delirium or mania; so in minor degree may mercury. But the most potent and most common of all poisons in the etiology of mental disease is undoubtedly alcohol. And this poison acts in two ways, for it may not only induce insanity in the individual, but it also is most active in causing that hereditary predisposition to insanity in the offspring to which reference has already been made. In fact, the subject of heredity is not a little involved with the subject of alcoholism in the progenitor.

Traumatism, or injury, may act as an exciting cause of insanity. This is true especially of injuries to the head. Trauma acts most readily in conjunction with other causes, such as alcoholism and syphilis. Injuries to other parts of the body, especially when associated with great shock, as in severe railroad accidents, may lead to various forms of mental alienation.

Overwork and exhaustion from any causes whatever may predispose to, or directly cause, a mental breakdown. This is true especially in cases in which the blood is depleted, the nutrition of the nervous system impaired, and the mind harassed with care and anxiety. These causes are most active in persons otherwise predisposed, as by alcoholism, syphilis or heredity.

Mental and moral shock and strain, such as sudden loss, grief, fright, mortification, intense religious and political excitement (as in the French Revolution), long continued anxiety, and the harassment of uncongenial surroundings, as in the home-life, may all act as causes of insanity.

The above are the chief categories of causes, but they do not exhaust the subject. It is in fact too extended for brief treatment. Finally, it must be borne in mind that in any individual case not one but a combination of several of the above causes has usually been active.

Classification.— Almost every alienist of repute has attempted a classification of the forms of insanity. The subject is one of peculiar difficulty, owing largely to the fact that our intimate knowledge of many of these various forms is far from complete. One of the most satisfactory schemes is the one by Krafft-Ebing, and is as follows, slightly abridged:

"A."

MENTAL DISEASES OF THE DEVELOPED BRAIN.

I. Diseases without Anatomical Lesions, or Functional Diseases.
  (1) Psychoneuroses, or diseases of a brain otherwise sound.
    1st. *Melancholia.*
      a. Simple Melancholia.
      b. Stuporous Melancholia.
    2d. *Mania.*
      a. Maniacal Exaltation.
      b. Frenzy.
    3d. Stupor, or Acute Dementia.
    4th. Hallucinatory Delirium.
    Note.— The above affections are primarily curable, but the worst of them may terminate in chronic incurable forms and in dementia.
  (2) Degenerative Insanities: Affections of a brain endowed with a morbid predisposition.
    1st. Constitutional Affective Insanity.
    2d. Paranoia.
      a. Congenital.
      b. Acquired. This form includes various subgroups according to the character of the delusions entertained by the patient.
    3d. Periodical Insanity.
    4th. Mental Affections arising from the constitutional neuroses.
      a. Neurasthenical.
      b. Epileptic.
      c. Hysterical.
      d. Hypochondriacal.
II. Organic Insanities or Mental Diseases with Recognizable Lesions in the Brain.
    1st. Acute Delirium.
    2d. General Paresis.
    3d. Cerebral Syphilis.
    4th. Senile Dementia.
    Note.— Chronic Alcoholic Insanity and Morphinism may yet have to be added to this group.

"B."

MENTAL AFFECTIONS OF THE UNDEVELOPED BRAIN.
Idiocy and Imbecility.

This scheme by Krafft-Ebing, while not without defects, is excellent for practical purposes and until someone can devise a better. Its great merit is that it is flexible: it readily admits new forms. Its defect is that it draws too sharp a distinction between the so-called functional and the organic insanities; and between the psychoneuroses and the constitutional forms. The truth is, all insanities are organic; and a constitutional taint may be present in the psychoneuroses.

Following this classification we note the following forms of insanity:

A. The whole group of insanities as distinct from idiocy is included under this head, and as a first great subdivision comes:

I. Mental Diseases without recognizable anatomical lesions: Functional Diseases. As

was inferred above, this whole group is only tentative in one sense, because as scientific knowledge advances it is found more and more that insanity in all its forms depends upon anatomical changes. For the present, however, this group may be allowed, with some reservation, to contain the following:

(1) The Psychoneuroses. In these forms the mental disease is such as can happen in a person with an otherwise perfectly normal brain. It is in a sense fortuitous, and not dependent necessarily upon a hereditary taint. Given the same causes, and it may be presumed that any person might develop a psychoneurosis, just as he might develop a fever. By this it is not implied, however, that heredity cannot act to predispose to these forms.

Melancholia is marked by depression. The affective or emotional, rather than the intellectual, faculties are involved. The patient has a sense of personal unworthiness; in other words, the depression centres about the patient's ego. He is not so much concerned about his misfortunes or his troubles, as about his unworthiness. Neither is he concerned about other persons: he is entirely self-centred. This may be said to be the keynote of melancholia. Delusions of a depressive character, as of having committed the unpardonable sin, may be present. The depression may become so profound and overwhelming that the patient passes into a stuporous or atonic state. (*Melancholia Attonita.*) In this state the physical functions, such as appetite, digestion, and nutrition, may be correspondingly depressed. Suicide may result. In some cases the patient is restless under the burden of his mental suffering (*Melancholia Agitata*).

Mania is marked by exaltation. The intellectual faculties are much more involved than in melancholia, and the patient is active, loquacious, sometimes destructive and combative, or else gay. He is somewhat incoherent, and his delusions are not well-defined, but fleeting and changeable in accord with his varying moods and disordered thoughts. The physical functions suffer as a result of exhaustion from over-activity. *Frenzy* is only a higher degree of mania, in which the mental functions are in entire disorder from over-excitation. Exhaustion is rapid.

Stupor, as its name indicates, is a psychosis in which the predominant tone is one of profound subversion of all the mental functions. *Acute Dementia* is another term for it. The patient may recover from a most unpromising state, especially in the case of young persons. *Dementia Præcox* is such a form, although the prognosis is not always good. *Primary* Dementia occurs without preceding acute stages.

Hallucinatory Delirium is a form of acute insanity marked by confusion and by the presence of hallucinations of sight and hearing. *Confusional* insanity is a term sometimes used, especially for the types which occur after acute infection, such as post-febrile insanity, and some forms following child-birth.

All these psychoneuroses may, in unfavorable cases, pass into chronic forms, and terminate in incurable dementia.

(2) The Degenerative Insanities.

In these forms mental deterioration is engrafted on a constitutional defect. Heredity plays a great part. The patients have been born with the neurotic predisposition. Their insanity is simply a logical evolution of a badly organized nervous system.

The great type of this form of insanity is *Paranoia.* The chief characteristic is the formation of systematized delusions. At first these may be of a persecutory tinge: the patient believes that he has enemies, who plot against his welfare or his life. He has hallucinations, especially of hearing. In a second stage, the delusions acquire a more expansive type: the patient believes that he is some great personage. As preliminary to all this, there is often a long career of moral and mental perversion: the patient has been noted as erratic, eccentric, visionary, and even immoral. He usually has displayed but little real brain power or steadiness, but often an intense egotism and a lack of common sense. Innumerable varieties and several stages occur. From this class are recruited in large part the criminal insane. These patients are the monomaniacs of the older writers, and they include also the moral lunatics, pyromaniacs and kleptomaniacs of more recent systematists. Among them are found also the victims of obsessions, morbid impulses and fixed ideas. The paranoiacs are the dangerous lunatics, and the prognosis is not favorable.

Periodical Insanity is a form of constitutional insanity in which, as the name indicates, there is a tendency to recurrence. This recurrence is sometimes in cycles (*Circular* Insanity), in which there is a period of maniacal exaltation, followed by one of melancholic depression, and then a somewhat prolonged period of apparent recovery, to be followed again by the morbid cycle. With every recurring cycle, however, the patient deteriorates somewhat, and may eventually degenerate into chronic insanity.

In the constitutional nervous diseases, such as Epilepsy, Hysteria, Hypochondria, and Neurasthenia, there are often mental changes of a morbid type, and these give rise to the forms of insanity named in accord with these respective neuroses. The symptoms vary widely in the several diseases.

II. In the organic insanities, so-called, the disease is marked by recognizable changes in the brain-structure.

Acute Delirium, or Bell's mania, is an acute infectious disease of the brain, of unknown origin, and of rapid progress, usually terminating fatally. It is marked by confusion and delirium, passing into coma and death. The changes in the brain are of an inflammatory kind.

General Paresis, or Dementia Paralytica, is caused by a progressive infectious or destructive process in the brain substance. Its dependence on syphilis is no doubt close, and it is further induced by alcoholism, dissipation and overwork. It is marked by change of character, erratic conduct and loss of mental and moral control, passing on into a stage of expansive delusions with progressive dementia. There are also characteristic speech defects, changes in the ocular muscles and in the gait, with increasing feebleness and paralysis. Various crises occur, such as maniacal, epileptoid and apoplectic, and in the last stage the patient is paralyzed and demented. Death is the inevitable result in the vast majority of cases.

In *Cerebral Syphilis* there is a characteristic inflammatory process beginning in the coats of the small blood-vessels. Mental symptoms oc-

cur in great variety, also many forms of paralysis.

Senile Dementia is a form of deterioration occurring in old age, and is dependent primarily on changes in the blood-vessels in the brain. Progressive failure of mental powers, with occasional delusions, is the chief feature. In some cases paralytic and epileptic crises occur.

B. Finally we have the great group in which the mental affections are the results of arrest of development of the brain. These are not included in insanity proper by systematic writers, but are regarded as a group apart. This group includes Imbecility and Idiocy, and is defined under the latter head.

No attempt has been made in the above classification to include various debatable forms. Among such forms are *Hebephrenia* (occurring in adolescence) and *Katatonia* (a psychoneurosis with both melancholic and confusional symptoms), and some others about which alienists are not yet agreed. The list must still remain open.

Pathology.— In the group of organic insanities it has been pointed out that these diseases rest upon a recognizable anatomical basis: thus in general paresis the structural changes in the blood-vessels and tissues of the brain are so marked and so well studied that this disease may be said to have as well known a morbid anatomy as pneumonia. But this is true of very few of the insanities, and the above classification is constructed largely on the distinction between forms of insanity with, and those without, well-defined anatomical changes. But while such changes cannot in many cases be detected even with the most powerful microscope, there is practically no doubt in the minds of most alienists that all insanities depend upon a physical or structural basis. In other words, they are but manifestations of morbid changes in the brain-cells. To detect these changes is still one of the great problems of psychiatry. The tendency of modern pathology is to seek for the anatomical changes of insanity mainly in two directions: first, in heredity; and, second, in infection or toxæmia. Heredity makes its impressions so invisibly upon the brain-cell that there may be wise doubts whether we shall ever be able to detect them; but its signs, or stigmata, on the body at large are not so difficult to distinguish. The main difficulty is to interpret them. By these stigmata are meant defects or peculiarities in the grosser parts of the body, as in the bones, especially of the head and face, the ears, eyes, teeth, etc. As to infection, and the marks of it as found in the brain-cells, the evidence accumulates more and more that in many forms of insanity, especially those called functional, the direct agent is often a poison circulating in the blood and interfering with the nutrition and functioning of the brain plasma. Syphilis and chronic alcoholic poisoning leave definite changes in the blood-vessels, tissues, and membranes of the brain.

Treatment.— The treatment of insanity resolves itself into the preventive and the curative. Modern practice is beginning to concern itself more and more with the former, while of course it does not in any way relax its attention to the latter. The prodromal, or initiative, symptoms of many forms of insanity, especially the psychoneuroses, are now so well understood, that it is often an easy matter to recognize the insidious changes that herald a mental breakdown, and to guard the patient from the dangers and misfortunes of a fully developed attack. Of first importance is to remove the patient from the exciting causes. Complete rest and isolation are therefore required and cannot be instituted too early. In order to secure these, hospital treatment is often essential. Very recently it has been proposed to treat these patients in general hospitals, in special wards, and not to hurry them into asylums under legal certification. In other words, they are to be regarded simply as other sick persons, and not to be immured merely as lunatics. The motive is thoroughly humane, and the practice is often successful in promising and selected cases. The indications are for rest, isolation and attention to the nutrition especially. There is no specific for insanity except in cases in which syphilis is active.

In very many cases, however, the nature and course of the disease render it imperative to commit the patient to special hospitals for the insane. This is not only for the good of the patient, but also for the welfare of society. These hospitals or asylums in all civilized countries are now among the very best of public institutions, and the prejudices once existing against them are no longer warranted. The indications for treatment vary according to the nature of the case. The weak and exhausted must be built up; the depressed must be encouraged and diverted; the violent and excited must be restrained; the chronic and demented must be cared for often as though they were children. The practice of to-day is in favor of all humane methods, such as by recreation, useful employment, amusements, and an appeal to the best remaining or active elements of the mental life. Physical restraint is reduced to a minimum, although in the most violent cases it cannot be entirely abolished. Punishment is practically abandoned. It is satisfactory to know that all our best regulated hospitals for the insane are enabled to report annually a good percentage of recoveries, and this is in accord with the teaching and practice of modern science, which regards insanity entirely from its physical aspect as a disease of the brain. With this definition this brief article may end as it began.

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James Hendrie Lloyd,
Formerly Neurologist Philadelphia Hospital.

Inscriptions. The term inscriptions comprises, in its widest sense, all words or word-signs engraved (or painted) on relatively durable materials such as natural cliffs, wrought stone, baked clay, metal, or even wood. For rea-

sons of practical convenience, however, certain sorts of inscriptions are grouped apart; for example, legends on coins and the lettering on painted vases. The etymological sense of inscription (Latin *inscriptio,* "in-scratching") is not to be taken so strictly as to exclude raised lettering. The role of inscriptions in modern times accords in general with the ancient use, but is much less extended. Then, copies of official and religious documents were frequently promulgated in the form of inscriptions, a usage that no longer survives, though commemorative and titular inscriptions are still plentifully employed. In general, inscriptions serve one of two purposes: (1) they constitute a record, and the material containing them is wrought for the express purpose of receiving the inscription (example, known from literature only, Moses' stone tables that held the decalogue); (2) the object on which the inscription is engraved fulfils a purpose of its own, while the lettering indicates the name, nature, purpose, maker, or owner of the material object (commemorative column, mirror, ring, etc.). To these may be added another class, (3) the incidental inscription, a notice or entry upon an object not prepared to receive it.

Inscriptions furnish materials of value to students in many fields. To the historian — and we must understand history to be the life-record of the nation and its citizens — they supply evidence of great value, all the more valuable because nearly always contemporaneous with the facts recorded. The incidental as well as the formal record may bear testimony. An example of this sort has been found on the leg of a colossal statue at Abusimbel in Nubia, whereon Greek mercenaries who had ascended the Nile under the leadership of Psammetichus — more probably the second (594–589 B.C.) than the first (654–617) of that name — traced a brief notice of their expedition. The incidental inscription is particularly apt to furnish details valuable for social history. To the archæologist inscriptions of the second class furnish testimony of value for topography (witness the fragments of the marble *Forma Urbis*, an ancient inscribed plan of the chief buildings of Rome) and for the precise identification of statues and other works of art. The discovery of inscriptions is among the express tasks of the excavating archæologist, who thus supplies the raw material, so to speak, for the historian or philologian. To the philologian inscriptions yield the key to the history of writting and, if his interests lie in the comparative and historical study of words, give him a fuller knowledge of their form. To the philologian of literary interests inscriptions yield a knowledge of historical fact or of vocabulary that may lead to a correct interpretation of a difficult literary passage. For example, the Greek historian, Thucydides, records (6.54) an altar inscription set up by Peisistratus (527–510 B.C.), which, he says, was still "in clear evidence," but "in dim letters." The identical inscription was found in 1877, with lettering perfectly distinct, and the literary interpretation of "dim" had to be revised and brought into accord with the facts. Meantime, the archæologists had learned that red or blue paint was employed to bring out more clearly the lettering of Greek inscriptions, and it was easy to infer that not the incision but the coloring of this inscription was dim in the time of Thucydides. Inscriptions previously known from literary works have for the philologian the added value of yielding testimony concerning the reliability of the manuscript tradition. Thus the best manuscript of Thucydides is of the 10th century A.D. and, as the last in a long chain of copies, must have been exposed to a great deal of corruption in transmission. The fact that a treaty recorded by the historian (5.47) corresponds almost exactly with the (fragmentary) inscription recording the alliance is reassuring for the MS. tradition. The *littérateur,* even, may be concerned with material furnished by inscriptions. One of the most considerable fragments of the poet Simonides, for example, has reached us in a copy on stone of an epitaph (epigram) in honor of the Megarians who fell in the Persian war. Some literatures have survived only as inscriptions.

It is safe to declare that inscriptions are as widely diffused as the art of writing. Even a primitive picture, if painted to convey a message, would constitute an inscription. Hieroglyphics (conventionalized picture writing) constitute the most primitive type of writing, and inscriptions of this sort, in the Maya language, are found in Yucatan. Though probably not earlier than the discovery of America, these represent, as regards writing, the same stage of culture as the hieroglyphics of Egypt (4700 B.C.). Chinese inscriptions — the Chinese being a highly conventionalized hieroglyphic script — of 1,200 B.C. are also extant. The Mayan (and Aztec) system is still very imperfectly understood. Egyptian hieroglyphics were likewise long undeciphered, but in 1822 the Rosetta Stone (q.v.), a trilingual in Greek, demotic Egyptian, and hieroglyphics, whereon the names Ptolemy and Cleopatra were of frequent occurrence, furnished a clue to the hieroglyphics which had been conventionalized, through a syllabary, to a pure phonetic system.— — This means, to invent an instance, that a picture (symbol) representing motion [=(to) go] comes to be used for the syllable *go* in a proper name like Goshen (this step was taken by Aztec hieroglyphics), or in a word like gopher: and that in the last stage the syllable sign *go* reduces to the letter *g*. — — The decipherment and interpretation of Egyptian inscriptions belongs to the science called Egyptology. See EGYPT.

The cuneiform script, invented by the Accadians of Chaldæa, found its way to the Semites of Babylonia and Assyria. This was a syllabary, developed from an earlier pictorial system, and such it remained in those countries, where not only small objects like seals and cylinders, but whole libraries of clay tablets (reaching back into the 4th millennium B.C.), have been found. These tablets contain genuine literary works as well as the documents and announcements commonly included under the term inscriptions. The University of Pennsylvania is in possession of some 35,000 cuneiform documents, a collection particularly rich in fourth and second millennium records, and outnumbered only by the British Museum and the Louvre collections. The Tell-el-Amarna Letters are historically among the most noteworthy cuneiform inscriptions. Found by an Egyptian peasant woman in 1887, the collec-

tion is now split up between the Berlin and British museums, though a part remains in Egypt. These tablets contain a correspondence between three kings of Egypt (15th century B.C.) and the rulers of Babylonia, Assyria, Armenia, the states of Asia Minor, Syria, and Palestine. Of transcendent importance for the early political history of Western Asia, this correspondence is also accounted to confirm the validity of the Hebrew Scriptures as an historical record. It is noteworthy for the history of culture that the petty chief of every town could command the services of a scribe able to write a letter in Assyrian — the common correspondence language, it would seem, of all those countries. The science of Semitic Cuneiform belongs to Assyriology (q.v.).

Fortunately the Assyrian syllabary, after being borrowed by the Medic Aryans, was converted into an alphabetic system. King Darius (521 B.C.) caused an Old Persian (Protomedic) inscription of 413 lines, averaging 6 feet each, with versions in Neo-babylonian and Neo-elamitic, to be inscribed on the Great Rock of Behistun, at a height of 400–500 feet. The same script had been observed on other short inscriptions found at Persepolis, which evidently contained proper names chiefly. As early as 1802 Grotefend allocated the names Darius, Xerxes and Hystaspes to certain script groups in these brief formulæ, and correctly isolated 9 of the 13 symbols concerned. In course of time the entire Protomedic cuneiform alphabet was identified and subsequently the more complex Semitic syllabaries were worked out, resulting in the decipherment of the older cuneiform. In the Behistun inscription Darius, following precedents of Assyrian kings, summed up the history of his accession and reign. Copied in 1844 by Mr. H. C. Rawlinson, it has been carefully inspected again (1903) by the American scholar, Mr. A. V. W. Jackson.

Farther west, the Phœnicians, also Semitic, developed, perhaps from Egyptian hieroglyphics, a true alphabet, out of which sprang, on the one hand, the scripts used by the Hebrews, Arabs, Persians and Hindus, and on the other the Greek (and Roman) type. The most notable early inscription in alphabetic Semitic is the Moabite Stone (q.v.) (9th century B.C.), which recounts the victory of Mesha, king of Moab, over Israel. The language used differs but slightly from that of the Hebrew Scriptures, of the historical validity of which the Moabite Stone, like the Tell-el-Amarna Letters, is held to be in general confirmatory. For facsimile, transcript and translation see Hastings' 'Dictionary of the Bible' iii., p. 405 seq. Phœnician-Greek bilingnals from Cyprus, belonging to the 4th century B.C., are extant; also Phœnician-Cypriote, which furnished the key to the Cypriote syllabary. Punic inscriptions proper are chiefly of the dedicatory sort, and relatively late, all after the Greek period. Aramaic dockets on Assyrian contract tablets (8th century B.C.) form another instance of early alphabetic Semitic.

India also has its inscriptions. The oldest (250 B.C.) and most interesting are the religious edicts of King Piyadassi, known as the Asoka Edicts, which are engraved on rocks and pillars. They inculcate the religion and morals adopted by this king after his conversion to Buddhism. These inscriptions, in two unknown alphabets (Karoṣṭhī and Brahmī), were deciphered chiefly by James Prinsep, who, in the winter of 1837–8, single-handed, unraveled the Brahmī script. He guessed that in certain brief Brahmī inscriptions, plainly of a votive character, a frequently recurring final group of letters must stand for the notion "gift" and be equivalent, if the language was Sanskritic, to *dānam*. He further surmised that the consonant preceding *dānam* must be the genitive (possessive) sign — *s*. He thus isolated the three consonants *s*, *d*, *n* and, with this start, soon identified the entire alphabet.

Greek and Roman inscriptions have been more studied and are accordingly more systematized for study than any others. The ancient Greeks were themselves conscious of the importance of inscriptions. Herodotus used them as sources, and Thucydides and Xenophon quoted them. Decrees are sparingly mentioned by Isocrates, but freely quoted by Demosthenes, who probably made use of the papyrus originals from the department of archives, not all decrees being promulgated on stone. Euripides alludes to the custom of inscribing formal compacts on tripods and dedicating them in temples. Greek antiquaries and scholars even made collections of inscriptions and Polemon (300 B.C.), who was neither the first nor the last of these collectors, owing to his zeal as an inscription hunter, got the nickname of *stèlokopas*, "tablet-picker." Roman writers also — Cicero, Livy, Pliny the Elder, Suetonius — occasionally mentioned inscriptions of historical interest. Varro, the antiquary, and the lexicographer, Verrius Flaccus, commented on the diction of inscriptions; while Polybius, the Greek historian of Rome, actually cited inscriptions, making a fuller use of them than Livy. But no interest in collecting inscriptions, comparable to the Greek interest, ever developed among the Romans. From the Revival of Learning on scholars were not lacking to show an interest in classical inscriptions, but the modern impulse may be said to have had its point of departure in the first quarter of the 19th century when the Prussian Academy, under the promptings of August Boeckh, inaugurated the great collection known as the 'Corpus Inscriptionum Graecarum' (4 vols, 1825–56), which contained nearly 10,000 numbers. But fresh inscriptions are ever coming to light — *dies diem docet* — and in 1891 the number was estimated at 50,000. There has been a steady increase ever since. Excavations are now pursued in Greece and Greekish countries with a diligence and at an outlay never before known. Almost all the great nations have established archæological institutes in Athens, and all of these issue some form of learned journal devoted in part to the publication of the new inscriptions discovered; for example, 'Papers of the American School of Classical Studies at Athens,' 'American Journal of Archæology,' 'Bulletin de Correspondance Hellénique,' 'Ephemeris Archaiologikè,' 'Journal of Hellenio Studies,' 'Mittheilungen des Deutschen Archæologischen Institut,' 'Archæologisch-Epigraphische Mittheilungen aus Oesterreich,' etc. Further great collections like Boeckh's have been issued, for example, the 'Corpus Inscriptionum Atticarum' and the 'Sammlung Dialekt-Inschriften' (in progress). A similar ac-

tivity has been exhibited at Rome also, with the same establishment of archæological institutes. In 1863 the first volume of the 'Corpus Inscriptionum Latinarum,' also supported by the Prussian Academy, was issued. Since then 15 volumes, with numerous supplements, have been published, new inscriptions being first provisionally printed in the 'Ephemeris Epigraphica.' In all, some 150,000 Latin inscriptions are now accessible in print.

Classical inscriptions require two classes of investigator, the field collector and the closet student. A knowledge of Greek and Latin acquired from printed books does not equip the student for field collecting. It is true that the decipherment of the known script of classical inscriptions does not present problems like those solved by the ingenuity of Grotefend and Prinsep but, for all that, training is needed for the accurate reading and copying of the inscription. Absolute accuracy in copying is difficult of attainment, but a "squeeze" made of (unsized) paper, wetted and packed into every crevice, or a copy made by covering the inscription with a sheet of dry paper and rubbing the same with powdered graphite secure excellent results. America has produced one collector of large and successful experience, Mr. J. R. Sitlington Sterrett, whose collections are to be found chiefly in the 'Papers of the American School.' After correct copies have been secured it remains intelligently to divine words and letters lost by mutilation and to expand the abbreviations, but the latter have been so thoroughly listed in works on epigraphy (= the science of inscriptions) as now to present little difficulty. The same works have so classified the script-forms as greatly to simplify the act of reading the inscription, and their topical arrangement of the subject matter of inscriptions is a great aid to interpretation.

Greek official inscriptions were chiefly recorded on marble, Roman on bronze. The latter material, being available for so many uses, proved the less enduring. But marble slabs were also converted into building material or foundation stones of ramparts, and at Rome many an inscribed stone was calcined into lime. So many were the hazards to which inscriptions were exposed that it is exceptional to find an important one in its original location. For purposes of study the modern habit of gathering inscriptions into museums is highly convenient. In Greece, besides public squares and buildings, temples were a favorite repository for inscriptions, such as state treaties, tribute and treasure lists; dress, armor, weapons and other offerings of gratitude — all with dedicatory inscriptions — made the temple a sort of museum; images of afflicted parts of the body that had been cured, with accounts of the case inscribed thereon, were offered to gods of healing, forming a sort of nucleus of an anatomical collection and a medical library. Commonest of all forms was the sepulchral inscription which began with simple announcements but grew into sounding eulogies. Among the Greek inscriptions none has been found so comprehensively important for history as the Great Rock of Behistun, but Mr. C. T. Newton, in his essays 'On Greek Inscriptions' ['Contemporary Review' (December 1876); 'Nineteenth Century' (June and August 1878, reprinted in 'Essays on Art and Archæology,' p. 95, seq.)], has set forth with great charm their collective value for history and the things pertaining to religion. At Rome, Augustus caused a succinct account of his deeds to be engraved in bronze and set up before his mausoleum. This inscription, widely diffused in the Augustus temples throughout the empire, was discovered at Ancyra (now Angora). The Monumentum Ancyranum constitutes an extensive historical document of the very first importance. The Edict of Diocletian (303 A.D.) has quite a modern ring, being a law to control mercantile "combinations in restraint of trade" by fixing a maximum price for provisions and other commodities. The Acta Fratrum Arvalium form an important memorial of a religious guild. A fragmentary black cippus unearthed in the Roman Forum (1899), supposedly near the grave of Romulus, aroused great enthusiasm. Its early date (550 B.C.) has been held to make for the credibility of the traditional account of Roman history as given by Livy rather than to give countenance to the skeptical method current since Niebuhr's time. Unfortunately, save for a few words of great interest for the comparative grammarian, the inscription admits of no more definite elucidation than the conviction that the words probably belonged to a religious prescript. The *graffiti* (wall-scratchings) of Pompeii form a large and interesting class of incidental inscriptions which comprises quotations, paraphrases, catchwords, proverbs; lovers' messages, complaints, tarryings, rendezvous; names and greetings. Among them the painted inscriptions (*dipinti*) contain election notices chiefly. The dialects of Latin are known almost entirely from inscriptions. The chief remains of the Umbrian language (dialect) are the Tabulæ Iguvinæ, seven bronze tablets found at Gubbio in 1444. They contain long ritual prescripts. Some 250 inscriptions, few of great importance save to the grammarian, represent the Oscan dialects. Etruscan inscriptions in considerable number have been found in Italy — one (supposedly) as far to the east as the island of Lemnos — but, pending the discovery of a long bilingual, these, though written in a well-known alphabet, still await definitive interpretation. The same is true of Iberian inscriptions (some 75 in number, several of between 50 and 150 letters). Runic inscriptions, in an alphabet derived from the Greek, have been found in Scandinavia and in England; the oldest (300 A.D.) being engraved on the utensils found at Thorsbjerg, others on stone monuments, rocks, weapons, ornaments and coins; the longest containing 16 words.

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Edwin Whitfield Fay,
Professor of Latin, University of Texas.

Insecticide, any agent which destroys insects. This definition includes natural as well as artificial means of control, the latter being those operated by man. The most important of the former are adverse temperatures, excessive or insufficient moisture, fire, bacteria, fungi, mites, spiders, fish, reptiles, insects, and birds. The artificial controls may be grouped according to their mode of action. Two principal groups are recognized; those intended to reach the alimentary tract through which they act, and those that act through the respiratory apparatus. The former are effective only with such insects as bite off and swallow pieces of plant tissue; the latter more or less also with these, but most frequently used upon insects which suck the plant juices from beneath the punctured epidermis. Caterpillars, beetles and their larvæ, grasshoppers, etc., all chew their food and have been most effectively controlled by Paris green, hellebore, arsenate of lead, etc., applied to the infested foliage either as a spray or as a powder. Plant-lice, plant-bugs, and other sucking insects have been held in check best by kerosene emulsion, whale-oil soap, fir-tree oil, or other substances that choke the breathing-pores in the insects' bodies. Some of these insects are dreaded because of their great prolificacy, their small size and resistance to treatment. Gases are often used under favorable circumstances to reach insects troublesome in stored grain, among clothes, upon plants in greenhouses, and even upon plants in the open air — these last being covered with tents or boxes while being fumigated. Various chewing insects which tunnel through the tissues cannot be controlled by sprays, and are usually beyond the reach of gases. The leaf-miners, which burrow just beneath the epidermis of leaves and green stems, have never been effectively controlled. Some borers (currant-borer) can be kept in check by burning the twigs they infest, (peach-borer) by prodding them in their burrows, (squash-vine-borer), by cutting them out, the method being suggested by the nature of attack. Other chewing insects (plum curculio) are jarred into kerosene. Lastly there are various oils and greases which are used upon animals and man to destroy fleas, lice, etc. Tobacco water and carbolic acid are also similarly employed.

Formulæ and Methods of Application.— Paris green should be mixed with a little water to form a creamy fluid, and then added to water or Bordeaux mixture (see Fungicide) at the rate of one pound to 200 gallons or more. Arsenate of lead may be applied somewhat more liberally. Hellebore may be mixed with water (1 ounce to 3 gallons) and a little glue or flour paste to increase adhesiveness. Each of these may be applied as a powder sifted on the plant, through a salt sack or blown upon them through a powder-gun. A little flour aids the sticking quality. When powders are used, the plants should still be wet with dew or rain. Kerosene emulsion is made by intimately mixing a solution of hard soap (one pound to two gallons of hot water) with four gallons of kerosene, and diluting as needed for use with from 30 to 60 gallons of water. Pure kerosene and crude petroleum can be safely applied only to dormant plants, and then only upon bright breezy days, which will hasten evaporation. Kero-water pumps mix kerosene and water drawn from separate tanks, and apply the mixture direct to plants. They have hardly passed the experimental stage. Whale oil soap is mixed with water (1 pound to 1 or up to 10 gallons), and applied as a wash or spray. Carbon disulphide may be used where there is no danger of its inflammable fumes coming in contact with flame. An ounce is sufficient for from 50 to 75 cubic feet of air-tight space; and the exposure should be for 24 hours or longer. Hydrocyanic acid gas is prepared by adding cyanide of potassium (98–99 per cent pure) to water and sulphuric acid (cyanide, 1 ounce; water 2¼ ounces; acid, 1½ ounces for every 250 cubic feet of greenhouse; 100 cubic feet of nursery stock-room and 125 feet of dwelling house rooms, flour-mills, trees, etc.). Exposures may be from 30 to 60 minutes for trees, the former time being for plants in active growth, the latter for dormant ones; from 12 to 24 hours is usual for rooms, granaries, etc. Since these gases are considered violent poisons the greatest care should be exercised in their application. Oils and greases are merely rubbed on infested animals and man. Boiling water is effective in destroying both lice and eggs in clothing, but the clothing must be boiled for hours to destroy the eggs of the body-louse and the crab-louse. Dust, tobacco-dust, etc., are useful in poultry

yards for the birds to wallow in. Carbolic soap is the favorite remedy for insects on pet animals. But with all stock, poultry, pets and man, cleanliness is the great preventive.

For condensed information concerning insecticides, consult: Circular No. 1, Division of Entomology, U. S. Department of Agriculture, 1891; Marlatt, 'Important Insecticides,' Farmers' Bulletin No. 127, U. S. Department of Agriculture; Hinds, 'Carbon Disulphid as an Insecticide,' Farmers' Bulletin 145 (as above); Johnson, 'Fumigation Methods' (New York, 1902).

M. G. KAINS,
Horticulturist.

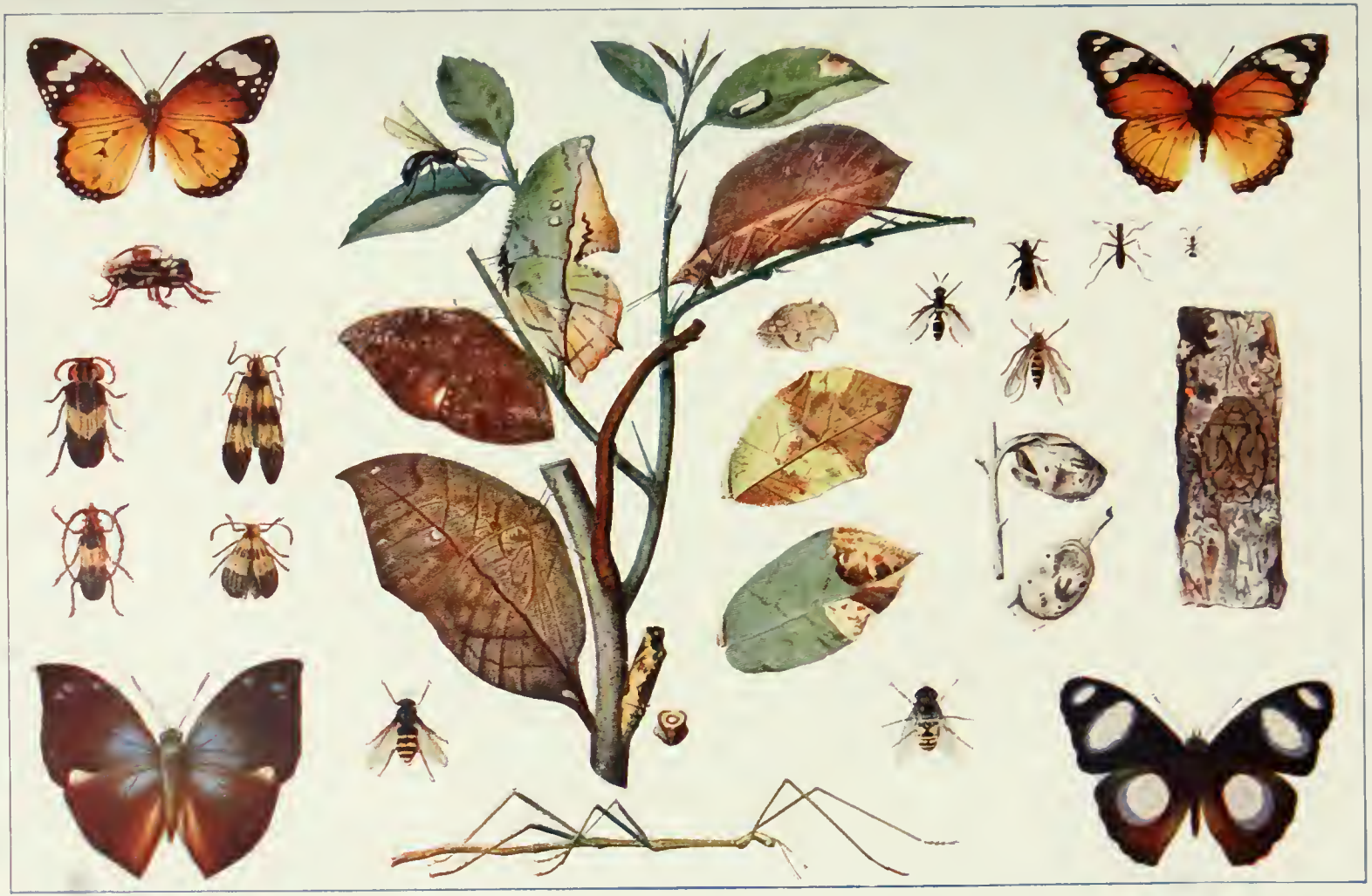
Insectiv'ora, an order of mammals, all of small size, usually five-toed, more or less plantigrade, and as a rule, possessing clavicles. "The snout is generally long, and is often prolonged into a small proboscis. There is a tendency for the teeth to be of a generalized type and their number is often the typical mammalian 44. Moreover, trituberculate teeth, which are certainly of an ancient form, are common." These teeth are adapted to feed on worms and insects alone. Many other evidences go to show that the type is a very old one, and Beddard thinks it may have survived because of the small size, imitative adaptiveness and nocturnal habits. Woodward speaks of the group as probably the little-altered survivors of some of the most primitive placental mammals, agreeing with the *Credonta* in their low type of brain. Most of the families may be traced back to the upper Eocene. The order falls into two divisions, (1) True Insectivores, including the hedgehogs (*Erinaceidæ*), squirrel-shrews (*Tupaiidæ*), tanrecs (*Centetidæ*) otter-shrews (*Potamagalidæ*), hutias (*Solenodontidæ*), golden moles (*Chrysochloridæ*), elephant-shrews (*Macroscelidæ*), aquatic moles (*Talpidæ*), shrews (*Soricidæ*); and (2) Dermaptera, embracing only the colugos (*Galeopithecidæ*). See HEDGEHOG; MOLE.

Insectiv'orous Plants. See CARNIVOROUS PLANTS.

Insects. (Lat. *insectum*), a class of *Arthropoda* characterized by the body being divided into three regions, that is, a head, thorax, and hind-body or abdomen, and by the presence, in all but the more primitive and certain degraded forms, of wings, and of three pairs of thoracic legs. The body of insects consists of 21 segments (somites) of which six are used together to form the head, while there are three thoracic, and from 10 to 12 abdominal segments. To the head are appended five pairs of jointed appendages, that is, the antennæ, mandibles, and two pairs of maxillæ, while in the embryo of certain insects and in the adult *Campodea*, there has been detected a pair of vestigial appendages. Besides these appendages, there are two compound eyes, one on each side, and usually three simple eyes (ocelli) situated in the middle of the head. While the antennæ are undivided the first maxillæ are subdivided into three branches, an inner (lacinia), a middle (galea), and outer (palpifer), bearing the palpus. The second maxillæ are fused together, forming the under lip or labium; each second maxilla is composed of a lacinia, the palpus, while vestiges of the galea occur in certain forms. In bees certain accessory appendages called paraglossæ are present. Besides the maxillæ, the so-called tongue or hypopharynx is present, being highly developed in bees; it lies on the under side of the mouth, just above the labium; in caterpillars it receives the end of the salivary duct, and is called the spinneret. Attention should also be called to the upper lip or labium, on the under side of which is the epipharynx, which bears minute taste-pits. The thorax consists of three segments, which can be easily distinguished in the primitive wingless forms (*Campodea*) and in the cockroach and locust, but in the more specialized forms as beetles, moths, bees and flies, the segments are more or less fused together and, owing to the movements of the wing muscles, are subdivided into many separate pieces. In the wasps and bees the basal abdominal segment becomes toward the pupa state transferred to the thorax. The legs as a rule end in five jointed tarsi, the last joint bearing a pair of claws with a cushion (pulvillus) between them. Insects are enabled to walk on glass, etc., by means of a sticky fluid exuded from the ends of hollow hairs fringing the cushion. They climb by means of their claws.

Insects differ from all other animals except birds and bats in possessing wings, and their presence, especially that of the muscles of flight, have greatly modified the shape and structure of the thorax. The front pair of wings is attached to the middle thoracic segment (mesothorax) and the hind wings to the metathorax. In the two-winged flies (*Diptera*) the second pair of wings are reduced and modified to form the balancers (halteres). The wings are flat sac-like outgrowths of the skin, and are strengthened by the "veins" which form hollow rods. These veins contain a trachea, so that there is a space between the air-tube and the outer wall. When the insect emerges from the nymph or the pupa, the vein is filled with blood. The spaces enclosed by the veins and their cross-branches are called cells, and their shape often affords valuable generic and specific characters. In the more primitive insects there are numerous cross-veins, and such wings as in locusts, etc., are said to be net-veined. In the *Lepidoptera* there are few cross-veins. In the *Diptera* and *Hymenoptera* the number of veins is limited, the cells also being few. The skin of insects is hard, dense and elastic, due to the deposition of chitin.

Internal Anatomy.— One of the distinctive characteristics of insects is their mode of respiration. This is effected by an intricate system of internal air-tubes (tracheæ), which are filled with air by openings (spiracles) in the sides of the body; of these spiracles there are from one to two pairs in the thorax, and eight pairs in the abdomen. The tracheæ are kept permanently open by a series of threads (tænidium) each of which makes from three to five turns around the thin tube; in this way the entire tracheal branch is provided with what at first was supposed to be a continuous spiral thread. The slit-like openings of the spiracles are guarded by a grate of stiff hairs to prevent the ingress of dust, etc. It should be borne in mind that no insect breathes through its mouth, but through the spiracles. Hence the efficacy of all oily or greasy substances in destroying every kind of insect in whatever stage of growth; wherever the oil touches the body a thin film spreads over it, covering the air-openings so that the insect soon dies by asphyxiation. Though



PROTECTIVE MIMICRY AMONG INSECTS

insects have a delicate pulsating tubular heart, they have no arteries and veins, since the air in the tracheæ seeks the blood in the remotest parts of the body. The blood is thin and colorless. The aquatic larvæ and a very few perfect insects breathe by external tracheal gills, the spiracles being in such cases often absent. The genital opening is always situated near the end of the body, in front of the vent on the under side. Besides a complicated digestive canal, insects have urinary tubes opening into the end of the intestine.

The nervous system consists, besides the brain, of a chain of ganglia the greatest number of which is 13, but which become more or less fused in the more specialized groups, especially in the flies. The brain is remarkably complex, in accordance with the varied and complicated movements of the segmented body and jointed appendages, all capable of different kinds of motions.

Sense of Sight.— The compound or facetted eyes (ommatea) are composed of numerous simple eyes called ommatidia, which vary in number from 12, in *Lepisma*, to 20,000 in the dragon-fly (*Æschna*), and even 25,000 in a beetle (*Mordella*). Yet notwithstanding the wonderful complexity of these compound eyes, most insects are near-sighted, and perceive rather the movements of other animals than their exact outlines; the dragonfly and butterfly can see for a considerable distance. The simple eye probably only enables the insect to distinguish daylight from darkness, or at most very near objects. Insects, like bees and butterflies, have the color-sense, and prefer certain colors to others.

Sense of Smell.— Insects are chiefly guided by the sense of smell. This resides in the antennæ, in which there are microscopic pits filled with fluid; to this pit goes a fine nerve whose fibres end in staff-like sense cells. The number of these olfactory organs is in some insects enormous; thus in the European cockchafer there are 39,000 in the leaves of the male antennæ, and about 35,000 in those of the female; in a single antenna of the hornet (*Vespa crabro*) are about 13,000 to 14,000. In the cockroach the abdominal cerci or feelers also possess such pits.

Sense of Hearing.— The auditory organs of the locust are drum-like ears situated one on each side of the base of the abdomen, directly behind the first abdominal spiracle; in the green grasshopper, katydids, etc., a little auditory sac is lodged in the fore-legs (*tibiæ*). It is supposed that most insects are destitute of the sense of hearing, at least auditory structures have not yet been detected; yet all sound-producing insects must have ears to hear.

Sense of Taste.— The taste organs are little pits or papillæ which resemble the olfactory organs, but which occur on the inside of the upper lips, on the epipharynx, or at the base of the proboscis and maxillæ in the bee.

The Egg and Growth of Insects.— The eggs and the fertilizing fluid of the male are produced in glands which open near the end of the body on the under side. The eggs are deposited by the female in the earth or in wood, leaves, etc., by means of the ovipositor, an apparatus composed of three pairs of hard appendages, and which in the wasps and bees form the sting. Most insects die on the approach of cold weather, when they lay their eggs, the species being represented in the winter by the eggs alone. The eggs hatch in spring, the embryo passing through remarkable changes.

Metamorphoses.— Most insects after hatching pass through a remarkable series of changes called a metamorphosis. The small flies, moths or beetles, are not the young of large ones, but adult insects, while the most primitive insects have no marked metamorphosis, the mature locust only differing from the young in having wings; the more specialized forms, as beetles, moths, wasps, bees, and flies, pass through two stages of growth, that is, the larva and pupa, before becoming winged and sexually mature.

Larva.— The name was first given by the ancients to the caterpillar because they thought it masked the form of the perfect insect. Swammerdam supposed that the larva contained within itself "the germ of the future butterfly, enclosed in what will be the case of the pupa, which is itself included in three or more skins, one over the other, that will successively cover the larva." But the discovery by Weismann (q.v.) of the germs of the imago (imaginal disks or buds) in the larva completely changed our notions of the nature of metamorphosis (q.v.), and revolutionized our knowledge of the fundamental processes concerned in the change from larva to pupa or chrysalis, and from pupa to imago. Not only are the larvæ of each order of insects characteristic in form, so that the grub or larva of beetles is readily distinguished from the larvæ of other groups, or the maggots of flies from the footless larva of ants, wasps and bees, but within the limits of the larger orders there is a great diversity of larval forms, showing that they are the result of adaptation to their surroundings and mode of life.

The larvæ of nearly if not all the metabolous animals are probably secondary in their origin. Fritz Müller (q.v.) pointed out that this is the case with the larvæ of the higher insects. The larva of a beetle is popularly called a grub; that of a fly a maggot. The young of the more primitive insects, such as the cockroach, locust, all bugs, etc., which undergo an incomplete metamorphosis, is called a *nymph*. See LARVA.

Pupa.— The word pupa is Latin, meaning baby. Linnæus gave it this name from its resemblance to a baby which has been swathed or bound up, as is still the custom in Southern Europe. The term pupa should be restricted to the resting, inactive stage of the holometabolous insects, that is, those with a complete metamorphosis. The typical pupa is that of a moth or a butterfly, popularly called a chrysalis. A lepidopterous pupa in which the appendages are more or less folded close to the body and soldered to the integument, was called by Linnæus a *pupa obtecta;* and when the limbs are free, as in Neuroptera, Mecoptera, Trichoptera, and the lepidopterous genus Micropteryx, it is called a *pupa libera.* When the pupa is enclosed in the old larval skin, which forms a pupal covering (puparium), the pupa was said by Linnæus to be *coarctate.* The pupa of certain Diptera, as that of the orthoraphous families, is nearly as much obtected as that of the tineoid families of moths, especially as regards the appendages of the head, the legs being more as in pupæ liberæ. The pupæ of Coleoptera and of Hymenoptera, though there is, apparently, no near relationship between these two orders, are much alike in shape, and,

as Chapman pertinently suggests, those of both orders are helpless from their quiescence, and hence have resorted for protection to some cocoon or shell. But it is quite otherwise with the pupæ of Lepidoptera and Diptera, which vary so much in adaptation to their surroundings, and hence afford important taxonomical and phylogenetic characters. This, as regards the Lepidoptera, was almost wholly overlooked until Chapman called attention to the subject, and showed that the pupæ had characters of their own, of the greatest service in working out the classification, and hence the phylogeny of the different lepidopterous groups. The pupæ of the Neuroptera, Coleoptera and Hymenoptera differ structurally from the imago, in the parts of the head and thorax being less differentiated. Thus in the head the limits or sutures between the epicranium and clypeus, and the occiput and gula, are obscurely marked, while the tergal and pleural sclerites of the imago are not well differentiated until the changes occurring just before the final ecdysis. It is easy, however, to homologize the appendages of the pupæ with those of the imago of all the holometabolous orders except in the case of the obtected pupa of the Lepidoptera (and probably of the obtected dipterous pupæ), where the cephalic appendages are soldered together.

Classification of Insects.— The number of known species of insects is from 200,000 to 300,000, but it is estimated that there are upward of a million species now living. In fact, the class of insects vastly outnumbers all other groups of animals. This is probably due to their being winged, and to their great fecundity. At present the class of insects is divided into two subclasses, that is, the (1) *Synaptera,* represented by the wingless orders Thysanura and Collembola; and (2) *Pterygota,* comprising 15 winged orders and which may be thus tabulated:

Series 1.— *Heterometabola,* with an incomplete or variable, though slight, degree of metamorphosis. No distinct larva or pupa state, the young being nymphs.
- Order 1. Dermaptera. (Earwig.)
- " 2. Orthoptera. (Cockroach, locust, grasshopper, stick insect.)
- " 3. Platyptera. (Bird lice, Perla, white ant.)
- " 4. Odonata. (Dragonfly.)
- " 5. Plectoptera. (Mayfly.)
- " 6. Thysanoptera, Thrips.
- " 7. Hemiptera. (Bugs.)

Series 2.— *Holometabola,* or with a complete metamorphosis.
- Order 8. Neuroptera. (Corydalus, lace-wing fly, ant-lion.
- " 9. Mecoptera. (Panorpa, Boreus.)
- " 10. Trichoptera. (Caddis flies.)
- " 11. Coleoptera. (Beetles.)
- " 12. Lepidoptera. (Moths and butterflies.)
- " 13. Siphonaptera. (Flea.)
- " 14. Diptera. (Mosquito, fly.)
- " 15. Hymenoptera. (Saw-fly, ant, wasp, bee.)

Fossil Insects.— About 3,000 species of fossil insects have been described, of these from 200 to 300 are Palæozoic, 500 Mesozoic, and the remainder are Tertiary. The oldest fossil insect-remains is the wing of a supposed bug (*Protocimex*) from the Ordovician of Sweden. The wing of a cockroach (*Palæoblattina*) has been detected in the middle Silurian of Calvados, France. From the Devonian shales of St. John, N. B., nine species of primitive net-veined insects have been collected. The coal measures are characterized by cockroaches, primitive dragonflies, May-flies, and grasshopper-like forms, phasmids, etc., also occurring. All of the Palæozoic insects known are very primitive. Modern forms, those having a complete metamorphosis, begin to appear in the Triassic and Jurassic, where remains of beetles, a saw-fly, and a moth occur. Ants, bees and butterflies date from the Oligocene and Miocene Tertiary.

Bibliography.— The latest general works on insects are Carpenter's 'Insects, their Structure and Life' (London, 1899), and Sharp's 'Insects' (Vols. V. and VI. of Cambridge Natural History, 1895–9); both contain sufficient references to other works. For American insects consult: Packard's 'Text-book of Entomology' (1898), and 'Guide to the Study of Insects' (1889); Comstock's 'Manual for the Study of Insects' (1895); 'Insects and Crustacea' (Vol. II., Standard Natural History, 1884); Howard's 'The Insect Book' (1901). The last named contains a copious bibliography, especially to the voluminous publications of the Entomological Division of the U. S. Department of Agriculture.

See FRESH-WATER INSECTS; MARINE INSECTS, and the names of groups and species, as FLIES, HYMENOPTERA, MOTHS, etc.

ALPHEUS S. PACKARD,
Late Professor of Zoology, Brown University.

Insects and Flowers. See FLOWERS AND INSECTS.

Insects, Fungi Affecting. See FUNGI.

Insects, Injurious and Beneficial. See ENTOMOLOGY, ECONOMIC.

Insects, Propagation of Disease by. See FILIARISIS; FLIES; MOSQUITOES; MYIASIS, ETC.

Insessores, ĭn-sĕ-sō′rēz, a discarded term in Ornithology designating a group styled "perchers," which included the majority of the smaller and more familiar birds. The term has been abandoned because the group denoted by it is a purely arbitrary one.

Insid'ious Flower-bug. See FLOWER-BUG.

Insolvency. In a popular sense the word insolvency applies only to persons without property or means sufficient to satisfy their creditors. The legal definition embraces all who are unable to pay their debts at maturity in the ordinary course of business, even though they may possess assets exceeding their liabilities. A failure to meet overdue obligations renders a person liable to proceedings against him in a court of insolvency, in which his assets may be taken into the possession of the officers, marshaled, and distributed to his creditors. Should there be an amount in excess of what is required to pay the creditors and the expenses of administration, the balance so remaining is the property of the debtor. From a very early period in the history of civil government, laws have existed providing for proceedings by creditors against insolvent debtors, by which the debtor's property could be taken from his possession, to be held by another as a trust fund to be applied to the payment of his just debts. In case of an insufficient amount to pay all debts in full, provisions are usually made for a *pro rata* distribution. These laws have generally provided for classes of preferred debts, payments of which were to be made in full, even though such payments exhausted the entire assets. Preferred claims commonly included all claims of the government or state, and often claims for labor to a limited

amount, and claims for the necessaries of life. Provisions are usually made for the exemption of certain articles to the use of the debtor, not to be included in the assets. The Constitution of the United States provides that Congress may establish uniform laws on the subject of bankruptcy throughout all the States, and the first act upon that subject was passed in 1800, since which time there has been some Federal bankruptcy law, with brief interregnums. A uniform national law upon the subject now exists. The first act of Congress upon this subject provided for proceedings by the creditors only, but in 1841 an amendment provided for voluntary proceedings by the debtor, by which he could surrender his property and obtain a discharge from all of his debts, provided he had been guilty of no fraud. In the absence of a national law on the subject of insolvency, the States all have authority to enact and enforce laws upon that subject. The Federal act now provides for voluntary proceedings by the debtor, as well as proceedings against him by the creditors, with provisions for his discharge. The various State acts have usually contained such provisions. The Federal act suspends all State insolvency laws during its continuance. See BANKRUPTCY LAWS.

Inspiration, in theology, the communication by the Holy Spirit, to writers and speakers, of a portion of the knowledge and feeling of God, in such fashion that they can be communicated to other men; especially used in relation to the Bible. On the fact of inspiration rests all attribution of divinity to the sacred writings above any others; but theories of its method and extent have necessarily changed with the advance of critical knowledge. They have never had an authoritative pronouncement even from the Church of Rome, which allows liberty of judgment on this; the Bible not holding the supreme place there as in Protestant bodies, and the latter being too divided for a credal statement on this point, by the very causes which call for one. All theories rest not only on the necessary implication of divine character in the Bible, but on two specific passages: 2 Tim. iii. 16: "All Scripture is given by the inspiration of God, and is profitable for doctrine" (Revised Version, "Every Scripture inspired of God is also profitable for teaching," which does not relinquish the claim of inspiration); and 2 Pet. i. 21, "Holy men of God spake as they were moved by the Holy Ghost" (Revised essentially the same). The Scriptures were the Old Testament.

The early Church did not generally dwell on theories of inspiration, regarding it as a passive "ecstasy" in which divine truth was communicated, but rarely going on to its effects on the inspired writings or the methods which produced them. Origen, however, the great builder of doctrinal framework, formulated an exact theory of "plenary" or entire inspiration, which preserved the writers from all faults of memory, and left no iota either incorrect or superfluous in Scripture. But others held that all believers were inspired in different degrees; as this made all believers infallible interpreters of the Scriptures, the perilous nature of such a doctrine led to the opposite one, that there was an inspired official depositary of interpretation as well as an inspired canon of writings. The mediæval schoolmen evolved the theory that there were two kinds of inspiration in the Scriptures: direct, found where moral and doctrinal truths are directly taught; and indirect, in historical passages, whence ethical truths can only be derived by allegorical interpretation.

Regarding inspiration not as a purpose but a method, there are three explanations within the limits of orthodox Christianity: the "plenary" or verbal, the dynamic, and what may be termed the "irradiant" theories. The remaining one, which makes the inspiration only that common to all human beings — who are part of the divine mind — and having no part in any special revelation, is really not a theory of inspiration at all, as it holds that there is none; that all things are parts of the world's evolution, and the sacred writers and the Bible were evolved like the rest, though the latter is the greatest moral product of the world, and to be reverenced in the moral rank as we reverence the greatest writers and thinkers in theirs.

In the early uncritical ages of the Protestant churches, the universal and obvious theory of inspiration was the plenary. The original text of the Bible was dictated word for word by the Holy Spirit, the writers being merely penmen, or media on whom were impressed certain phrases, which must not be varied on peril of distorting the divine revelation. The words of Scripture thus transmitted are God's words, to each reader as if spoken directly to him by the Deity, and no matter to what subject they relate, be it doctrine or history, the origin of man or the duty of man. That there are different styles, corresponding to different writers, means only that God has accommodated his expressions to their natures, for his own utilities. Hence the least particle in the Scriptures is surcharged with meaning, and if anything seems in conflict with science, history, or other portions of the Bible, it arises from corruption of text, bad translation, or other change from the actual revealed language. This is the only theory with perfect logical continuity; unhappily it can only be maintained, in face of the increasing body of knowledge of texts, facts, and natural ethics, by those willing to abnegate their own right of criticism wholly in favor of their own infallible interpretation. Indeed, the chief argument for the latter is that the divine purpose would be defeated, if its intention in giving the revelation were made null by the misunderstanding of fallible human faculties.

The dynamic theory is the first step outside this bulwark enforced by the impossibility of maintaining verbal inspiration, and relegates the divine agency to an indirect function. In place of its dictating the exact phraseology and the precise facts, the writers are so filled with divine force that for all purposes of conveying the essential divine purpose, that of showing the truths of sin and danger and the path of salvation, they are a portion of the divine and incapable of error. Under this theory the writers are left a free hand, according to their own limitations and those of their age, in dealing with narrative facts or their own guesses at them; but are guided explicitly in all matters of faith and morals. In order to be received, the revelation had to be accommodated to the mental conditions of different ages; and men of each received guidance from God to present it so that it was true in relation to them, and remained so for all ages under all conditions. The war-

rant of the Bible is its incomparable and superhuman system of ethics, and its proof of divine origin is that evident superiority to all human devices.

The "irradiant" theory is a recent one, and a step farther from the old claim of entire divinity. In this view the record as such has no divinity, nor infallibility of any kind. There is a divine revelation, but it acts by generating moral ideas in certain great selected men, and which, once generated, are left to fight their way and take their chance like the other useful ideas of the world, and undergo disbelief and mutilation, with the certainty that according to God's purpose, truth will prevail at last. The proof of divinity in Christianity lies in the fact that its moral truths are the greatest in the world, and were original with it.

Instinct. Instinctive acts are those physiological activities in which mind or consciousness is involved. Instincts may be regarded as intermediate between simple physiological or reflex actions and acts of reason exhibited by man. Animals of a grade higher than sponges, polyps, most mollusks and other forms of a corresponding grade, have organs of sense, of perception, and in the higher vertebrates a brain and nervous system and other organs of the same type as those of man, and such animals react to something more than mere physical stimuli. We know by observation that the social insects, birds and mammals, at least those which have become domesticated, have sufficient intelligence to meet the ordinary exigencies of life, and that at times the ant, bee, beaver, elephant, dog, and ape can meet extraordinary emergencies, that is, rise with the occasion; that they may to a very limited extent be free agents; that they are not mere automata. It has been observed that the more intelligent animals are not solely guided by the physical stimuli of light, odors, etc., but that they exercise the power of choice, selecting this or that kind of food, this or that mate. Animals are subject to what we call the passions: they show anger, even when not hungry or under the domination of the reproductive instincts; their sounds express dissatisfaction or contentment. They possess memory; with its aid ants and bees find their way back to their nests.

Definitions of Instinct.— Descartes believed that animals are automata. It is popularly supposed that animals are automata, physiological machines in which have been implanted by supernatural power what we call instincts. This view is still insisted on by two excellent observers of the habits of insects, Favre and Wasmann, who claim that instincts are special innate or natural propensities, "transcending the general intelligence or experience of the creature." But of late years the impression has arisen and gained force that instincts are "innate" and "natural" because they have arisen by a natural process and have been gradually acquired and transmitted from one generation to another.

Erasmus Darwin held that instincts were the result of imitation by young animals of the actions of their parents. This view is still held by Wallace, and, as Eimer claims, the power of rapid learning has played a part in the evolution of certain instincts. Thus the fox or rat learns from its parents, and becomes more cunning or sagacious with age and training. Lamarck practically regarded the lowest animals as automata, but in the higher animals, that is, those with a nervous system, we have instinct. "Hence, instinct in animals is an inclination which necessitates that from sensations provoked while giving rise to wants the animal is impelled to act without the participation of any thought or any act of the will." To satisfy these wants they contract different kinds of habits; these are transformed, he says, into so many propensities, from which "originate their habitual actions, and special propensities to which are given the name of instinct." He then adds that the same habits and the same instinct are perpetuated from generation to generation, "without offering any notable variation, so long as it does not suffer change in the circumstances essential to the mode of life." He thus intimates that instinct may vary, and he states that in birds and mammals instinct is variable.

Darwin does not give a formal definition of instinct, but after stating that several distinct mental actions are commonly embraced by this term, he adds that "a little dose, as Pierre Huber expresses it, of judgment or reason often comes into play, even in animals low in the scale of nature." He calls attention to the points of resemblance between instincts and habits, showing that habitual action may become inherited, whence it results that "the resemblance between what originally was a habit and an instinct becomes so close as not to be distinguished." He concludes that, by natural selection, slight modifications of instinct which are in any way useful accumulate, and thus animals have slowly and gradually acquired through successive generations, their power of acting instinctively, and that they were not suddenly or specially endowed with instincts. Herbert Spencer defines it as compound reflex action, and also as "a kind of organized memory," arguing that instinctive actions grow out of reflex, and in time pass into intelligent acts. Romanes defines instinct as "reflex action into which there is imported the element of consciousness." Lloyd Morgan also says: "It is a bit of animal automatism not necessarily involving more than the lower brain centres," but it is a bit of automatism accompanied by a consciousness in a broad sense. "The role of consciousness in a chick's pecking is to select the adequate responses, and to steady the muscular mechanism to its work." As the result of recent experiments Loeb regards instincts as inherited reflexes so purposeful and so complicated in character that nothing short of intelligence and experience could have produced them. Packard gives the following definition: "The sum of inherited reflex acts, becoming habitual and arising from blended reflex and subconscious though involuntary acts, performed at birth or through life blindly, without practice or previous experience, effort, training or thought."

Examples.— It should be understood at the outset that instincts in animals are fundamentally connected with the means of obtaining food, or with reproduction, the latter involving care for the young, as in egg-laying, the selection of a nesting place by insects and birds, the construction of the nest, and the defense of the young, and in the birds and mammals the training of the young to fly, or to hunt for prey.

Reflex acts are simply physiological responses

to external physical stimuli, as muscular irritability, the different tropisms, such as response to odors, and other chemical properties, to cold, heat, etc. Many of the movements of the lowest animals, as the protozoa, sponges, polyps, worms, etc., their modes of selecting and getting food, of escaping their enemies, are scarcely more than reflex. As examples of instinctive acts are those of very young chicks. Morgan regards as instinctive in these birds the act of "pecking, walking, scratching themselves, preening their down and feathers, stretching up and flapping their wings, squatting down and dusting themselves, scattering and crouching when alarmed, uttering the danger-warning *churr,* and other sounds." Young ducks afford examples in the way they "seize and mumble their food in the bill, their aptness in swimming directly on leaving their shell, piping, and smoothing the down of their breast with their bill."

It is when we observe the complicated nesting habits of the spiders, and of the social insects such as ants, wasps, bees, as well as those of birds and the muskrat and beaver, when such striking and inexplicable forms of intelligence arise that we become perplexed how to explain them. Thus take the mode in which the honey-bee builds its cells. Is it simply mechanical, the result of several bees working together, and due to the mechanical pressure of the insects against each other during the formation of the cell? While some contend that if left alone to build a single cell, this would probably be round, others show that a solitary wasp will build its cells in very regular hexagons. It is now conceded by Darwin, Romanes, and others, that the process is not a purely mechanical one, but is "constantly under the control of intelligent purpose." It is most probable that the hexagonal-cell building instinct is the result of habits which gradually arose, and which became fixed by heredity. In birds the modifications sometimes occurring in the shape and situation of their nests show that their instincts are, owing to change of conditions, plastic, reason teaching them to modify their nests so as to adapt them to new conditions. Experience and intelligence lead to such changes. The beaver manifests in his works intelligence and reasoning capacity, both in the construction of dams, canals, and in the mode of felling trees, and in the use in certain localities of "slides." In the monkeys and apes we apparently have the nearest approach to human intelligence, judging by the instances narrated by Romanes. Were it possible to breed apes for many successive generations more light would be thrown on their psychology. Meanwhile many acts performed by the domestic animals, the horse, dog, cat, elephant and even the pig, and their susceptibility to be trained, show that they may often act intelligently, and are prompted by a low degree of reason.

Instincts Variable and Sometimes at Fault.— Lemmings in their migrations, impelled by their instincts to go ahead, will swim out into the sea and be drowned. Ants will store up beads instead of seeds, and there are many instances where instinct is at fault. Certain instincts may also by change of the environment become directed into new channels. This is illustrated by numerous cases of insects, reptiles, and mammals which have become adapted to an aquatic life. An entire new crop of habits and instincts may thus arise. The instincts of young animals, particularly of larval forms, caterpillars, grubs and maggots, are of a different description from those of the pupa state, and more especially of the adult state. In fact, instincts are pliable, variable, and in certain cases may lapse altogether, to be replaced by a new set. Were this not the case we should have no progress in the evolution of life. The more generalized animals have vastly less intelligence than the highly specialized forms. Compare the instincts of so complex a being as the ant, or wasp, or bee, with that of the locust or bug, or the instinctive and intellectual acts of social insects, with their wonderful differentiation of the individual into workers of different castes and the normal and supplemental males and females. Such are what are called complex instincts, and they are all brought into action through the principle of the division of labor.

Do Animals Reason?— Lloyd Morgan observed that the chick rapidly profits by experience after a few practical trials; hence he concludes that intelligence is founded on experience. He allows that chicks have intelligence, this involving the association of impressions and ideas, and the power of making a choice. He then asks the question, "Do animals reason"? "Do they focus the therefore"? "Do they think the why"? Probably not. Reason is not (as animals "reason") adaptation; they do not profit by experience of actions to varying circumstances. Hence, he thinks that animals probably do not reason as man is capable of reasoning. Here might be quoted Herbert Spencer's definition: "Reason or intelligence is the faculty which is concerned in the intentional adaptation of means to an end." Finally, it is safe to assume that the higher animals, especially the domestic animals, which have been in contact with and more or less trained by man, exhibit the germs of reason, and while they cannot make inductions and deductions or predictions, their intellectual acts differ rather in degree than in kind from those of the lowest human races.

Consult: Romanes, 'Animal Intelligence' (1883); 'Mental Evolution in Animals' (1884); Morgan, 'Animal Life and Intelligence' (1890–1); 'Animal Behavior' (1900); Loeb, 'Comparative Physiology of the Brain' (1902).

Alpheus S. Packard,
Late Professor of Zoology, Brown University.

In'stitute of France, a learned body organized after the first outbreak of the French Revolution, during which all the academies of learning and arts in France had been suppressed. It was formed by the decree of 25 Oct. 1795, to replace the Académie Française, the Académie des Sciences, and the Académie des Inscriptions et Belles-Lettres. Its object was the advancement of the arts and sciences by continual researches, by the publication of new discoveries, and by a correspondence with the most distinguished scholars of all countries, and especially by promoting such scientific and literary undertakings as would tend to the national welfare and glory. The Institute was composed of a number of members residing at Paris, and an equal number of associates in the different parts of the Republic. Each class could also choose eight learned foreigners as associates. It was at first divided into three classes, each of which was subdivided into several sections. The first class embraced the physical and mathematical sciences,

the second the moral and historical, and the third literature and the fine arts. The number of active members, exclusive of the associates, was limited to 144. The Institute received, however, its final organization by a decree of 23 Jan. 1803. It was then divided into four classes: (1) the class of the physical and mathematical sciences, consisting of 65 members; (2) the class of the French language and literature, consisting of 40 members; (3) the class of history and ancient literature, of 40 members; (4) the class of the fine arts, with 28 members. A royal ordinance of 21 March 1816, restored the former names of the classes, so that the name of Institute was applied only to the whole body collectively. The same ordinance assigned the first rank to the Académie Française, as being the oldest; the next rank to the Académie des Inscriptions et Belles-Lettres; the third to the Académie des Sciences; and the last to the Académie des Beaux-Arts. These united academies were under the personal direction of the king, and each had an independent organization. To each academy were attached 10 honorary members, who had merely the right of being present at the meetings. In 1832 the old class of Sciences Morales et Politiques was reconstituted as a separate academy, so that there are now five academies.

The Académie Française had for its chief object the cultivation of the French language, and was charged with the composition of a French dictionary, the merits of which have been often disputed and its plan condemned. The disposal of its vacant chairs has not always been regulated by the best taste and judgment, Descartes, Pascal, Molière, La Bruyère, J. J. Rousseau, Balzac, Dumas père, Daudet, and Zola having been rejected, while in former times many a shallow court favorite was accepted.

The Académie des Inscriptions et Belles-Lettres has 40 members, 10 free academicians, and 8 foreign associates. It has 40 correspondents at home and abroad, and devotes itself chiefly to subjects of a historical nature. The most distinguished scholars, both in and out of Europe, are, or have been, connected with it. Committees of this academy superintend the erection of public monuments and the preservation of those already in existence. Works brought out under its auspices are: 'Histoire littéraire de France,' 'Recueil des Historiens de France,' and 'Corpus Inscriptionum Semiticarum.'

The Académie des Sciences has for its province the various branches of knowledge connected with the physical and mathematical sciences, natural history, medicine, etc., there being in all 11 sections. It has 66 members, 10 free academicians, and 100 correspondents. The number of foreign associates is limited to eight.

The Académie des Beaux-Arts has 40 members, 10 free academicians, 10 foreign associates, and 61 correspondents. A committee of this academy was charged with the publication of a dictionary of the fine arts.

The Académie des Sciences Morales et Politiques, has 40 members, 10 free academicians, 6 foreign associates, and 48 correspondents.

Members of the Institute of France are elected for life by ballot, and have an annual salary of 1,500 francs.

Institute of Social Service, American. See SOCIAL SERVICE.

Institutional Church, a non-credal organization of Christians, to supplement the regular church methods and ministrations — preaching, prayer-meetings, Sunday school, and pastoral visitations — by helpful social work in the community. The moving spirit is the same as in the Y. M. C. A., University Settlement, Salvation Army, Rescue Missions, Christian Endeavor societies, etc.; but «with the emphasis on Church, not Institution.» The prime object is to reannex to the church the functions which other bodies have been compelled to fill by its neglect of its duty; and strengthen it by gathering potential Christian elements which under the old system do not come to it, as well as by combining in itself all the claims to public gratitude and interest now shared between the purely ecclesiastical and the purely social institutions, or the half-way houses like the Y. M. C. A. It differs from the latter in not merely furnishing a religious atmosphere which may lead to church membership, but enrolling members at once in a real church of Christian work by absorbing the secular features of the other; in a word, to do, without vows or uniforms, what the Catholic Church has always done with its charitable functions — make them an integral portion of the church organization. Hence, it is not by itself a church in the sense of the Roman Catholic or the Methodist Church, but in a broad sense a description of any church which adds educational or social work; in general use, a title of any which throws into this work its predominant vitality. Free pews are an essential accompaniment, as the social aristocracy fostered by rented pews contradicts the basal democratic principle of institutional work; hence it is sometimes called Free Church, but preferably Open Church. The present name originated with President Tucker of Dartmouth College, who applied it to Berkeley Temple, Boston.

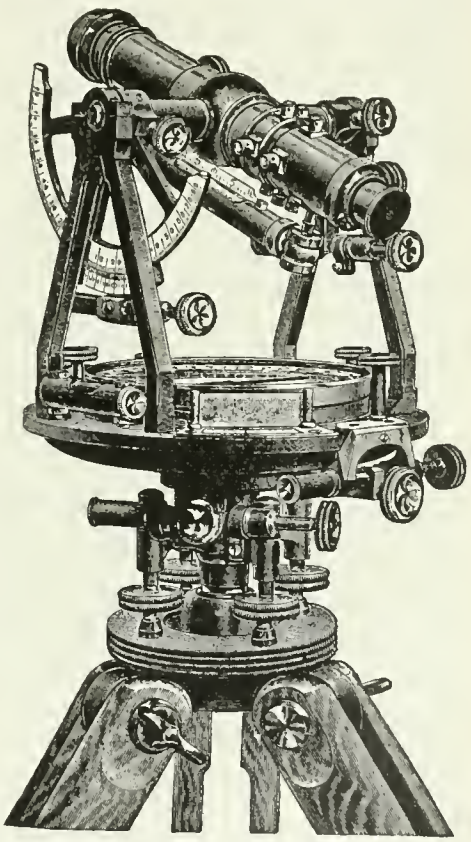
The movement started chiefly with the High Church element in England, modeled on the Catholic idea; it flourished for two generations in that country before reaching the United States, about 1880, and it has hardly been a vigorously spreading one here for above 15 years. Now, however, a large number of churches — Episcopal, Congregational, and Baptist in the forefront, but also Methodist, Presbyterian, Unitarian—have adopted the idea with increasing vigor, besides the work of this class always performed by the brotherhoods and sisterhoods of the Roman Catholic Church. One of the earliest of these was Plymouth Church of Indianapolis, inspired by the memory of Mr. Beecher. Notable among others are the St. Bartholomew, St. George, St. Paul, and Judson Memorial of New York, and the Tabernacle of Jersey City; Berkeley Temple, Parker Memorial, and Ruggles Street Baptist of Boston; Grace and Bethany of Philadelphia; Ninth Street of Cincinnati, Pilgrim of Cleveland; Plymouth Tabernacle of Detroit; People's of St. Paul; and the Denver Tabernacle. In 1894 the Open and Institutional Church League was organized in New York; it held several conventions in Eastern cities (1895–1901), and for three years published the 'Open Church' as its organ, but has practically lapsed, being merged in the 'National Federation of Churches and Christian Workers.' The total of its work, however, is not shown by its nominal member-

ship; the same spirit has infected outside churches, and their methods are being more and more adopted as a general basis of work.

The platform of the League stated that it aimed to save all men by "abolishing, so far as possible, the distinction between the religious and the secular"; by "open church doors for every day and all the day, free seats, a plurality of Christian workers, the personal activity of all church members, a ministry to all the community through educational, reformatory, and philanthropic channels, to the end that men may be won to Christ and his service, that the Church may be brought back to the simplicity and comprehensiveness of its primitive life." It is not correct to say, as is often done, that its methods are purely secular: its *additional* methods beyond the regular religious ones are so, for the very reason it exists. These involve a thorough organization for social and philanthropic work; but the religious features are sedulously conserved and carefully fitted to the work, the spirit of worship being cherished and made the centre of inspiration. The service generally ends in the communion; there is congregational singing of both hymns and chants, led by a highly trained choir, and often responsive readings; the whole with the sermon are intended to be brief, varied, and attractive. Sunday schools are carefully attended to; prayer meetings given new features; in summer there are open-air meetings; and other Christian associations, endeavor societies, brotherhoods, etc., are encouraged. The officers and workers of the church are given active special duties, such as pastoral visiting, reception and welcome of strangers, canvassing for the various activities of the church; and there are not only sub-pastors, but deaconesses, sisters, and nurses. The purely secular side embraces all departments of culture, physical, intellectual, and moral, as well as direct charities. Morally, the church work above should be sufficient. The charitable departments include not only direct aid to the poor, but wood-yards, employment bureaus, etc.; personal endeavor to provide employment for those willing to work; dispensaries, hospitals, and crèches; and encouragement to thrift by savings funds. Special buildings are often erected.

That the movement is liable to perversions is admitted; such is the case with every institution. Secularization is one; but unless it can be faced, the churches cannot influence or draw in those outside them, for the simple reason that the latter cannot be brought within hearing. Sensationalism, to draw in hearers to be benefited, is a graver one, and ill-judged; as one of its chief workers puts it, "a camp-stool congregation neither pays nor repents," and a lasting work must be content with slower processes.

Instruments, Engineering. To attempt a definition of an engineering instrument is hardly practicable, as the wide range of departments into which the profession is now divided demands so many special appliances for their requirements that no one description is possible, and an extended catalogue is inadmissible within the limits of this article. The earliest known engineering instrument was the Diopter of Hero of Alexandria, 130 B.C., although rude appliances must have been used long before that time by the ancient engineers in the construction of the public works of Chaldæa and Egypt, the ruins of which even now awaken our admiration and wonder. It was not, however, until the beginning of the 19th century that the great impulse to the construction and use of engineers' instruments was given by the advance of civilization and commerce incident to the application of steam as a motive power on sea and land. Since that time great advances have been made not only in the design and accuracy of engineering instruments but also in the invention of new instruments for the many purposes required by engineers in the construction of railroads, canals, bridges, harbors, etc.



The characteristics of engineers' instruments differ in the various nations as the requirements of engineering practice, and thus American engineers' instruments possess a distinct character of their own as compared with other nations, having as a rule few parts and lightness of construction combined with great strength and an adaptability of parts for the special service required. It is not the purpose of this article to attempt a description of the various instruments used by engineers — this may be found in the article SURVEYING, — but to give the reader a general idea of their construction. The metals used in the construction of engineers' instruments are principally the alloys of copper and tin with small quantities of silver, aluminum, and German silver. Great care must be constantly exercised that these substances be

free from iron or other material which would affect the magnetic needle. In the construction of an instrument such a distribution of the metals is aimed at that the greatest strength consistent with light weight may be obtained and that the metals coming into contact at the bearing surfaces may be of such varying composition as to cause the least friction.

Take, for the purpose of better illustration, an American transit, illustrated herewith, as typical, as far as the construction is concerned, of nearly all engineering instruments. The plate of the instrument on which the magnetic needle is mounted, or, as it is termed, the compass circle, is turned with great care so that the surface may be absolutely true, and is graduated usually into 720 spaces, each representing one half of a degree.

Compass circles are usually figured in quadrants of a circle, that is, from 0 at the point marked "N" or "North" to 90 and back again, while the figuring of the limb varies with the custom of the maker or the requirements of the engineer.

In engineers' instruments, however, the angular measurements are made usually without the use of the needle, by a telescope so mounted as to revolve in a vertical or a horizontal plane. The angular measurement of its movement being indicated on circles divided into fractional spaces of a degree and read for convenience to finer spaces by one or more verniers. Accuracy of graduation of the compass circle, and especially of the limb, is essential to the perfection of the instrument, and great pains are taken by manufacturers in perfecting and improving engines for graduating. The best machines are automatic in action and the spaces are so accurately laid off that there is no appreciable error in the finished work. The instrument rests on the socket or bearing surface to which the compass plate and limb are attached; the surfaces of the socket must be so accurately fitted together as to produce no error when the parts are moved on each other. The socket is mounted on a leveling head, which is actuated by three, or in the usual American practice, by four leveling screws, as shown, by means of which the instrument can be accurately leveled. Upon the compass plate are placed the standards which support the telescope, the preparation of the optical parts of which is next in importance to the fitting of the socket and the graduation.

The telescope consists of an eye piece and object glass mounted in a tube. The eye piece is simply a magnifier of the image produced at the focus of the object glass. Two kinds of eye pieces are used, one showing the image erect, and the other showing the image inverted. The object glass is composed of two plates of optical glass of such specific gravity and refractive index that it will magnify the image clearly without prismatic colors. To secure achromatism the two parts of the object lens are made the one of crown and the other of flint glass, the crown being a light glass of soda and silica and the flint being a heavier glass containing potash and lead. The surfaces of each are curved to such a degree that the rays of light entering the object glass may be properly refracted and concentrated at a point called the focus.

The making of the lenses is an operation requiring much skill in manufacture, as upon the accurate grinding of the curved surfaces depends the quality of the telescope.

At the focus of the object glass are placed the cross-wires, which are filaments of spider web or very fine platinum. In conjunction with these are often used two more wires commonly called stadia wires, so placed that they intercept on a rod a space proportional to its distance from the instrument, thus furnishing an efficient method of ascertaining distances directly by the observer. The metal parts of the instrument, having been prepared, are polished with some suitable material, a preparation of rouge being generally used for finishing the surface of the screws, and the larger surfaces being finished with fine emery paper. The larger parts are usually colored dark to avoid reflection of the sun, while the smaller ones, such as screws, etc., are left bright in order that there may be a pleasing contrast between the different parts of the instrument. The parts, prepared as above, are covered with a thin coat of lacquer, a preparation of shellac and alcohol, applied after heating. All the parts are assembled and fitted together, and the instrument is then ready for the final complete adjustment. This consists in fitting the sockets so that they will move freely on each other, placing the compass plate and limb in position on the sockets, making the limb truly concentric with the socket and placing the vernier in position. The telescope must be so adjusted that its parts may work freely, and having been supplied with optical parts, etc., it is then fitted to the standards or supports previously placed in position on the compass circle. The whole instrument is then tested for accuracy and if found correct is packed in its case and is ready for use.

The above description is only intended to give a general idea of the construction of a typical instrument, but in the same methods will practically apply in the construction of all engineering instruments, such as levels, plane-tables, the various kinds of compasses, etc.

W. F. Gurley,
of W. & L. E. Gurley, Troy, N. Y.

In'sulator, a body used to separate an electrified conductor from other bodies, and which offers great resistance to the passage of electricity. Glass, shellac, resins, sulphur, ebonite, gutta-percha, silk, and baked wood are notable insulating materials. Wires in which currents of electricity are passing are often arranged in coils. To prevent the lateral passage of electricity from one coil to another, the wires are usually covered with silk and shellac. Insulators on telegraph poles, to which the wires are attached, are usually made of porcelain, glass, or stoneware. Underground telegraph wires are usually of copper, insulated by means of a coating of gutta-percha or india-rubber, and protected by tape or iron wire, metal tubes, or wooden troughs filled with bitumen. The core of a submarine cable consists of a copper wire insulated by a covering of gutta-percha whose weight is greater than that of the wire. See Electricity (*Conductors and Insulators*).

Insur'ance, a contract by which one party, for a stipulated consideration, undertakes to indemnify or compensate another party against loss by certain specified risks. The

party undertaking to make the indemnity is usually called the insurer or underwriter, the other the insured or assured; the agreed consideration is termed the premium; the written contract, a policy; the events or causes of loss insured against, risks or perils; and the thing insured or the subject to be protected, the insurable interest. Marine insurance relates to property and risks at sea; insurance of property on shore against fire is called fire insurance; life insurance, in its widest sense, is a contract entered into by the insurer to pay a certain benefit contingent upon the duration of one or more lives. Besides these classes of insurance there are many others; the traveler may insure himself against loss entailed from damage by rail or sea; the farmer from the inroads of disease among his live stock; the employer from the fraud of a dishonest cashier, etc.

The practice of marine insurance seems to have long preceded insurances against fire and upon lives. It is impossible to state the precise period of its introduction, but it is probable that it dates from about the beginning of the 15th century; though it is contended, on the authority of certain ancient writers, that traces of this form of insurance are to be found among the Romans. Some Anglo-Saxon guilds insured their members against loss from fire, water, robbery, etc. Commercial insurance, however, seems to have originated in Flanders about 1300, although priority is claimed for both Italy and Spain. It is probable that insurance was introduced into England by the Lombards early in the 16th century, but few court cases pertaining to it are found till the middle of the 18th century.

In Great Britain fire insurance has been practised for over two centuries, but on the Continent its introduction dates considerably later. The history of life insurance, as well as that of various other forms now in practice, belongs to a still later time. For the history and development of the principal insurance systems in this country, see INSURANCE, MARINE; FIRE INSURANCE IN AMERICA; INSURANCE, LIFE, IN AMERICA; INSURANCE, FRATERNAL.

Insurance, Accident. See ACCIDENT INSURANCE.

Insurance, Casualty. The definition of the word casualty is, "chance, or what happens by chance; accident; contingency; an unfortunate chance or accident, especially one resulting in bodily injury or death," etc. The term Casualty Insurance is commonly held to include those forms of indemnity providing for payment in case of bodily injury or death, or for loss or damage to property (except from fire or the elements), resulting from accident or some other such unanticipated contingency. The four great headings into which this insurance is usually divided are Personal Accident, Liability, Steam Boiler, and Plate Glass.

Personal Accident Insurance.—The first of these to be introduced into this country was personal accident insurance which had flourished, in a limited way, for many years in Europe, but was not attempted here until 1863. The pioneer of accident insurance in America was James Goodwin Batterson of Hartford, Conn., who, while traveling in England in 1859, learned of accident tickets insuring against injuries or death resulting from railway accidents and purchased one of these tickets in going from Leamington to London. Being at once impressed with the possibilities of developing this idea to include all forms of accidents in place of travel accidents only, he consulted with many well-known English insurance experts on the subject, all of whom with the exception of the famous statistician, Walford, expressed grave doubts as to the feasibility of the scheme. However, Mr. Batterson came home determined to make the experiment and in 1863, the first American accident insurance company was organized at Hartford, Conn. There is reliable authority for the statement that the first contract made by this company was a verbal contract entered into by the president of the company with a citizen of Hartford, whereby in consideration of a premium of 2 cents, the company agreed to become liable in the sum of $5,000 in case of accident to the assured while journeying from the post-office to his home on Buckingham Street. The second contract was a more formal one and was issued in consideration of $2 to protect the assured against loss of life or personal injury while journeying from Hartford to Washington, D. C., and return.

An accident policy is a contract of insurance against loss of life, limbs, sight, or time through bodily injuries effected solely by external, violent, and accidental means. The full amount of the policy is payable in case of death, or for the loss of both hands or both feet, or both eyes, or one hand and one foot. Proportionate amounts are payable for the loss of one hand or one foot or one eye, and a fixed sum is payable per week during the term of temporary disability.

The first rates, based upon the statistics of the English companies proved inapplicable to American conditions and accident insurance had a hard struggle to obtain a legitimate foothold on American soil. However, a series of catastrophes by land and sea in the following two or three years emphasized the importance of this form of protection, and little by little the business became more firmly established. During this time about 70 companies started, but all either failed or were absorbed by the pioneer company, which held the field for many years alone.

Gradually, however, other companies were organized, each newcomer profiting by the experience of its predecessors until on 1 Jan. 1904 25 stock companies were writing accident and health insurance in the United States, with aggregate premiums amounting to the enormous sum of $13,337,000. The first accident policies were very primitive affairs compared with the elaborate and almost unlimited contracts of today. In the early times, policies covered merely loss of life, limbs, or total disability, conditions were numerous and technical, and policies for small amounts were the rule. Gradually, however, the competition of progressive and aggressive underwriters made itself felt in the broadening of the contract. One of the first important changes consisted in extending the period of weekly indemnity from 26 to 52 weeks. Some of the more conservative companies hesitated for a long time to follow this lead, but the pressure proved too great and they were finally forced to acquiesce. The policies of the leading companies have now reached the limit of liberality on this point by providing for the payment of weekly indemnity in a sum equal to the prin-

cipal sum insured. One of the important innovations was the introduction of the combination policy, covering not only all of the features of the regular policy, but giving double benefits for accidents happening in or on a moving conveyance using steam, electric or cable power and provided for the use of passengers. This clause was later extended to include accidents in elevators and burning buildings, as well as in any vehicle used as a carrier of passengers, such as carriages, coaches, omnibus lines, and the like.

During this period of evolution, other changes were taking place. Conditions and agreements, that for years had been considered indispensable, began to disappear one by one. The fundamental theory that accident insurance was indemnity for loss of income, resulting from total and absolute disablement, was qualified by the broader and more flexible rule of partial disability, whereby a varying percentage of the weekly indemnity called for by the policy became payable in case the assured was not totally disabled, but was partially prevented from attending to his business duties. This payment was fixed at 50 per cent by some companies, irrespective of the nature and extent of the partial disablement, whereas other companies adopted what may seem to be a more logical basis, providing for not less than 25 per cent, nor more than 75 per cent of the weekly indemnity, depending upon the special circumstances of each case. Other important concessions were made by the elimination of conditions that had been deemed a *sine qua non* to the safe and proper conduct of the business. One of the principal of these conditions was that "injuries, of which there is no visible mark on the body, the body itself in case of death not being deemed such a mark," were not covered by the policy. Others were the exclusion of accidents from "sunstroke or freezing; from injuries intentionally inflicted upon the insured by himself or by any other person, injuries from unprovoked assault excepted; from voluntary overexertion; violating law; violating rules of a corporation; voluntary exposure to unnecessary danger, expeditions into wild or uncivilized countries," etc. Many of these exceptions were reluctantly abandoned by the companies, oftentimes only after long and expensive litigation, the result of which was usually against the company.

The policies now issued by most of the companies are entirely free from all of the above-named conditions and are practically "conditionless," save as to the methods of reporting and adjusting claims. It was, however, not until 1899 that the most radical innovation yet to be introduced into the business of accident insurance was brought forward in the shape of health and disability insurance. It was perhaps but the logical sequence of events that after perfecting the accident policy to the point of the greatest liberality, the demand should make itself felt for insurance against "all the ills that human flesh is heir to" and underwriters in America again turned to their European neighbors, who had already taken the initiative. Sickness policies had become quite widely introduced into many Continental countries before that time and the system of compulsory insurance against accidents and sickness had been successfully instituted by many European governments. It is true that as early as 1847 sickness insurance was attempted in America, by the organization of companies in Massachusetts and Pennsylvania, but these companies, after brief and unprofitable careers, gave up the struggle, and nothing further was attempted in this way until about the year 1896. At this time a rider to accident policies, covering about eight diseases, was adopted by one or two companies. However, the statistics available on sickness insurance did not make the business appear very attractive, and hence, during the first year or two after its general introduction into the United States, few companies were prepared to assume the risk and then only from a limited number of diseases, about 15, comprising a few of the more prevalent forms, the balance being contagious and rare diseases. Soon, however, competitors entered this field and the number of diseases covered was increased to 30, and upwards, until finally all ordinary diseases were included under the policy. At first, a health policy was not issued alone, but was combined with the accident contract, the two constituting disability insurance. Many of the leading companies still adhere to this practice; others issue the so-called unlimited health policy alone, but do not write the limited health contract, which covers a specified list of about 30 diseases, except in connection with an accident policy, while a very few companies still issue either form of health contract separately.

The introduction of disability insurance was the signal for a still further broadening of the benefits and conditions under accident contracts. The most important of these benefits are the "Schedule of Operations," providing for a fixed sum, in addition to weekly indemnity, to cover the cost of a surgical operation for any of the injuries listed in the schedule; the "Schedule of Indemnities" providing for a specified sum to be payable in lieu of weekly indemnity for any of the injuries enumerated, and the "Accumulation Table" providing for a 10 per cent increase in the principal sum insured on each annual renewal until this accumulation amounts to 50 per cent of the original sum.

A startling innovation in the year 1903 consisted in the insurance of the beneficiary, without extra charge, in addition to the policy holder. This was limited, at first, to indemnity for loss of life from travel accidents, including accidents in elevators and burning buildings. However, this was extended in 1904 to cover loss of limbs as well, from accidents above described. It is difficult to predict what limit will be reached by the companies in the eager contest for business, unless a standard policy is adopted by agreement or through legislative enactment.

The figures for 10, 20 and 30 years of premiums written and losses paid, give some astonishing results. From 1873 to 1883, premiums amounted to $11,029,385 and losses to $4,221,616. From 1883 to 1893, premiums were $30,997,822 and losses $13,904,155, or an increase of 181 per cent in business and of 229 per cent in claims. From 1893 to 1903, premiums amounted to $64,832,874 and losses to $28,686,686, or an increase of 109 per cent in business and of 106 per cent in losses over the previous 10-year period, and an increase of 487 per cent in premiums and of 580 per cent in losses over the first 10-year period. These figures speak eloquently of the enormous strides already made by accident insurance in America, and are but a forerunner

of the growth and development that can reasonably be expected in the future.

Liability Insurance.— Liability insurance is of comparatively recent origin, and was unknown in America prior to 1887. As in the case of accident insurance, the business was first exploited in Europe, and its real development began after the passage of the English Employers' Liability Act of 1880. From time immemorial, the liability of employers for injuries caused by or suffered by their employees in the course of employment has been a part of the Common Law of all civilized nations. An eminent authority states that, as early as 1500 B.C. the Jewish law provided that "if a master were the means of causing the loss, either intentionally or unintentionally, of the eye or of the tooth of his slave, he was bound to let him go for his eye or his tooth's sake." And again, according to this same law, "if an employer allowed his ox to gore either his servant or a stranger, he was required to pay various compensations to the injured if he survived, or to his relatives in the event of the injury being followed by death."

Under the Roman law, a master was responsible not only for injuries suffered by his employees if due to his own negligence, but under the legal maxim, "Respondeat Superior," was liable for any personal injury sustained by a third person, due to the wrongful acts or omissions of his servants, acting as such and within the regular scope of their employment. The legal obligation to employees was expressed in the maxim, "*sic utere tuo, ut alienum non laedas*"; but the rule became subject to two important exceptions; firstly, that if the person injured and the one causing the injury were fellow-servants, the master was relieved from liability for the injury; secondly, under the doctrine of "*volenti non fit injuria*," if the person injured had actual knowledge or the means of knowing of and understanding the hazards incident to the employment and then voluntarily accepted the service, he was deemed to have assumed all the usual and ordinary dangers of the work and in case of injury, resulting therefrom, no recovery could be had against the master.

The passage of the Liability Act of 1880 by the English Parliament resulted in the organization of a number of companies for the protection of employers against the provisions of the act as well as against the expenses of litigation arising out of claims and suits instituted by employees for injuries sustained.

In 1887, the State of Massachusetts passed an Employers' Liability Act, fashioned to a great extent after the English statute, but with such changes and modifications as were necessary to suit the changed conditions.

One of the English companies then in successful operation abroad, deeming the time opportune to extend its field to America, determined to establish an American office and selected Boston, doubtless because of the existence of the act above referred to. It is stated that the local agency for the American branch was offered to various prominent insurance agents of Boston, but was declined by each in turn, as both the company and the class of business were unknown and there appeared to be no demand whatever for the kind of indemnity offered by the new-comer. It later became evident, however, that liability insurance had come to stay, and within the next few years a number of American companies were incorporated to carry on the business, and several foreign companies established American offices on somewhat the same lines as the first company had done.

During this early period, the business was entirely experimental and rates were constantly altered to suit the changing conditions, as they arose in the development of the various features of the insurance. At the outset, the indemnity was limited to employers' liability, under substantially the following form of contract: That the company, in so far as regards fatal or non-fatal injuries to any employee or employees of the insured at the place or places mentioned in the application, during the period covered by the premium paid or by any renewal premium, would pay to the insured or his legal representatives all such sums for which the insured might become liable in damages not exceeding the limits of liability stated in the policy, such payments to be made within one week after the receipt by the company of satisfactory proofs of claim. Soon, however, the insurance was extended to public or outside liability, whereby the insured was indemnified against loss in damages on account of common law or statutory liability for personal injuries suffered by any third person and due to the business operations of the insured or of his sub-contractors. This contract was limited for some time to contractors and builders, but gradually the demand arose for similar protection on the part of owners and lessees of buildings, which resulted in the further broadening of the insurance scheme to include general liability. This contract, briefly, provided indemnity to owners or occupants of hotels, apartment houses, office buildings and wholesale and retail stores "against claims for compensation for personal injuries to any person or persons whomsoever for which the assured may be legally liable, resulting from accident (fire excepted), happening to such person or persons on or about the premises of the assured, or caused by any of the horses or vehicles of the assured used in his or their business." It was further provided, that, subject to the limits of liability expressed in the policy in respect to any accident which should cause death or injury to any one person or to several persons, "the company will pay to the assured or his legal representatives, within one week after the receipt by the company of satisfactory proofs of claim, all sums for which the assured shall become liable for personal injuries caused and limited as aforesaid, during the period covered by the premium now paid or by any renewal premium, by virtue of the common law or any statute."

It was a comparatively short step from this contract to the issuance of separate policies, covering liability for injuries caused solely by horses and vehicles, known as teams insurance, and for injuries caused by elevators, known as elevator insurance. Meantime a few of the companies were engaging quite freely in the insurance of common carriers' liability, covering "any and every accident to or caused by the cars, horses, plants, ways, works, machinery or appliances" used in the business of steam or street railroads, steamships, steamboats and ferries. It is but proper to say that this feature of liability insurance was

looked on very unfavorably by the more conservative companies, and one of the companies engaging in the business notified its agency force after the disastrous results of this underwriting became first apparent in 1893 that, "we are not now seeking to push these specialties, as we find competitors (particularly companies whose managers have a commission interest), doing such business at rates which can only be productive of serious loss. Railways we take only when the lines are short, and street railways not at all in great cities." But the handwriting was already on the wall, and in November 1893 one of the largest and most important companies was forced into bankruptcy, largely through the losses sustained on common carriers' liability. This placed almost an embargo on that class of business, only two or three companies continuing to issue such policies. Two of these later discontinued the business entirely, and the other, after a somewhat meteoric career, collapsed in 1897 with heavy liabilities and few assets. In March 1896 the first significant action was taken with a view of placing liability insurance upon a sound scientific underwriting basis in the shape of a conference of the leading companies held in New York. After a series of meetings and discussions extending over a period of several weeks, an organization was effected known as the Conference of Liability Companies. A bureau of statistics was formed, with a well-known underwriter in charge, and the work of compiling the experience of the various companies was vigorously taken up. Frequent meetings of the Conference were called at which the managers and officers of the various companies discussed the different phases of the business and compared experiences. Policy forms were analyzed and conflicting conditions either eliminated or reconciled. As a result of these meetings, and of the work of the bureau, a manual of rules and rates was promulgated in the summer of 1896 and standard policy forms were adopted shortly afterwards. From time to time thereafter manuals and supplements have been issued by the Conference companies altering rates already established and publishing new rates, these changes and additions resulting from the statistical work carried on by the bureau.

Logical development of liability insurance in America dates from the formation of the liability Conference. Standard rates and policies having been adopted, competition was reduced to practically legitimate methods, and for three years the business went on smoothly and grew rapidly.

This highly satisfactory condition of affairs was rudely disturbed early in the year 1900 by the withdrawal of one of the largest companies from the agreement, and while the Conference continued in existence, its usefulness was considerably impaired. Shortly after this time three foreign companies established American offices and two additional companies were organized in this country, and as none of these newcomers became members of the Conference, the situation grew more critical than before and the companies comprising the Conference came to be the minority, while they had formerly constituted the majority. Early in 1903 one of the smaller companies in the agreement withdrew, being unable to withstand the competition of the outside companies. At the beginning of 1904, the Conference consisted of five companies, while twelve companies were operating independently.

This great discrepancy in numbers has forced the Conference to become almost solely a bureau of statistics and there is little attempt made to the adherence of standard rates in cases of competition, which are of course the rule rather than the exception. In spite, however, of what might be termed these unsatisfactory conditions, the business has grown and developed astonishingly. From the inconspicuous beginning in 1887 already noted, liability insurance has in the comparatively short space of 17 years taken its place as one of the most important branches of underwriting in this country involving more technical and difficult features than almost any other kind of insurance business.

The liability policies of the present day are substantially the same with all companies, and are known respectively as Employers' Liability, Public Liability, General Liability, Teams Liability, Elevator Liability, Owners' Contingent Liability, Theatre Liability, and Marine Vessel Liability. The premium is based, in most cases, on the estimated annual payroll of employees, and is subject to adjustment at expiration of the policy according as the actual payroll expended is greater or less than the amount estimated. To ascertain this, the assured is required to render a payroll statement to the company which is usually verified by an audit of the assured's books.

Under the various forms of policies issued, protection against legal liability for damages on account of accidental death or injuries to employees and the public is afforded to manufacturers, and contractors, owners, lessees, and tenants of buildings; to owners and users of horses and vehicles, including automobiles, elevators, vessels and boats; to theatres, agricultural exhibitions and shows, and to owners and general contractors of buildings in course of construction. While at first the limits of liability were rarely in excess of $5,000 for one person injured or killed and $10,000 for two or more persons injured or killed in any one accident it is now quite common to provide double these limits and in fact the indemnity is often fixed at limits of $10,000 for one person and $50,000 for a number of persons injured or killed in one accident. These increased limits are due not only to the inevitable tendency of the courts in the majority of States to sustain verdicts for large amounts, but more particularly to the enactment of laws increasing and extending the liability of employers and others in cases of negligence. For example, in New York State the statutory limit for damages in case of fatal injury from negligence was $5,000 for an individual until this limit was removed by the legislature a few years ago, leaving the amount recoverable in such cases unlimited. In Illinois, likewise, the sum of $5,000 was formerly the maximum amount payable, but an act of 1903 increased the individual limit to $10,000. While it was rare to read 10 years ago of a verdict for $5,000, such amounts are now deemed quite reasonable in serious or fatal cases, and it is not unusual to find that verdicts of ten, twenty, and even fifty thousand dollars are sustained by the courts of last resort. In fact, legislation is playing a most important part in the evolution of liability insurance in this coun-

try. The Employers Liability Act of 1887 of Massachusetts, while the most important statute yet to be enacted on this subject, in America, has never been quite satisfactory and just as changes and amendments have been constantly suggested for the English acts of 1880 and 1897, so the legislators of the Bay State have attempted from time to time to extend and alter the provisions of their act. The latest effort in this direction, proposed in 1904, is known as the Workingman's Compensation Act and is quite revolutionary in its character so far as this country is concerned, for nothing of the sort has ever been attempted here before. In the words of an eminent member of Congress from Massachusetts, while discussing this measure, "One of the principal reasons for it is because there have grown up in this country, lawyers and doctors who combine together to hunt up trouble and cheat the injured person out of his money. Another great trouble and reason for the proposed legislation is the employee's habit of bringing suit at once, without trying to bring about amicable relations with the employer. As things are to-day, while employers frequently have to pay out large sums of money, in many cases the injured employee is not benefited. Now, an employee has to show that he received his injuries as the result of the neglect or fault of the employer. This new law does away with all of this and favors the compensation of an employee for the loss of an arm or other serious injury, whether the employer is to blame or not." The passage of the so-called Slater Act of 1902 by New York State was another step in the direction of absolute compensation to workingmen and it is only a question of time and probably a short time, when most of the important States will have legislated on this subject. Not only so, but there is some talk of a national act to be put forward by the United States government affecting these vital questions of the relations between capital and labor.

It may not be entirely utopian to believe that the ameliorating influences of these State laws either with or without a national statute will result ultimately in the more friendly and unselfish attitude between employers and employees and in the discontinuance of strikes and labor disturbances generally.

The growth of liability insurance has kept pace with the industrial development of this country during the past 15 years as will be noted from the following exhibit: From 1889 to 1893 inclusive, premiums amounted to $9,319,591 and losses to $3,838,665. From 1894 to 1898 inclusive, premiums were $20,535,668 and losses $10,084,319, or an increase of 120 per cent in income and of 162 per cent in claims. From 1899 to 1903 inclusive, premiums were about $50,000,000 and losses about $25,000,000 or an increase of 250 per cent in premiums and of 250 per cent in losses over the previous five-year period, and an increase of 437 per cent in premiums and of 552 per cent in losses over the first five-year period.

Steam Boiler Insurance.—The first steam boiler insurance in America was written in 1866, dating almost as early as accident insurance, and like that other branch of indemnity, it owes its origin in this country to the thrifty, practical citizens of Connecticut. It was, however, not until 1869 that the business became well established. At the close of that year total premiums amounted to $55,819, and total losses to $2,188, a modest beginning considering that for the year 1903, premiums aggregated about $2,000,000, and losses about $200,000, while the amount of insurance in force had grown from $5,000,000 to over $600,000,000.

For many years the pioneer company had a monopoly of the field, as, for some unknown reason, capitalists seemed disposed to leave this business alone, due, perhaps, to the slow growth of the premium income, as well as to the mechanical technicalities of the insurance.

At the outset, the form of contract was limited to indemnity for loss or damage to the boiler or boilers and other property of the assured, and to property of others for which the assured could be held legally liable, due to the explosion, rupture or collapse of the boiler or boilers. As a guarantee of the value of this indemnity, as well as a protection to the company against the insurance of old and unsafe boilers, a periodical inspection is made of each boiler during the term of the policy by an inspector of the company, and a written report is forwarded to the policy holder showing the condition of the boiler, recommending such repairs or changes as appear necessary, and stipulating the pressure under which the boiler can safely be run. Steam users were at first slow to grasp the many advantages offered by this new scheme, and engineers of plants strongly resented the reflection on their skill and management implied by some of the features of the insurance. Conflicts of opinion between the inspector of the company and the engineer of the assured were of frequent occurrence and oftentimes much hard feeling was engendered. Nothing daunted by these obstacles, the company vigorously pushed forward the business and at the end of the first 20 years the premium income had grown to about $1,000,000.

In the year 1887 another company was organized which gave considerable impetus to the business and introduced a new feature, namely, indemnity against loss from legal liability for fatal or non-fatal injuries suffered by any person or persons due to the explosion, rupture, or collapse of the boiler or boilers. From this time forward the business increased rapidly.

On 1 Jan. 1904 nine companies were engaged in the business of the insurance of boilers, tanks, dryers, rotaries, digesters, and other objects operated under steam pressure. Nearly 150,000 boilers were regularly inspected in 1903 and a small army of inspectors are maintained by the various companies at an annual expenditure of several hundred thousand dollars. Policies are frequently issued for as much as $100,000 limit for any one loss, and a limit of $50,000 is quite common. Notwithstanding the great number of objects insured annually, and the large limits of liability as above mentioned, serious explosions have been comparatively rare, and the average loss ratio of the largest company for 35 years has not exceeded 10 per cent per year. This showing would seem to indicate that there is an exceptionally large profit to be made in this branch of casualty insurance, but such is not the case, for owing to the inspection system before mentioned, the management expenses range from 60 to 85 per cent of the premium income. Some of the companies maintain in connection with

the inspection department, a force of draughtsmen for the purpose of furnishing plans and specifications for new boilers, at the request of their policy holders or of prospective clients. This service is rendered without charge and adds somewhat to the already heavy expense of conducting the business. It is interesting to learn from the statistics of one of the companies, that from the beginning of their business to 1 Jan. 1903 the number of visits of inspection made was 1,815,465. The total number of boilers inspected was 3,568,838. The total number of defects discovered was 2,559,592, of which dangerous defects numbered 270,856, and 15,169 boilers were condemned as unfit for use. During the year 1902 the company made 142,000 visits of inspection, examined 264,708 boilers, condemned 1,004 boilers, found 145,489 defects, of which 13,000 were dangerous.

The total premiums of all companies during 35 years, to the close of 1903, amounted to nearly $25,000,000, and total losses to almost $2,500,000, and with the rapid increase in the number of new manufacturing plants throughout the country, and the general expansion of business, it is safe to predict that steam boiler insurance will develop much more rapidly in the next decade than in the past quarter century.

Plate Glass Insurance.— The first American plate glass insurance company was organized in New Jersey in 1868, but unlike the pioneers in the other casualty lines, this company does not rank among the leading companies in point of financial strength or amount of business written. In 1874, the first New York company was started, and from that year the business steadily increased in volume, total premiums for 1903 amounting to over $2,000,000, and total losses to over $800,000. There have been fewer changes in the plate glass policy than in any other of the casualty contracts, presumably because the business is less intricate and there has been no occasion to make many changes. Plate glass insurance provides indemnity on account of loss or damage caused by breakage of glass, provided that such breakage is the result of accident and due to causes beyond the control of the assured. No claim is paid, however, for breakage resulting directly or indirectly from fire, earthquake, inundation, insurrection, riot, or any military or usurped power, or from the blowing up of buildings or from alterations or repairs to the premises. While for years the insurance was limited almost entirely to what is known as plain plate glass, many different kinds of glass, such as bevelled, mitred, cathedral, leaded, chipped, bent, Florentine, jewelled, ribbed and wired glass are now insured freely by all companies.

In 1900 plate glass underwriters were confronted with an entirely new proposition in the shape of clamped or patented plate glass, resulting from riveting the sides and tops of plate glass together without the use of wooden frames that before that time had been indispensable. The rates formulated for patented glass were at first entirely inadequate and the companies lost a considerable sum while experimenting with the subject. Not only was there great trouble and delay in having broken glass replaced, but the patentees, having a monopoly, were disposed to secure the full benefit from the product of their ingenuity. As a result of these conditions, the companies placed an almost prohibitive rate on all patented glass in the hope that they could successfully taboo that kind of risk, but the public demand for it was too great and patented glass has come more and more into general use. However, near the close of the year 1903, the leading companies found that the experience with patented glass had been more favorable than had been anticipated, and, as a result, the rate was materially reduced.

Plate glass insurance is now almost as general as fire insurance, and while the average premium is small, the business has assumed very considerable proportions. During 30 years ending 31 Dec. 1903 total premiums amounted to over $20,000,000, and total losses to over $8,000,000. Fifteen stock companies were on that date engaged in the business, in addition to numerous local mutual companies located in various parts of the country. From time to time in the past 10 years, compacts have been formed between the largest companies for the purpose of regulating rates, and establishing sound underwriting practices. Unfortunately, however, these agreements have been of comparatively short duration and as oftentimes happens in similar cases, the demoralization following the termination of the compact has been even greater than before it was made.

It is difficult to predict what will be the final outcome of the admittedly unsatisfactory state of affairs prevailing in plate glass insurance, with rates low, commissions excessively high (sometimes as much as 50 per cent), and the cost of replacements increasing, unless the companies form a national compact and place the business upon a logical underwriting basis. One company heretofore writing plate glass insurance alone, decided early in the year 1904 to add a personal accident department, and it is probably only a question of time when every company engaged in this one line of business will be forced either to add other lines of insurance, or to consolidate with other companies engaged in the same business.

Sprinkler Leakage Insurance.—While not constituting one of the main divisions of casualty insurance, this form of policy is written to a limited extent by two of the casualty companies, as well as by some fire insurance companies. The contract covers loss or damage to the building and contents caused by the accidental discharge or leakage (except from fire) of the sprinkler equipment erected in or on the premises. The premium, based at a varying rate, depending on the class of merchandise covered, is predicated upon a certain percentage, usually 10 per cent, of the cash value of the building, stock, and machinery. Sprinkler leakage insurance has been in vogue only nine years in America, during which period the total premiums have not amounted to any considerable sum. There is, however, a slow, steady growth of the business, due to the wider use of sprinklers in mercantile and manufacturing plants, principally in the Eastern and Middle States.

Fly-wheel Insurance.—This is one of the less important branches of casualty insurance and is of recent origin in this country. One company alone is engaged in the business at this time, and hence the statistics are limited. The contract covers loss caused by the explosion, bursting, or disruption, during rotation of the fly-wheels or any of them, first for loss upon the fly-wheel or fly-wheels and upon other property

of the assured; second, for loss from liability of the assured for loss upon property of any other person or persons; third, for loss from liability of the assured for bodily injuries or death sustained by any person or persons. Flywheel insurance is more or less allied to boiler insurance, and the limits of the company's liability in case of loss, as well as the rates of premium and the methods of handling the business, are very much the same as in boiler insurance. The insurance against breakage of machinery in general is being introduced to some extent in one or two European countries, but has not yet been attempted in America. There appears to be a field for such a policy, and doubtless the indemnity will be offered by some American company before very long. In fact, at the present time, a few corporations are engaged in the business of insuring the maintenance of electric machinery and of making the repairs found necessary from a periodical inspection of the premises or plants.

Physicians' Liability Insurance.—This is another of the modern schemes in casualty insurance, and provides indemnity against loss from common law or statutory liability for damages on account of bodily injuries fatal or non-fatal suffered by any person or persons in consequence of any alleged error, mistake, or malpractice by the assured in the practice of his profession. The limits of the company's liability are uniformly $5,000 for one person injured or killed, and $10,000 for any number of persons injured or killed during the term of the policy. Naturally, the moral hazard is the main consideration in a contract of this nature, and, while a fixed premium is charged, a careful selection is made by the conservative companies of the risks offered.

Taken all in all, the field for casualty insurance is an ever widening one, and the vast interests involved have given to this branch of indemnity a place in the front rank of insurance schemes. The magnitude of the business, the great scope of the contracts, the elaborate and comprehensive machinery required to properly conduct the affairs of these great corporations, can best be understood and appreciated when it is known that during the period in which the various lines of casualty insurance heretofore enumerated have been written by the total premiums have exceeded $221,000,000, the total losses have been more than $88,000,000, and the total amount of insurance in force on 1 Jan. 1904 was estimated at the bewildering sum of over $5,000,000,000.

EDWIN W. DE LEON,
Vice-President Casualty Company of America, New York.

Insurance, Credit, is a business proposition which offers to the seller of merchandise on credit protection against excessive losses as the result of bad debts. When loss occurs a certain percentage is to be borne by the party insured, and the balance of the loss is made good by the company issuing the policy of indemnity. To illustrate: Application is made for an insurance bond on sales amounting to $400,000 a year, and a bond is written on a basis of one half of 1 per cent loss; this one half of 1 per cent on sales, or $2,000, would represent the insured's own risk in bad debts, and if he lost no more than that amount he would receive nothing from his insurance. But should his losses be $5,000 in bad debts, his own loss would still be only $2,000, and the excess, or $3,000, would be paid him by the insurer, provided the losses had come within the terms and conditions of the bond. Credit insurance is a natural product of the present age. The first important systematic aid to the credit system was the establishment of the commercial agency, which is now recognized as indispensable to an intelligent transaction of credit business. But this first aid was not complete within itself, and a supplementary system was needed to still further minimize the risk of excessive losses through insolvency of debtors, which want is supplied by credit insurance.

The annual losses in the United States by the insolvency of debtors exceed by about 50 per cent the losses by fire. It has long been the general custom to pay insurance companies to carry the risk of loss by fire, but until comparatively recent years each merchant had to carry his own risk of loss through insolvency of debtors. Credit insurance is based on the sound economic principle which recognizes the province of the specialist. Both fire and life insurance offer protection superior to that which can be obtained through any other medium, because the principle of the law of average cannot be efficiently employed except by the specialist. Protection is against the possibility of abnormal loss no less with fire than with credit insurance. Credit insurance from the standpoint of the insurer proceeds on the principle of average which promises a profitable return on the sale of protection. The cost of protection is assessed on the basis of normal losses accruing in any given business for a period of years. Such loss may be termed the normal loss. Normal loss is that inevitable impairment of resource which can be borne by a business and yet admit of a satisfactory dividend on capital invested Abnormal loss is loss in excess of that which permits satisfactory dividend on capital investment, and it is against such loss that credit insurance offers protection. From the standpoint of the insured, credit protection cannot be considered a profit-earning investment. It is simply and solely protection against excessive loss by bad debts. A crop failure; an epidemic of disease, or a widespread or protracted industrial labor strike, are possibilities of danger which no man can provide against, as respects commercial credits, except through the medium of insurance protection. Experience may qualify a credit man to guard against bad debts through the rascality or impaired credit condition of those seeking credit, but no amount of experience or capacity can of themselves render it possible to provide against contingencies growing out of such cases as above mentioned.

Great care should be exercised by the insured in taking out a policy of credit indemnity. The peculiar need of his business should be intelligently considered. Precedent cannot be safely followed, for the character of every man's business is in more or less degree individual. Unless an intelligent application of the principle of credit insurance is made to each individual case, the greatest amount of protection cannot be realized. The principle of credit insurance being economically sound, it follows that if the insured in any given case does not realize the protection contemplated, it is because the conditions of the

indemnity are not adjusted to the needs of the business. No amount of indemnity can be considered a profit maker of itself; its true sphere is that of a profit saver. In explanation of the proposition that an insured is always a loser, when his losses make demand on the indemnity company, it is conceivable that excess losses should so dovetail with the conditions of the policy as to reimburse the insured for every dollar of excess loss, but such instances would be rare indeed.

It would be practically impossible to limit precisely the line of credit on every individual case to the exact ratio of protection. Such a conservative policy would by no means realize the best results of credit protection, and, if strictly adhered to, would restrict rather than expand business. Protection can be made to operate injuriously in both directions, and it would be as false policy to limit business to the letter of protection as it would be to expand it beyond the limits of the spirit of indemnity. A credit should not be extended merely by reason of the collateral security furnished by credit-indemnity, but such security should be used to justify a risk which would not otherwise be undertaken, and to increase a line of credit beyond its natural unsecured limit. A bank will not lend on collateral alone. The personnel of an individual borrower is an equation which can not be eliminated, whether the loan be in money by a bank or in merchandise by a merchant. Collateral security in the case of a bank operates to reduce the interest rate, and the difference between the rate which would be demanded without collateral and the rate with collateral, measures the premium paid by the bank for the protection. In the case of a merchant, the rate paid for protection is the cost of carrying the security as represented by the premium on the policy of indemnity. The banker, therefore, pays a higher rate for collateral protection than the merchant.

The essential features of the contract between the insured and the insurer are: (1) The insured to bear a normal loss of an agreed percentage of his annual sales. The said ratio of own loss to be determined by facts established by the record of the business for a series of years. (2) Insurance to apply to both rated and unrated accounts at an agreed ratio, as the circumstances of the business in question may require and justify. (3) Liberal insolvency conditions, in which technical distinctions are eliminated, and the actual and virtual facts equitably arrived at. (4) Prompt payment of losses at the period of settlement.

J. A. Taylor,
Prest. Wilmington, N. C., Board of Trade.

Insurance Engineering, a science or method of procedure for the better application of principles and rules in the business of insuring property against fire. The decision of the trustees of the Massachusetts Institute of Technology to establish a course in what for want of a better name has been designated insurance engineering, is commendable and should meet with hearty encouragement from the fire underwriters. Its object will be to instruct those who take the course in the selection and constructive use of materials with a view to minimize the risk of destruction by fire. Naturally, this will for the present relate more directly to mill and factory property than to dwellings, but the influence of such a school should soon be felt in every department of architecture, especially if out of its work shall grow a determination on the part of the fire underwriters to make such discrimination against buildings in which they are expected to take all the risks as will make it to the advantage of those who build or buy houses of any kind to do what is possible to share this risk by guarding against fire within practicable limits of slow-burning construction.

The latest official calculations — those of Insurance Commissioner Dearth of Minnesota — lead to the conclusion that 75 per cent of the enormous annual loss from fires in this country results from fires which are preventable. The policy of the insurance companies has lent itself to the encouragement of indifference on the part of owners of insured property to everything except the rate of premium. Commissioner Dearth's further conclusions are:

> It is not to the large number of promiscuous fires that heavy losses to property are attributable, but more to the larger select risks occuring in heavy commercial circles where great values are involved. One of the greatest evils in fire underwriting is in the matter of over-insurance, which places a premium upon criminal carelessness on the part of the assured, if not absolute incendiarism. For this evil the companies themselves alone are, of course, to blame, and consequently have it entirely within their power to eliminate. There is very little question that the companies are at the present time exercising a far greater degree of precaution in this direction than heretofore; in short, cancelations, reducing the liability of the companies on all the more hazardous classes of risks, are causing not only the local agents, but the assured, no end of trouble, and much greater care is, beyond question, being exercised in the line of inspections, especially looking to the matter of values as compared with the amount of insurance covering on the property. These are all matters that are being strenuously considered by the underwriters throughout the country, and beyond question must result in a material decrease in the fire waste.

The erection of insurance engineering into a profession will enable the insurance companies gradually to reorganize their business on safer lines, and in so doing discourage the practices which have grown up through the co-operation of owners and agents to saddle them with larger responsibilities than any scale of practicable premiums would warrant. The number of men qualified to practise as insurance engineers has never been great enough to meet the requirements of the companies. The new school should have an immediate and important practical relation to the public welfare in the safeguarding of life and property and the raising of the standards of construction in buildings admitting of classification as insurable risks.

The undertaking has the enthusiastic support and co-operation of Edward Atkinson of Boston, whose efforts in recent years have materially changed the methods of mill construction and the theories of industrial insurance; and it has appealed so strongly to mill owners, builders, manufacturers, and other investors to whom fire is a constant menace that, at Mr. Atkinson's instance, a fund sufficient to place it at once on a substantial money basis with liberal allowance for the heavy initial expense has been raised

Insurance, Fraternal. The principles which govern the system of fraternal insurance can be gleaned only from the decisions of the courts of law, the dictum of the insurance departments of the different States, the files of the leading fraternal journals, and the official reports issued by the National Fraternal Congress, the associated fraternities of America and the fraternal societies themselves.

Fraternal Insurance, as popularly understood at the present time, is "The obligation of a fraternal beneficiary association to pay the benefits prescribed in its constitution and laws when all requirements by or on behalf of the members are fulfilled." In the early days of fraternalism in America the term "protection" was universally used in describing the benefits furnished by the different beneficiary societies. See FRATERNAL BENEFICIARY SOCIETIES IN AMERICA.

The term fraternal insurance, although originally a misnomer, and clearly inapplicable in any true conception of the real aims and objects of a fraternal beneficiary association, has, however, come into general use of late years as being synonymous with the words fraternal protection and fraternal benefits, whenever reference is made to the money benefits paid by a fraternal beneficiary society. This change has come about so gradually that it is difficult to trace its origin or fully measure its effects. The primary cause of this mingling of insurance terms with fraternal names has undoubtedly been the failure of the officials of the different societies to constantly keep in mind the distinction between the insurance contract supplied by an insurance company and the fraternal protection furnished by a fraternal society, while a secondary cause has been the efforts of the insurance commissioners of the different States to compel all fraternal beneficiary associations to comply with the regulations in force as to insurance companies.

In order, therefore, to fully understand the scope and meaning of the term fraternal insurance, as now understood, it is first necessary to ascertain the meaning of the word insurance. Webster defines it as "a contract whereby for a stipulated consideration called premium one party undertakes to indemnify or guarantee another against loss by certain specified risks." The supreme court of Pennsylvania (1890), in the case of the Commonwealth *v.* the Equitable Beneficial Association (137 Pa. St. 412) (18 Atl. 1,112), thus points out the distinction between regular life insurance and fraternal protection, as then understood.

"The general object or purpose of an insurance company is to afford indemnity or security against loss. Its engagement is not founded in any philanthropic, benevolent, or charitable principle; it is a purely business venture, in which one, for a stipulated consideration or premium per cent engages to make up, wholly or in part, or in a certain agreed amount, any specific loss which another may sustain, and it may apply to loss of property, to personal injury, or to loss of life. To grant indemnity or security against loss, for a consideration, is not only the design and purpose of an insurance company, but is also the dominant and characteristic feature of the contract of insurance.

"What is known as a beneficial association, however, has a wholly different object and purpose in view. The great underlying purpose of the association is not to indemnify or secure against loss; its design is to accumulate a fund from the contributions of members for beneficial or protective purposes, to be used in their own aid or relief in the misfortunes of sickness, injury or death. The benefits, although secured by contract, and for that reason, to a limited extent, assimilated to the proceeds of insurance, are not so considered. Such societies are rather of the philanthropic or benevolent character. Their beneficial features may be of a narrow or restrictive character; the motives of the members may be to some extent selfish, but the principle upon which they rest is founded in the considerations mentioned. These benefits, by the rules of the organization, are payable to their own unfortunate out of funds which the members themselves have contributed for the purpose, not as an indemnity or security against loss, but as a protective relief in cases of sickness or injury, or to provide the means of a decent burial in the event of death. Such societies have no capital stock; they yield no profit, and their contracts, although beneficial and protective, altogether exclude the idea of insurance, or of indemnity, or of security against loss."

We may therefore assume that insurance is a contract between an insurance company on the one hand and the insured on the other, and provides for the payment of a specific indemnity by the company in consideration of certain stipulated premium payments by or on behalf of the insured. It has been held that a verbal contract of insurance is valid, but by universal practice the contract is made in writing, and is called a policy. The policy, therefore, expresses the terms of the contract, and governs the right of the parties.

Fraternal insurance, on the other hand, is the very antithesis of insurance as above understood. A fraternal society does not, and under the laws of the different States has no power to, make an insurance contract. It does not, and cannot, issue a policy. It does not promise indemnity against loss, and is not limited to any stipulated premium payments. Its contract is not between the society on the one hand and the members on the other, but between the members of the society, each with the others, and this contract is not expressed in the certificate of membership issued by the society. This certificate which it issues is not a policy. If it were, the society would immediately cease to be a fraternal society, and be not only classed by the insurance departments of the different States as an insurance company, but required to report and pay taxes as such. The usual form of certificate in use certifies that the holder has been duly and regularly accepted and admitted to membership in the organization, and entitled to all the rights and privileges accruing under the specified benefit, as prescribed in its constitution and laws as then existing or subsequently altered or amended by the duly constituted supreme body of the association. The certificate, therefore, is merely evidence of membership, and certifies that the holder is entitled to the rights and privileges flowing therefrom. It is in no sense a policy, and has never been so construed by any court of last resort.

Of late years there has been some conflict in the decisions of the courts as to the legal effect of some peculiar certificates of membership that have been issued by fraternal associations, but in the leading cases the courts have uniformly adhered to the rule that the certificate is merely evidence of membership, and that the rights of the parties, or, in other words, the contract for fraternal protection, is governed by the constitution and laws of the organization as they exist at the time the right to the benefit accrued, although in some cases the society has been held

to have waived certain provisions in its constitution and laws because of peculiar features in its certificate, and in other cases, certain practices or customs that, in the judgment of the court, tended to mislead the members, as to the proper construction or binding effect of some clauses in the constitution, have been held to be a waiver on those provisions.

The laws of the different States require every fraternal beneficiary association to have a representative form of government and to be organized and carried on for the sole benefit of its members and their beneficiaries. Each member, therefore, has a voice in the management, and has no right to complain of any lawful changes, alterations or amendments to the constitution and laws made during his membership, because they have been made by him or in his behalf, and for the general good of the entire membership.

As the organization is purely mutual, every member who is to share in the benefits ought in equity to bear his fair share of the cost, and it follows, therefore, that he is also bound by any changes that may be made in his rate of dues or assessments by the constituted authorities of the organization.

To sum up in a word, "insurance" is a contract, while fraternal protection is the result of a contract; the one makes a definite promise of a certain indemnity in consideration of certain stipulated premium payments, while the other is the obligation of a fraternal association to pay the benefits prescribed in its constitution and laws when all requirements by or on behalf of a member have been fulfilled. Many, of course, prefer to rely on the business promise of the insurance company to pay the prescribed indemnity, but the millions of members in the fraternal societies of America prefer their fraternal protection, not only because it is cheaper, but because it is better and surer. Every member of every fraternal association fully realizes that any tampering with good faith in dealing with any single member would be fatal to the organization, and ultimately injure the entire membership. In the judgment of all true fraternalists, the mutual interests of the members, therefore, constitute a safeguard that is far more reliable, and certainly more durable, than the mere promise of any purely business company. The membership of the various fraternal beneficiary associations in America that report to the insurance departments of the different States is over 4,500,000, and the amount of protection carried is in excess of $6,450,000,000. Up to the end of 1902, the various societies have distributed over $800,000,000 among the beneficiaries of deceased members. Last year their total payments for death losses were over $73,000,000. These figures do not include the vast number of small societies scattered through the various States which do not report to the insurance departments. For further information consult: The Annual Reports of the Insurance Departments of the different States, and the Official Reports of the Fraternal Beneficiary Societies.

FREDERICK GASTON,
President The Grand Fraternity.

Insurance, Industrial. *Definition.*—Industrial insurance may be defined as family insurance at retail. While in scientific principles it does not differ at all from ordinary life insurance as described by Mr. Nichols, in practice its distinctive features are: (1) that instead of having its policies written for $1,000 and multiples thereof at varying premiums according to mortality tables, its policies call for premiums of 5 cents and multiples thereof, the amounts of insurance varying according to age; (2) the premiums instead of being payable annually, or semi-annually, or quarterly, are payable weekly; (3) these premiums are called for weekly by collectors instead of being remitted by mail; (4) the amounts of insurance payable are based upon mortality tables drawn from experience in industrial insurance, and these tables differ very widely at all ages from the tables used by the ordinary companies; (5) the insurance is taken upon lives between ages 1 and 70, without distinction of sex as to premium, and, in the largest company, without distinction as to color. Industrial insurance is so called because it is the insurance of the working classes. For this reason it has grown very rapidly, and no doubt in time will exceed in amount the annual premium insurance.

History.—For its origin industrial insurance must point to the guilds of the Middle Ages, whose place was taken in England after the Reformation by burial societies or clubs. These were voluntary associations, meeting periodically and collecting dues and undertaking to bury members out of the funds so paid in. The dues were the same for all ages and the management so bad that up to 1867 14,000 of the clubs out of 38,000 had collapsed and a large majority of the existing remainder were insolvent. In 1849 the first industrial life insurance company was founded in England, called the Industrial and General; three years later an offshoot called the British Industry Life Insurance Company was formed; two years after this — in 1854 — the Prudential Assurance Company, which had been in existence six years as an ordinary company, took up the industrial business and soon absorbed the British Industry. At the outset the business was experimental, as actuaries had insufficient data upon which to base calculations; and several tables of benefits for the weekly premium of a penny succeeded each other, widely differing in amount. The first table ran from ages 10 to 50; age 10 was found too high for practical working and the table was run down to age 7; then a demand arose from the people for insurance at younger ages which was first met privately by an agent of the Prudential on his own account. His fine business record attracted the attention of the officers, who found it arose from his practice of himself insuring the younger members of the family. This discovery led to the company's making its system a real family insurance. It was not successful until all ages were accepted. Thereafter the business grew rapidly, so that at the end of 1904 the Prudential had 15,577,161 industrial policies in force secured by £24,973,082 of assets credited to the Industrial Department, besides £30,386,422 assets credited to the Ordinary Department. The Board of Trade exhibit of regular industrial insurance (that is, excluding friendly societies) in Great Britain shows the steady and rapid growth of the business as will be seen from the following table:

INDUSTRIAL INSURANCE IN GREAT BRITAIN.

Year	No. of Companies	No. of Policies	Insurance	* Death Claims Paid	Assets
1890	8	9,432,778	£86,203,873	£1,928,406	£8,737,936
1895	7	14,990,581	144,142,569	2,418,754	13,803,227
1900	14	18,653,846	181,135,538	3,410,642	21,512,384
1904	21	23,810,937	234,217,606	3,944,927	32,412,434

The number of policies in force in the industrial companies of Great Britain equals about one half of the population of the country.

In America the first weekly premium experiment of importance was the connection of the Hildise Bund, a German society which received premiums weekly and used them to pay to the Metropolitan Life Insurance Company to be credited upon quarterly premiums on policies issued by the Company on the lives of the members of the Bund. A large business was done on this plan for several years after 1860, amounting at one time to $7,500 per week. There were other similar societies in name, but they seem not to have done much business. The English experiment had attracted a good deal of attention in America, and various industrial insurance companies were formed which, however, never got to the point of issuing policies. There was a good deal of literary discussion which culminated in a State report in 1874 by Commissioner Clarke of the Massachusetts Insurance Department, describing the work of the English Prudential Company and setting forth the principles of industrial insurance. In 1875 the Prudential Insurance Company of America, then a small corporation in Newark, New Jersey, known as the Widows' and Orphans' Friendly Society, changed its name to the Prudential Friendly Society and in November began the industrial business on the lines of the London company after which it was named. Before it attained much growth the John Hancock Mutual Life Insurance Company, of Boston, the Germania Life Insurance Company, of New York (which, however, soon ceased writing industrial insurance), and the Metropolitan Life Insurance Company of New York, old line companies of experience, began the industrial business. The progress of this system of insurance in the United States has been wonderful. Its first policy was issued in America only 30 years ago; at the end of 1904 there were in force in the United States and Canada over fifteen and a half millions of industrial policies against less than five millions of annual premium policies — the amount insured thereby being respectively: $2,134,458,411 industrial insurance and $9,360,278,728 annual premium insurance.

The following table shows the rapid growth of the business:

INDUSTRIAL INSURANCE IN THE UNITED STATES AND CANADA.

Year	No. of Companies	No. of Policies in Force	* Death Claims Paid	Insurance in Force	* Assets
1880	3	228,357	$ 430,631	$ 19,579,780	$ 4,687,071
1885	3	1,360,375	1,919,533	140,101,632	6,573,267
1890	9	3,875,102	6,438,334	427,882,964	21,229,162
1895	12	6,947,223	12,551,865	820,062,966	54,306,416
1900	17	11,115,968	20,301,793	1,450,324,885	122,943,845
1904	11	15,599,449	31,436,785	2,134,458,411	255,255,034

The following table shows how extensively the working classes take out this insurance, by a comparison of the population of five large cities with the number of industrial policies in force in three companies (other companies are doing business in most of these cities):

City	Population in 1900	Number of Industrial Policies in Three Companies in Force Dec. 31, 1904
New York	3,437,202	2,191,818
Philadelphia	1,293,697	1,145,172
St. Louis	575,238	427,403
Baltimore	508,957	424,135
Cincinnati	325,902	294,540
	6,142,996	4,483,068

There are in the United States about 30,000 agents writing industrial insurance and the head office clerical force numbers about 5,000.

Industrial insurance was introduced in Australia in 1884, but was not vigorously prosecuted until 1887. By the end of 1902 there were six companies, with 291,198 policies in force, assuring £6,216,589. In New Zealand the Government started the business of Industrial insurance in 1875, but quickly discontinued it. In 1881 the Government revived the work of the insurance branch of its Insurance Department, but finally abandoned it in 1887.

* The figures in the columns of payments and assets include the annual premium business of the companies. As to these items, the reports do not separate the weekly premium business from the annual premium business. But so very large a proportion of the business of the companies is industrial that these figures are not at all misleading.

The business flourishes best in Anglo-Saxon countries. It is scarcely known anywhere else except in Germany, where in 1900 there were 34 companies, having two and a half millions of policies in force for $115,000,000. In Austria, Holland, Denmark, Sweden, Switzerland, Hungary, and Belgium the business is transacted on a very small scale.

Policy Contracts.—We have said that the unit in industrial insurance is the five cent premium; the amounts of insurance vary with the age of the insured and the duration of the policy. The curve in the mortality table descends from birth to age 12 and then ascends, and the companies for the same premium increase the amount of insurance with each age up to age 10. The amount of insurance thereafter does not decrease through life; for the policies are, like the annual premium policies, constructed with a level premium carrying a reserve from age 10 on whole life and on endowments at all ages. Insurance at younger ages is term insurance. Different kinds of policies are issued. The Prudential and John Hancock companies' policies are nearly all whole life; the Metropolitan policies issued for the last ten years have been practically all endowments; together these three companies have in force and issue yearly about 95 per cent of the American business. This table of the largest of the companies shows the benefits payable on children for a 10 cent premium with the period of endowment:

PREMIUM OF 10 CENTS, IN USE BY THE COMPANY WHICH HAS IN FORCE ABOUT ONE HALF OF THE AMERICAN BUSINESS.

Amount payable provided death occur after the policy has been in force for the following periods:

Age next Birthday	Under 3 months	Under 6 months	Under 9 months	Under 1 year	1 year	2 years	3 years	4 years	5 years	6 years	7 years	8 years
2	16	20	24	30	34	40	48	58	110	160	200	240
3	18	22	28	34	40	48	58	102	150	200	240	
4	20	26	32	40	48	58	94	140	200	240		
5	22	28	36	48	58	80	130	190	240			
6	24	32	44	58	78	120	180	240				
7	28	38	52	70	110	170	240					
8	32	44	70	100	160	240						
9	40	56	100	150	240							

On each anniversary of the policy, after the insured reaches twelve years of age, there will be added to the maximum amount named in the above table, ONE DOLLAR.

The endowment periods and the amounts payable at the end of such periods are as follows:

Policies issued at	age	2	mature in	47	years for	$276.00
"	"	"	3	"	48	"	278.00
"	"	"	4	"	49	"	280.00
"	"	"	5	"	51	"	283.00
"	"	"	6	"	53	"	286.00
"	"	"	7	"	56	"	290.00
"	"	"	8	"	62	"	297.00
"	"	"	9	"	68	"	304.00

For five cents per week the benefits are one half those named above.

No higher premium than 10 cents will be taken.

It will be noticed that the amount payable increases materially after the policy has been in force for several years. The reason is that in the early years insurance is not needed in so large amounts and the unearned part of the premium charged is used to increase the amount of insurance in the later years as well as to shorten the endowment period. Technically in industrial insurance adult insurance begins at age ten because the old actuarial tables were not carried below that age. Above that age at each advancing year at entry the amount of insurance for the same premium decreases. Thus, entering at age 10 the amount of insurance is $230 for 10 cents; entering at age 20 $154; entering at age 30 $120—and so on. These amounts are payable (with certain dividend additions) at age 80 or prior death. There are other tables, whole life tables, where the insurance at certain ages for the first few years of insurance is slightly higher for the same premiums; and there are also 20-year endowment tables, where obviously the death benefit for the same premium is less.

The provisions of the policies in industrial insurance do not differ in principle from the annual premium policies. Because of the small premium payable weekly the policies are only in partial benefit during the first year of insurance, that is, one quarter is paid if death occurs within six months, and one-half if death occurs after six months and within a year. The insurance is payable immediately upon receipt of proofs of death; and these proofs are prepared by the companies' agents without charge. The intention of the insurance being mainly to provide for expenses of sickness and death, everything is done to facilitate the payment of the premiums of the company and of the claims to the insured. Collectors call weekly for the premiums; the companies have local offices convenient to the policy holders and from there death claims are attended to and paid either without reference to the home office or on telegraphic instructions therefrom. Four weeks' grace are allowed in the payment of premiums which in practice is usually extended to five weeks, within which time claims are paid even if premiums have not been. Paid up policies are issued after two, three, or five years in different companies. The Massachusetts law provides for two years; the New Jersey law for three years; the New York law does not compel paid-up insurance—but the company grants it nevertheless. Revivals are freely granted in cases of lapsed policies, and where policies have been long lapsed, so that payment of arrears is difficult, the companies loan the amount of arrears on the security of the policies. Special allowances are made in cases of long strikes and lockouts, death claims usually being paid even if policies are lapsed.

Dividends.—Policies of industrial insurance have in form been mostly non-participating; but of late years three American companies have begun to pay dividends and have voluntarily disbursed to industrial policy holders over nine and a half millions of dollars—averaging over a million of dollars annually in cash dividends for the last eight years. The profits come from a very small margin upon an enormous amount of business. It has been estimated that the reduction of premium one cent a week on each policy would bankrupt the largest of the companies in five years. The only feasible way of reducing the cost to the holder is therefore the return of surplus by dividends. Two of the companies

once in five years return to the holders of life policies a cash dividend equal to ten weeks' premium — or about 20 per cent of the premiums for a year. One of these companies, which in 1896 practically withdrew the whole life form and has since issued endowments, substituted as to this form of contract a reversionary dividend guaranteed in the policy; that is, after the third year a sum is annually added to the face of the policy equal to the sum of ten weeks' premiums. Thus a policy which is for $230 after the first year (premium 10 cents, age 10 years) eventually is for $297 payable as an endowment at age 80. One advantage of this long endowment is that the amount of paid up policy is readily calculated by the insured — being for such a proportion of the amount of the policy as the number of years paid bears to the endowment period. The other of the large American companies provides in the policies for reversionary dividends to be paid when death occurs after 5 years; for cash dividends after 15 years and quinquennially thereafter; and for cash surrender values after 20 years.

Mortality.—When the cost of industrial insurance is considered, the first thing to be noted is the increased mortality among the industrial classes. Let us compare the number per thousand dying at each of several specified ages according to (*a*) Farr's English life table of the general population in Great Britain, compiled from two censuses (we have no such table in America); (*b*) Actuaries' table, (that is, a table of insured lives formulated from the combined experience of 17 companies, compiled by English actuaries, which is made the statutory basis in many of the United States for the computation of insurance liability); and (*c*) the Metropolitan Life Insurance Company's industrial table (based on observation of twelve millions of insured lives):

DEATHS PER 1,000.

Age Next Birthday	Farr	Actuaries	Metropolitan
20	7.74	7.29	10.52
21	8.46	7.38	11.56
25	9.24	7.77	14.14
35	11.24	9.29	17.15
45	14.50	12.21	22.56
55	21.75	21.66	35.22
65	41.20	44.08	64.51
70	60.80	64.93	90.99

A glance at these tables shows the net cost of industrial insurance of adults to range from 140 to nearly 200 per cent of the Actuaries' table. As the experience of the American companies shows an actual mortality of only about 80 per cent of the Actuaries' table, it follows that the industrial mortality is from 170 to 230 per cent of annual premium insurances. At age 35, generally taken as an average age, the percentage is 230. A comparison of industrial mortality with general mortality shows a less, but still large, percentage of difference. It is reasonable that it should be so, because, in the first place, industrial insurance in this country has not yet reached, in proportionate amounts, the agricultural and rural population, which is so large a percentage of the whole population. In the second place, the mortality of the working people in cities is large, because of the exposure, the mode of life, the hard toil and confinement, the carelessness of self which the observation of everybody must have noted among working men and women. To some extent there is also a selection against industrial companies, often unconscious, which is the correlative of the unconscious selection against tontine and endowment policies in annual premium companies. A man vaguely conscious of low vitality will insure himself more readily than his opposite, just as one vaguely conscious of superior virility will prefer tontine to whole life insurance.

Insurance of Children.— The insurance of children has been the subject of much discussion in England and Ameriea, and legislation against it has been proposed; but no law of prohibition has been passed in any State where the business has been well established. In England the law has remained for many years permitting the insurance of children within the limits previously adopted and maintained by the companies; and this after repeated Parliamentary investigations. In America, New York State in 1892 adopted as part of the insurance code a provision authorizing the insurance of minors according to the table of benefits in use by the companies. The Province of Ontario, Canada, followed a few years after with a similar table. In the States of Massachusetts, New York, Pennsylvania, Ohio, Connecticut, New Hampshire, Tennessee, Missouri, Wisconsin, Michigan, Georgia, Virginia, North Carolina and California proposed legislation forbidding the insurance of children has been defeated, in many of them repeatedly. In Massachusetts in 1895 the joint legislative committee took six weeks to investigate the subject, examining hundreds of witnesses, resulting in a vote of 143 to 29 against the prohibitive bill. Colorado is the only State which forbids the business and the law was passed there without a hearing of the company which had only recently begun business in the State — in other words, in anticipation of, not after experience of, evils. So France, which is without experience of industrial insurance, recently passed a prohibitive act; while in Australasia, where such insurance has been written for years, New Zealand has passed a law on the lines of the English permissive act. The tables above printed show the American limit on child insurance by the practice of the companies. It is apparent therefrom that at the earlier ages the insurance is simply burial insurance, while at the older ages it amounts to a very respectable endowment insurance. No case of child murder or abuse for insurance has ever been shown in the United States. In England the matter is thus summed up by Doctor Jones of the Royal Southern Hospital in Liverpool (where child insurance is most common and has been for many years) in a book 'On the Perils and Protection of Infant Life': "The incentive to child neglect and child murder is *not* the prospective receipt of insurance money." Statistics in both England and America show that the mortality of insured children is less than the general child mortality. The following table compares the mortality of the company which has in force one half of all the industrial policies in the United States and Canada, with that shown by Farr's English life table of the general population of

Great Britain and by the United States census of 1880:

DEATHS PER 1,000 AMONG CHILDREN.

Age Next Birthday	Farr's Table	United States Census		Co.'s Experience 1904
		General Population 1900	31 Cities 1880	
2	65.59	46.6	87.4	32.7
3	36.13	20.5	36.7	22.
4	24.59	13.2	24.7	12.8
5	17.92	9.4	17.9	8.8
6	13.53			
7	10.75			
8	9.18	5.2	8.9	5.1
9	7.69			
10	6.56			

*The census tables of 1880 were the last to give mortality percentages for the group of 31 cities. Improvement in the mortality of the general population and of the company's experience is shown in the adjoining columns. The company's business is, however, done almost entirely in cities, and a very large proportion is in the 31 cities referred to in the census of 1880.

The companies limit the amount of child insurance to the amounts fixed by the New York statute, which are practically those shown by the Infantile Endowment tables printed above; and the rule in case of over-insurance is either for all companies to cut down the payments proportionately or for the companies issuing the latest policies to return the premiums. No specialty of child insurance is made. Industrial insurance is, as we have said, family insurance. This is strikingly shown by comparing the percentage of population at various groups of the ages with the percentage of policies in force at the same ages in the largest industrial company:

Ages	Percentage of Population Census, 1900	Percentage of Policies in Force, 1904
1 to 4 inclusive	9.57	9.57
1 to 9 inclusive	21.28	22.47
1 to 14 inclusive	31.94	34.66
1 to 19 inclusive	41.91	45.35
5 to 17 inclusive	28.42	31.65
20 to 29 inclusive	18.29	17.68
30 to 39 inclusive	13.88	12.83
40 to 49 inclusive	10.16	9.96
50 to 59 inclusive	6.80	8.06
60 to 69 inclusive	4.08	4.86
1 to 69 inclusive	95.12	98.74

Expense.—Like everything else sold at retail the cost of industrial insurance is high. Its cost, however, is scientifically adjusted. The loading on the net premium is necessarily about double that used in annual premium companies; and, as we have seen that the mortality is also double at some ages, the cost of industrial insurance is necessarily great compared with annual premium insurance. The expense ratio is high because of the system of weekly collection of premiums, because of the large number of policies for small amounts which have to be recorded and cared for at the head offices, because of the relatively high cost of medical examination (two of the large companies medically examine every applicant, adult and infantile, on every application, however small, and the third examines in cases of policies over $300), and because of the heavy lapse rate. One company paid $550,000 in the year 1904 for medical examinations of applicants for industrial insurance. As the premiums are payable weekly there are 52 opportunities each year for lapsing, as against 1 to 4 in annual premium companies; and in the first year of insurance the lapse ratio is very high. All of these lapses are a pecuniary loss to the companies; and this largely accounts for the high expense ratio. In fact it takes nearly and in some cases more than the fund accumulated from premiums for five years to cover the reserve. Of the business lapsed within the first three years, more than half goes off within the first three months, and six sevenths during the first year of the life of the policy. The lapses in industrial insurance, while they cause a heavy loss to the companies, do not usually represent any serious loss to the insured. The premiums are weekly and the policies are carried on grace for four weeks after lapse; and they are reissued upon payment of a single week's premium; the loss is therefore not like that of those who pay annually. On the infantile table the policy, if reissued, is for the same amount as the policy lapsed would have called for at the age of reissue, because up to age 10 the amount of death benefit increases each year; so that the only loss is from the partial benefit rule for the initial year. On the adult table a policy lapsing during the first year in force can be revived at any time without any loss to the insured; after a policy has been in force a year it may be revived within a year after lapse at the original amount in full benefit. Here also is no loss. If the policy has been in force two years and lapses, the premiums will within two years thereafter be loaned by the company if the applicant wishes to revive and is unable to pay the arrears. Here therefore there is no loss. If not revived and new insurance is taken, the amount of insurance at each advancing year is very little less than the preceding year. If the policy is kept in force until it is entitled to be surrendered for paid-up insurance, the holder may have paid-up insurance; or he has the alternative privilege of extended insurance, by which the full reserve is applied to the payment of premiums upon a new policy issued at the attained age. If he elects to take the extended insurance he can begin paying again when the period of extension has elapsed and thereby lose nothing by his original lapse except the reduction in the amount of the policy by his increased age at the date of the new policy. It goes without saying that in all these cases lapses are no great source of loss to the insured. There can be no doubt that the lapses in industrial policies are very largely by those who subsequently take new insurance, suffering no loss at all in case of revival, and otherwise suffering only the small loss arising from partial benefits during the first year and the small decrease of benefits by reason of advanced age. The fact is there are many who insure and lapse and reinsure, according to their disposition of mind and their resources, with small loss to the holders but large loss to the company, which is put to the expense of commissions for placing the business and the large expense of caring for it. After

three years the business is very persistent; so that the average persistence of industrial business as a whole compares very favorably with annual premium business. The average duration of the policies in force in the largest English company is 10¾ years, and that of the policies of the largest American company (which has been in business only about half as many years) over 6½ years. In Australia, in 1902, the average duration of the policies in the company which had two thirds of all the industrial insurance in force was about 6 years. The expense of insurance to the industrial classes has been greatly reduced by the introduction of what is known as intermediate policies. These are policies which in 1896 the two largest industrial companies designed and issued for the working classes. They are policies for an even amount of $500 each, premiums payable yearly or in half or quarter years. The premiums of the largest company are based on the industrial table of mortality and the loading is similar to that used in annual premium policies. The result is a moderate priced ordinary policy contract issued on all the usual forms — whole life, limited payment and endowment — and placed in a separate class for dividends. A working man who has got beyond the necessity of making small weekly payments and can afford to pay dollars annually where he has been paying cents weekly, finds in these policies insurance approximately as cheap as his rich neighbor buys. There were at the end of 1904, 308,796 of these policies in force in the United States and Canada, insuring $152,710,657. The English Prudential had at the same date 742,147 ordinary policies in force, of which a very large proportion is endowment, averaging less than £100 each, the premium averaging about £5. The English Prudential policies are participating, the dividends being applied to increasing the amount of insurance. In America the "Intermediate" policies are also participating, kept in a separate class; the dividends have been large, derived principally from saving in mortality and gains in interest; they are payable in cash reduction of the premium or in reversionary additions. The industrial companies on both sides of the water claim that by the issue of this class of policies they have perfected the system of industrial insurance and have performed their full duty to the wage-earners by furnishing insurance adapted to the condition, means, habits of life, and requirements of all: weekly premiums for those who can afford no better, and for those of an age unsuitable for large insurances; annual premiums for small policies with dividends as earned, bringing the cost down to nearly the cost of what is known as ordinary insurance.

HALEY FISKE,
Vice-President of the Metropolitan Life Insurance Company.

Insurance, Life. Life insurance is the application of insurance to loss or injury caused by death. It may be defined as a contract under which one party called the insurer, in consideration of certain stipulated payments, termed premiums, agrees to pay to another a moneyed benefit upon the happening of a contingency dependent on the duration of a human life. The person whose life is the subject of the contingency is termed the insured, and the party receiving the benefit the beneficiary, while the benefit itself is called the insurance money. The contract when in writing is known as a policy. In practice the contingency involved is either the death or the continued survival of the insured. If the benefit is to be paid upon the death of the insured, it is known as a strictly life insurance contract, if upon his survival to a given age, it is called an endowment. The issue of such contracts is confined to companies incorporated for the purpose and to benevolent and fraternal associations. The fundamental object of life insurance is the protection of families and dependents, or of business interests from the pecuniary loss which is liable to result from the death of the party insured. It furnishes a method of at once providing a fund which shall be available in case of such misfortune, by means of a series of limited payments made during the continued life of the insured. The latter is able for a small consideration to secure the benefit of an immediate investment payable upon the expiration of the contract, instead of awaiting the slow and uncertain process of accumulating a capital which may be defeated by his untimely decease. The business man is thus enabled also to protect his creditors or his business as well as those dependent on him. In case of the endowment the policyholder is able to unite such protection with a fund available for his own use should he survive during a stipulated period. In short, life insurance may be regarded as a method of purchasing immunity against moneyed misfortunes liable to result from death, and appeals with special force to those whose chief dependence is on their daily or yearly earnings. It offers peculiar advantages, too, because it can be placed beyond the reach of creditors and need not be involved in business misfortunes, while the policies themselves can be hypothecated or sold like ordinary commercial securities.

The policies are issued by the companies upon written applications from the purchasers, in which detailed statements are required regarding the health, habits, and family history of the applicant, accompanied by the certificate of a physician based on a careful examination. The policy stipulates as to the amount and character of the benefit to be paid, the party to whom it is payable, and the premium payments to be received, together with such other provisions as may be needed to express the complete contract with the applicant. The premiums are usually payable annually or at shorter intervals in advance.

History.—Life insurance in its more modern form was practically unknown until it was introduced into England by the establishment of the Amicable Society in 1696. Other companies were gradually started there. But for many years afterward it was prohibited on the continent of Europe as immoral. Modifications of the system, however, known as annuities and tontines had long been familiar, and the former had been employed as a basis for national loans. It was not until the 17th century that sufficiently reliable observations on human life were compiled to furnish a satisfactory foundation for the business, and that the commercial elements of society attained an importance sufficient to give it the needed support. Companies thereafter multiplied in Great Britain and the business gradually extended to the continent of Europe.

Life insurance was introduced from Great Britain to America, and the first society was organized in Philadelphia in 1759 for the relief of Presbyterian ministers and their widows and children, followed 10 years later by a similar corporation for the benefit of Episcopal clergymen and their widows. Their operations, however, were confined to the classes named. The first company to attempt a general business was the Insurance Company of North America, organized in the same city in 1796. A number of other companies gradually followed in that and other important cities during the earlier part of the 19th century. All these earlier offices, however, combined fire or marine insurance, or banking and trust business, as well as annuities with life insurance, and gradually abandoned the latter. Popular prejudice proved to be too strong, and the economic condition of the country to be too little developed to make its prosecution successful. The real beginning of modern life insurance in the United States dates from the organization of the Mutual Life Insurance Company in New York in 1843, which was quickly followed by that of others, both there and elsewhere, some of which had already secured charters for the purpose. The business of these new companies was confined to life insurance, and their success led to the gradual multiplication of such companies until within 20 years it had attained proportions which made these corporations among the most important financial institutions of the land. The business has since continued to expand until the enormous sums now invested in life insurance in America far exceed those in any other country. Its leading institutions are unrivaled in their size elsewhere, and several are transacting business in every quarter of the globe.

Insurable Interest.—Every form of insurance presupposes some pecuniary interest in the subject insured, without which it would be a mere speculation or gamble and a temptation to crime which public policy does not permit. Where the insurance is on property, such interest on the part of the insured must usually be commensurate with the amount of the insurance. The insured is restricted in his recovery on the policy to a sum which will indemnify him for his loss. This doctrine, however, is relaxed in case of life insurance, since no strictly moneyed value can well be placed on a human life. The principle of indemnity goes no farther here than a requirement that the party procuring the insurance shall have such an interest in the life insured as shall prevent the contract from being a mere gamble on its survival. Any reasonable expectation of pecuniary advantage from the continuance of the life is deemed sufficient, such as dependence or the payment of a debt. Every person, too, is assumed to have an interest in his own life, which he may insure to any amount, and may make the policy payable to any beneficiary whom he may elect so long as the scheme is not a mere cover for gambling.

Classes of Companies.—Life insurance is carried on by two distinct classes of institutions. One consists of those which treat it as an ordinary commercial or financial business, the other, of those which deal with it as a form of benevolence or fraternal aid. The former may be again divided into those in which the premiums are definite in their amount and time of payment, and those which depend on assessments from their policyholders to pay claims as they become due. Life insurance as a business, however, is chiefly carried on by the first mentioned, which are known as old line or legal reserve companies. It has been found the only business method which has successfully stood the test of experience. Two systems have been adopted in this class of companies. One is the mutual, in which the policyholders are regarded as the owners of the corporation, and all profits or surplus arising from the business are distributed among them. Such surplus performs the functions of an ordinary capital. The choice of directors or trustees and consequent management of the company is usually placed in the hands of the members. The majority of companies in the United States are conducted on this system. The other is the stock plan, in which the company is owned and controlled by stockholders, who deal with the policyholders simply as customers and divide the profits of the business among themselves. Higher premiums are charged for mutual policies for the purpose of creating a surplus, which may be eventually returned in dividends to the policyholders. In the stock policy, on the contrary, the holder sacrifices the right to dividends in exchange for a lower premium rate. Many of the companies combine both features, mutual offices issuing also stock policies, known as non-participating, at lower rates of premium. Often, too, a stock capital is added to a mutual company which is restricted by the charter to the amount of dividends which it can receive. When the stock is allowed to share in the profits in excess of its legitimate earnings as an investment, the system is known as the mixed plan. Sometimes, too, the election of directors is apportioned between the stock and policyholders, or, in a company otherwise mutual, may be restricted to the former. In some of the States a capital stock is required by law in the organization of a mutual company until it can be replaced by surplus belonging to the policyholders. The distinctive feature of the legal reserve company, apart from its fixed premiums, is that it must at all times maintain a reserve fund adequate to the payment of its future obligations, less the future premiums which it will receive; in other words, it must in a commercial sense be financially solvent. It is also known as an old line company because conducted on the principles which have always characterized life insurance as a business until the introduction of the assessment plan.

Assessment companies were started in the United States over 30 years ago for the purpose of furnishing life insurance at lower rates than those charged by the regular old line companies. Instead of a fixed premium, assessments were levied on the policyholders to pay the losses as they occurred. Various methods were adopted for levying such assessments, and, as the policyholders were in theory liable for whatever assessments were needed, they only became insolvent when unable to meet their claims. The plan was an adaptation of methods employed by fraternal orders, and for a while was exceedingly popular among those seeking a cheap form of insurance, since the actual cost of insurance being low in the early years, the assessments were correspondingly light. But the increased

cost as time went on ultimately so increased the assessments that it was found impossible to enforce them, and most of the companies were compelled to retire or change their methods. Comparatively few now remain, and the system itself has been condemned by some of the State authorities. Many of the companies were accustomed to assume the character of benevolent organizations in their operations.

Stipulated premium insurance is a combination of the assessment and legal reserve systems with a view to correct the defects of the former. The premiums, as in the old line company, are definite payments, supplemented, if needed, by assessments, and a moderate reserve is carried to reduce or render such assessments unnecessary. It has been employed by some of the assessment companies as a method of establishing their business on a firmer foundation. But life insurance as a business in the United States, as well as in other countries, is chiefly done by old line legal reserve companies, whose definite contracts, financial strength, and scientific business methods give to such contracts a commercial standing unattained under any other system.

Industrial insurance is a branch of the legal reserve system designed to furnish burial funds for the poorer classes, and especially children. Its principles do not differ from those of ordinary insurance, but its methods are essentially different in many respects owing to the small size of the policies and the character of the applicants. The premiums are payable weekly or at short intervals, and are collected by agents through house-to-house visitations. It was introduced into the United States from Great Britain about 30 years ago, having been an outgrowth of the burial clubs and friendly society system of that country, and has attained enormous proportions in America, as well as Great Britain. See INSURANCE, INDUSTRIAL.

Fraternal and benevolent societies have been popularly associated with assessment companies owing to the similarity of their methods. But they are a distinct class, having the character of social clubs solely for fraternal or benevolent purposes, with a form of insurance as merely one, though it may be their most important, feature. They are strictly mutual in their character. Their general type of organization is that of the ordinary society or club known as a lodge, whose members meet for social or fraternal purposes. The society is formed of a combination of such lodges, through chosen representatives, into a single grand lodge, by which the insurance is carried on, the subordinate lodges acting the part of agents in securing members and collecting the payments. The insurance itself is simply a death benefit allowed to the members under provisions in the constitution, and not a business contract secured by the purchase of a policy. The premiums are paid in the form of dues and assessments, much after the manner of assessment companies, the dues being used for expenses and other incidental features. Efforts are being made to scientifically adjust the payments and benefits of these societies according to the cost of insuring the various members, as is done in the legal reserve companies. The insurance which they furnish is regarded as a species of fraternal aid to the members and their dependents, and their operations are not subject to the same legal control as those of business corporations. See INSURANCE, FRATERNAL.

Mortality Tables.—The life or mortality table, from which the premiums must be determined, is at the foundation of the business. The tables mostly employed are constructed from the experience of the companies themselves with insured lives which have been found to have a mortality distinct from that of the population at large. Such a table in its simplest form consists of a statement of the number surviving at the beginning of each succeeding year out of a given number living at any age, from which the number of deaths and percentage of mortality at each age are readily determined. The latter is the important function employed in life insurance. In America the two tables which are chiefly used, and which have been recognized by the various States as standards for determining the liabilities of the companies, are the Actuaries or Combined Experience and the American Table. The former was constructed from the experience of 17 prominent English offices, and was published in 1843. Its general accuracy has since been confirmed by later observations. The American Table was constructed from the experience of the Mutual Life Insurance Company of New York, and came prominently into use about 1868. It was found to represent the actual experience of American companies better than foreign tables which had been employed. Many other mortality tables have been constructed which have attained a recognized standing. Prominent among them were the Northampton and later the Carlisle Table, both of which were framed from mortality returns of English towns, and were successively used both in England and America, until replaced by the Actuaries' Table. Farr's Tables, constructed from the census returns in Great Britain and published in 1864, have been much used for certain purposes. Various tables, too, have been constructed from observations in other European countries and employed there as standards. The three requisites of such tables for insurance purposes are that they should be safe, should be properly graduated, and should fairly represent the mortality to be expected.

Premiums.—The premiums, which must equal the cost of insurance, are computed from the risk of death, as shown by the mortality table; and since the former are usually fixed sums, while the risk increases with age, it is necessary to charge more than the actual cost in the early years in order to offset the deficiency later on. This excess above the cost is accumulated at compound interest by the company, and constitutes its reserve fund. The rate of interest assumed in the calculation is such as the company is justified in expecting will prevail during the continuance of the contracts. In the United States 4 per cent was formerly considered a safe rate, but the continued fall in interest has led to a general substitution of 3 or 3½ per cent for newer contracts. The payments, which, when thus accumulated will be sufficient on the average to meet the claims on the policies as they fall due, are known as the net premiums, to which additional sums are added for expenses and other contingencies. When thus loaded they are known as gross or office premiums, and are the real amounts charged by the company.

These loadings may vary from a trivial addition to 40 per cent or more of the net premium, according to the character of the contract. Premiums in ordinary insurance are usually payable annually in advance, and are then known as annual premiums. Frequently the payments are restricted to a certain number or term of years. These are known as limited payments. Sometimes the entire payment is made at the start. This is known as a single premium payment. The annual premiums, too, are sometimes payable in instalments at shorter intervals to suit the convenience of the policyholder.

Expenses.—The expenses of a life company are chiefly made up of two classes, the cost of securing the business, and the office expenses incident to its care. The principal element in the former is the commission or other compensation paid to the agents, which also varies with the character of the contract. It is usually a large percentage of the first premium paid, and a very moderate percentage, in the nature of a collection fee, for those succeeding. The office expenses aside from the salaries of the officers and employees include taxes, fees, rents, and those numerous items involved in the care and investment of funds, and the conduct of the business.

Legal Reserve.—The legal reserve is the measure of an ordinary life company's liability on account of its insurance contracts to which, in addition to any other liabilities, its funds must be equal in order that it may be legally solvent. The process of estimating this reserve is known as valuing the policies. Two methods of valuation are used, known as net and gross, dealing respectively with the net and gross premiums charged. The former is generally employed in the United States, and is the one usually adopted by the State authorities. It consists in determining what fund the company must have in its possession in addition to the future net premiums which it expects to receive in order to meet future claims on its policies. This fund is the net or legal reserve. It assumes that all other expenditures are cared for by the premium loadings. The gross valuation, on the contrary, deals with the gross or office premiums, and a certain deduction is made from the resulting fund for assumed future expenses. The latter method is regarded as furnishing the surest test of a company's actual condition, and is sometimes employed when the question of legal solvency is in doubt. The former has the advantage of compelling the use of the premiums for the purposes assumed by the company in their computation.

As in the case of the premiums, the computation of this reserve depends on the future rate of interest which is assumed. In most of the States 4 per cent, as in the case of premiums, was formerly regarded as a safe rate, and even 4½ per cent was at one time allowed, but during recent years 3 or 3½ per cent have been insisted on in the case of new contracts by some of the States.

The mortality on which the sufficiency of the premium depends is lighter in the case of insured lives, owing to their careful selection, than among the general population or that called for by the mortality table for a number of years after the policy has been issued. The cost of insurance in mutual companies is reduced to the policyholders by this lighter mortality. In American companies the mortality among lives that have not been newly selected remains nearly stationary after age 20, or increases but slightly until age 40 is reached, when it is not far from 1 in 100, increasing more rapidly with each age thereafter until it is about 2 per cent at age 50 years and 4 per cent 10 years later.

Form of Contract.—As before remarked, policies may be either participating or non-participating, the chief difference being that smaller premiums are charged in the last and no provisions are included for sharing the profits. Policies for short terms are more frequently made non-participating. The classes of policies most in use are three in number, whole life, term, and endowment. In the first the insurance is simply against death and covers the whole term of life, while in the second it runs only for a certain term of years. The pure endowment is an insurance payable at the end of a certain term of years only in case the insured is alive, and is the reverse of a term policy. The ordinary endowment which is almost exclusively used, however, and which has of recent years largely supplanted the whole-life policy, is a combination of the pure endowment and the term policy. The insurance money is payable to the insured if alive at the end of the endowment period, or to some beneficiary in case of his previous death. Such endowments are usually issued for periods of from 10 to 30 years.

The annuity is a contract frequently combined with life insurance in which the life insurance principle is reversed. The purchaser buys outright a contract under which he is to receive an annual payment during life. Annuities have been familiar since an early period, and before life insurance became understood was the principal form of contracts dealt in by this class of companies. It secures a fixed income during life to those who may wish to surrender their capital for that purpose.

Still another form of contract is the tontine, in which the funds of a body of subscribers are pooled and the accumulations are divided among the survivors after a certain time. Societies of this kind were formerly common in Europe and were occasionally found in the United States, though few, if any, remain.

All these different contract forms are now frequently combined in various ways in the ordinary life policy, in order to increase its attractiveness or to better meet the requirements of policyholders. Various methods of premium payments and of paying dividends are also combined for the same purpose. Great ingenuity has been displayed by the companies in making these combinations, and an almost innumerable variety of contracts have resulted. Among those more familiar in the United States are the tontine or deferred dividend policies, in which dividends are accumulated and divided among the surviving policyholders after a certain period; limited payment policies, in which the premiums are limited in number; instalment policies, in which the insurance money, instead of being payable in a single sum, is converted into a series of annual payments as an annuity; and debenture bonds, which are similar to instalment policies, except that the insurance money is represented by a bond bearing an annual inter-

est and payable at the end of a certain time. Besides, there are policies insuring the life of more than one party. When they are payable upon the death of either of the parties insured, they are known as joint life insurances; when payable only on the death of all they are survivorship insurances. The greater part of the business in the United States is written either in the form of continued payment life, 20-payment life, or 20-year endowment insurance. Renewable term insurance is another plan for reducing the cost of insurance during the early years and avoiding the accumulation of a reserve. The premium is only sufficient to pay for the temporary cost of insuring and increases with age. The policies are written for a single year or term of years, with the right to renewal at the increased premium. The subsequent increase of cost, however, has been found a serious obstacle to the plan. Preliminary term insurance is also insurance for a single year, but with a right of renewal for the entire period at the same rate of premium. The object of such policies is to enable the company to use the fund which, under the law, must otherwise be added to the reserve during the first year of insurance to meet the cost of securing the business, and is a favorite method with young companies having a limited surplus.

Dividends.—Dividends are apportioned from the accumulated surplus according to the equitable share of each policy. Many different methods of determining this share have been devised. That chiefly employed in the United States is what is known as the Contribution Plan. The surplus is treated as made up of gains from a lower mortality and expense and a larger interest earning than those assumed in computing the premiums, and the contribution of each policy to the fund is estimated. Dividends are applied according to the provisions in the policy in various ways. They may be used as single premiums to increase the amount of insurance, which is called a bonus addition, or to shorten the term of the insurance, or to the payment of the premium, or may be received in cash. When, as in tontine dividends, they are to be apportioned among a special class, the share of surplus belonging to that class is separately dealt with. Sometimes a minimum future surplus earning, which can be relied on, is made the basis for guaranteeing the payment of a certain dividend in the policy. But as such earnings are uncertain, the usual estimates of these amounts, as given by the companies, are simply expectations and not obligatory as promises. The fall of interest rates has tended to reduce dividends during recent years. At an earlier stage of life insurance, dividends were payable at intervals of five years or more. Afterward, as the business became better understood, the practice of declaring annual dividends in the United States became universal. Of late, however, the introduction of deferred dividend policies has again lengthened the distribution periods among these special classes. Notes were at one time received by many of the companies in part payment of premiums, but the practice has been for the most part abandoned.

Policy Loans.—Practically all forms of life insurance in which a level premium is paid involve an investment or savings bank element, which is represented by the reserve and is now treated by the law and the contract as belonging, in a sense, to the policyholders. This is the basis of the policy loans which are so generally granted. The portion of the reserve fund belonging to the individual policy, or a portion of it, may be borrowed by the policyholder as a loan bearing interest, on his own note with the policy as a collateral, and is deducted from the insurance money when the policy becomes payable.

Termination of the Contract.—The life insurance contract is terminated either by becoming a claim, which is usually payable at once after satisfactory proofs have been furnished, or by previous lapse or forfeiture through a violation of its conditions, especially non-payment of the premium, or through a voluntary surrender. Policies usually provide for their surrender and allow the insured to receive back a large part of the reserve held against them, called the surrender value, either in the form of paid-up insurance for such an amount as this value will purchase, or insurance of the original amount for such a term as it would pay for, called extended insurance, or else in the form of cash. Statutes in many of the States require similar returns in case of lapse for non-payment of premium, and such provisions are also usually incorporated in the policies. Non-forfeiture laws, as these statutes are called, are designed to prevent the assumed hardship or injustice entailed on the insured through the forfeiture of the money standing to his credit in the reserve fund. This money is regarded as a saving bank accumulation for his future benefit, which is in a sense his property and which should be restored after reserving a surrender charge to compensate the company for his loss. Since healthy lives are most likely to lapse and the cost of insurance to be made greater for those who remain, the selection against the company, as it is termed, is an important element in determining the surrender charge.

Insurance for the Benefit of Wife and Children.—The fundamental object of life insurance as a family protection is liable to be defeated if the policies can be attached for debt. Therefore, statutes have been enacted in many of the States exempting from the claims of creditors policies up to a certain amount made payable to wives and children. The interests of such parties, too, have been held unassignable, at least without their consent. The life insurance contract, except in the case of benevolent societies, is held to be the property of the party who is the beneficiary, when not otherwise stipulated, and not of the party who may pay the premiums, and can usually be assigned as collateral or sold outright by the owner. Policies not protected by statutes, as above, may, like other personal property, be attached for debt to the extent of their surrender value; and where, as in endowments, two interests are sometimes involved, the interests may be severed.

Medical Examinations.—Medical examinations of applicants for insurance are essential to prevent an inroad of unsound lives that would wreck the company, whose mortality rates are based on the acceptance only of healthy lives. For this purpose medical examiners are employed, who report the health, physical condition, and habits of the applicant and the life history of his near relatives. These reports

are passed upon by the medical directors of the companies to determine whether the life is up to the normal standard fixed by the company, otherwise the application is rejected.

Sub-Standard Insurance.— Parties who may not be seriously diseased and yet who are not insurable as healthy lives, on account of constitutional weakness or predisposition, are known as sub-standard or under average lives and are insured by some companies as a separate class under special rates of premium, or under special policy conditions, according to the defects of each applicant.

Limitation of the Risk.— Formerly many restrictions were imposed in the policy as to the residence, travel, and personal habits of the insured, and military employment and suicide were debarred. These have been gradually modified or removed, until it has become customary with some companies to issue so-called indisputable policies, which in the absence of fraud, can only be forfeited by failure to pay the premiums.

Moral Hazard.— The moral hazard in the business arises from deceptive representations as to health, the temptation to insure as a mere speculation lives in which no insurable interest exists, in the expectation of an early death, and the temptation to destroy life through suicide or murder in order to secure the insurance money. The ability of an average applicant to judge of his future health is shown in the higher death rates among those classes of policies where an early death would profit the applicant and is an element of the moral hazard.

Legislation and Supervision.—Until about 1860 little or no supervision was attempted over life insurance by the various States. Legislation concerning it was chiefly confined to taxation of the companies or restrictions on their operations. The multiplication of irresponsible corporations, the growing magnitude of the business, and the recognition of the dangers involved in its mismanagement, led to the creation of special departments for its supervision, and the enactment of laws for its conduct by the States of Massachusetts and New York. Their example has been followed by most of the other States. The fundamental aim of these laws is to compel the companies to so utilize and apply the moneys which they receive as to properly carry out the contracts with their policyholders. This is accomplished by requiring the funds in the company's hands to be at all times sufficient, together with its future accumulations and the future premiums, and their accumulations receivable from its policyholders, to meet its future claims as they arise. Since the proper investment of these funds is also essential, this becomes an important part of the investigation, as well as the general manner in which the business has been conducted. Annual statements are required from the companies, embodying the facts essential to such an inquiry, and may be supplemented, if necessary, by a personal examination of the company on the part of the State official. Failure to meet the required test may be followed by a prohibition against additional business until the defect is remedied, or, if actual future insolvency is threatened, by proceedings to close the company.

Theary of Life Insurance.— The fundamental problem in life insurance is to find the average premium at each age, which, with its accumulations, will be just sufficient to meet the promised future payment. This is done by first finding the present value of that future payment, or the sum which, invested immediately at compound interest, will, on the average, with its accumulations, meet this payment when due. The probability of death occurring, and consequently the payment becoming due, during any subsequent year is determined from the mortality table. This probability, multiplied by the sum which accumulated to the end of that year would equal the required payment, is the present value of the payment if made that year. The aggregate of such values computed for each successive year of life, is the entire present value of the future payment to which the present value of the premiums to be charged must be equal. These premiums are in effect so many annuities receivable by the company, and their present value is the amount which, at once invested at compound interest, would reproduce them. The problem, therefore, now becomes the determination of the present value of an annuity at any given age. The process is analogous to that already described. The value sought is the aggregate of the amounts which, at compound interest, would provide the annuity at the beginning of each year, multiplied by the probability of the insured being then alive to pay it. Having determined the present value of any given annuity it is easy to find the annuity which has the value required. This annuity is the net premium.

Life Insurance a Science.—This brief explanation will serve to illustrate the general character of the problems involved in the theory of life insurance, many of which are exceedingly complicated and require a knowledge of the theory of compound interest and of the calculus of probabilities, which, when combined, form the mathematical basis of life insurance. The calculus of finite differences has also an important place, and even the infinitesimal calculus has been utilized to advantage, especially in preparing mortality tables. This whole subject has been developed into a special branch of mathematics termed actuarial science, which has become a recognized profession, whose members, known as actuaries, direct the mathematical computations required for the business. A special class of symbols has been devised in connection with this science, by which the processes involved in its various calculations are readily expressed in the shape of ordinary algebraic formulas. Life insurance computations have been greatly facilitated by an ingenious device known as commutation columns, through the use of which the calculations are much simplified. Published tables of premium and annuity rates and policy values, in connection with the more important benefits, too, relieve much of the office work.

WALTER S. NICHOLS, A.M.,
Lecturer on Insurance at Yale University, and Editor of the 'Insurance Law Journal' and 'Insurance Monitor.'

Insurance, Life, Assessment. The plan of meeting the cost of life insurance through assessments was first used in the United States

about 1807 by local bodies, making no pretense to business standing or management. Their plan followed in a crude way that of the levy societies and friendly societies of Great Britain, but without the variety of benefit which these give. As a rule, they confined themselves to funeral or death benefits, with, occasionally, weekly payments in case of sickness.

The disasters which, in the early seventies, overtook companies operating on the basis of fixed premiums and an accumulated reserve, turned popular attention strongly toward a system which claimed to give corresponding benefits without the accumulation of large funds, and which confined its demands for payments to its actual needs in meeting benefits. As a result there grew up organizations operating through local councils or lodges, having a general governing body, representative in character, at least nominally. These grew, in time, into the great fraternal or beneficial orders, with hundreds of thousands of members, obligated to pay hundreds of millions of benefit, the integrity of the obligation dependent upon the ability for perpetual renewal of membership, with perpetual willingness to respond to assessments.

The marked success of these organizations in securing large memberships and temporarily meeting claims at low cost attracted the attention of men intent upon conducting life insurance as a business. There were organized a great number of business, or open, companies, which dispensed with the lodge machinery and placed the business upon a commercial footing. In organizing these, advantage was taken of the charitable and club statutes of different States. Not until 1883 was there a special law regulating this business in New York. The law in Massachusetts was enacted in 1885.

There was no attempt at scientific method, and, indeed, the claim of the earlier projectors of these companies was that, for the practical business of life insurance, a mortality table is useless. It was constantly set forth that, since contracts remain in force but a comparatively few years, a table based upon the theory that every man will ultimately die and become a claim on the funds, is essentially a falsehood.

At first, the simple plan was to collect from every member, on the death of another, $1, with generally 10 cents for expenses, and to pay to the beneficiaries of the deceased the fund formed from the dollar payments. The benefit was, therefore, indeterminate in amount, as was also the cost. An early modification of this scheme was to divide the members into classes of 1,000 or 2,000, which classes were theoretically to be kept full by the infusion of new blood, which, it was claimed, would, by keeping a level average age, result in a level cost. This theory ignored the fact that death rate depends upon actual, and not average, age.

When the plan of uniform payments began to break, through its practical discrimination in favor of older lives and heavier risks, the plan of graded assessments fixed by the age of admission was adopted. This simply modified the degree of error, by substituting for the assumption that all risks were equal, the equally inconsistent assumption that, after the admission of a member to a society, the risk of death ceased to increase. The scheme thus resolved itself into an attempt to meet the cost of insurance, which increases with increasing age, by a level premium, but without the accumulation of a reserve for the diminution of the risk. The fallacy of this was repeatedly urged by those who understood the scientific principles of life insurance, but obtained little or no effective hearing. Strenuous opposition was developed to the accumulation of a reserve, and a great parade was made of "the reserve in the pocket," ready to the call of the company when needed.

The irregular periods for calling assessments gradually merged into periodical assessments at fixed dates, varying in amount with the number of claims which had accrued since the last preceding call. Then came a tendency to call for an assessment in advance, to provide for death claims to occur, the fund thus accumulated being generally named an "emergency fund."

In the meantime, statutes regulative of the business were passed in many States, but in none was any particular regard paid to the demands of a permanent business. In fact, these statutes were in very many instances addressed to securing the advantage of a claim of State supervision, without the imposition of the requirements necessary to permanence. In 1885, however, Massachusetts provided by law that the amount of the benefit must be fixed in the contract, and this provision was finally adopted by New York in 1892.

Finally, as the proportion of older members became heavy, with rapid increase in the cost of the benefits afforded, there came rapid diminution of membership, especially among the younger, and this, in turn, had a tendency to increase the death cost by depleting the character of the risks. The transfer of memberships from one association to another followed in many instances. There was no possibility in such transfers of protecting accumulated liabilities, the result being that claimants under death claims which had accrued received but a small percentage of their face. Later, many of the larger and better managed business organizations passed under the laws regulative of fixed premium insurance with accumulated reserve, and the plant which they had established thus became foundation for new legal reserve companies. In 1899, the State of Massachusetts repealed the law permitting assessment life companies to do business therein, and provided a means by which those then authorized to do business on the assessment plan could obtain licenses under the legal reserve law.

There was an important organization of the business assessment companies, known as The National Convention of Mutual Life Underwriters, which held its first meeting in Elmira, in June 1876. Reports of the fourth meeting, in 1879, show 136 companies, with a membership of 253,000. This convention held its last session, at Mackinaw, in 1898. The report made at the session in 1897 showed 650 companies, with a total membership of 4,039,000, and insurance in force to the amount of $7,800,000. The payments to beneficiaries for the year 1896 were given at $73,000,000, and the total payments to beneficiaries, so far as records existed, since the organization of the business, amounted to $711,700,000. These statistics, to a large extent, covered the fraternal, as well as the business, organizations. The reports of the 23 sessions of this

convention afford an amount of historical matter connected with the movement of great importance.

The fraternal organizations established, in 1886, the National Fraternal Congress, which still holds annual sessions and has compiled and is compiling exceedingly valuable statistics. It formulated the National Fraternal Congress Mortality Table, which has been adopted as the official standard in several of the statutes since enacted, and which is coming quite generally to be recognized as a standard table in connection with fraternal insurance. Their latest compilations show a membership of four and one half millions, with benefit obligations amounting to nearly seven billions of insurance.

There is also an organization of younger fraternal orders, known as the Associated Fraternities of America, the first meeting of which was held in 1901. The published records of both of these associations afford a vast amount of useful material to anyone who would study the history of the fraternal insurance movement of this country. GEORGE DYRE ELDRIDGE,
Vice-President Mutual Reserve Life Insurance Company.

Insurance, Life, Statistics. The business of life insurance is of comparatively modern growth in this country, the oldest company transacting it being but little over 60 years of age. It was practised in Europe, however, many years before, but its development there was slow. There was much prejudice against it at first in this country, and instead of being regarded as a most beneficent method whereby the widows and orphans and other dependents upon the head of a family could be provided for in the event of his death, it was denounced as a gambling scheme, a wager against death, and some clergymen went so far as to condemn it from their pulpits as opposed to biblical laws. But the pioneer companies pushed the business with vigor, at the same time carrying on an educational campaign, until the public have come to recognize the value and importance of life insurance, valuable alike to the rich and the poor. To the poor, and to those of moderate means, it is held to be an imperative duty for every man whose life is insurable to insure for as liberal a sum as he can afford, in order that, in the event of his death, those dependent upon him may not become objects of charity or be thrown upon relatives for their support. The rich man finds in life insurance a relief from possible financial entanglements that might otherwise, upon his death, wreck his estate. Men whose wealth would seem to relieve them of all financial anxiety carry insurance upon their lives in sums ranging from $50,000 to $2,000,000. Their reasons for so doing are that they have investments that may prove troublesome for their executors to close up, necessitating sacrifices that would prove costly. The insurance upon their lives is payable immediately upon their death, and the funds thus made available at once will prevent the sacrifice of any portion of their estate to meet the claims of clamorous creditors.

Primarily life insurance is designed for the especial protection of families deprived by death of their head, the breadwinner, upon whose efforts they are dependent for subsistence. By the payment of a small sum annually a policy of insurance can be obtained whereby the company contracts to pay to the heirs of the insured a specified sum in the event of his death. For instance, a person 30 years of age can obtain a policy of insurance upon his life for $1,000 upon the payment of an annual premium of $24.18, and this rate does not increase during the life of the policy — hence the term "level premium." Should he die at any time after receiving the policy the company will pay the amount to his designated beneficiary immediately upon the receipt of proofs of his death. Insurance for a larger sum is obtainable by the payment of the same rate per $1,000 of insurance. The rates increase according to the age of the applicant, for the death rate increases with age, and the added liability must be provided for correspondingly. While at age 30 the premium for $1,000 of insurance is $24.18, at age 40 it is $32.76, and goes higher as age increases. The rates for life insurance are based upon scientific deductions. Carefully prepared mortality tables show how many persons out of a given number of a certain age will die each year, and while it cannot be told of an individual when he will die, it can be estimated with certainty how many persons in his class will die each year. Life insurance is a business of averages, and the cost of insuring 1,000 or 2,000 or 10,000 persons at a particular age is mathematically determined. The rates charged by all companies are substantially identical, and a person desiring insurance, if in good health, can obtain any amount he is able to pay for from $500 to $2,000,000 — this being the largest amount carried by one man.

As stated, the early days of life insurance in this country were days of trial and tribulation to the organizers of the pioneer companies, but the characteristic energy which is found in all great enterprises has carried the American life insurance companies far in advance of any others. A few statistics, given in concise form, will serve to show the magnificent proportions to which the business has attained in this country. At the beginning of 1905 there were 93 "old line," or "level premium" companies, doing business in the United States, a few confining their operations to a particular section, but the majority of them seeking business in all the States. Of this number 84 had 3,269,089 whole life policies outstanding, insuring the lives of their owners in an aggregate amounting to $6,767,197,991, while the total insurance in force (including endowments and other forms of policies) amounted to $10,412,078,338. The 93 companies were organized at different times and several of them have not been in business long enough at this writing to have made a record. The total premium receipts of 79 of the companies since their organization amounts to $5,214,441,446; they have paid to policyholders $3,276,051,697; their present assets held for the protection of policyholders are $2,261,851,182. As these companies operate on the mutual plan, all the assets belong to the policyholders; if the assets on hand be added to the amount paid to policyholders it gives an aggregate of $5,537,902,879, exceeding the amount paid in premiums by $323,461,433. In other words, the companies have paid to policyholders or now hold for their protection $106.20 for every $100 they have received in premiums.

In 1904 the total premium income of 79 companies was $378,118,121, most of this being in cash for new policies issued and for renewals on old policies. The investment of these vast sums pouring in to the several companies requires the highest order of financial talent in order that a profit to the companies shall be secured and no bad investments made. That these funds have been carefully and judiciously handled is shown by the fact that the companies hold or have paid out in benefits $106.20 for every $100 they have received in premiums.

The vast sums received annually by the life insurance companies for investment places them in the front rank of the great financial institutions of the country. Their finance committees are constantly on the lookout for safe and profitable investments, and their detailed annual reports to the various State insurance departments show that they are large holders of National, State, city, railroad, and other bonds, paying good rates of interest. Other classes of securities that are known to be safe are purchased at times, but their soundness must be absolutely guaranteed.

Other forms of policies than those referred to as "whole life" are issued by the companies, but the fundamental object of life insurance is the protection of families when the breadwinner is removed by death. Endowment policies provide for the payment of a stipulated sum at a specified period, 10, 15, or 20 years from the issuance of the policy. The gives the insured himself the use of funds in his mature years, the proceeds of his savings in his younger years, when his earning capacity was at its best. This form of insurance is popular with young men, who can afford to pay the extra cost of such policies. The companies also sell annuities, contracting for a specific sum paid in advance, to pay to the assured a certain sum annually during his lifetime. How much can be paid annually for the advance premium paid is computed by the actuaries of the companies, according to mathematical formulas scientifically evolved. It has been the aim of the life insurance companies, in their educational campaigns, to liberalize the conditions of their insurance contracts as far as safety will permit, and to popularize them by issuing policies to suit the requirements of all classes of persons, hence there are an almost endless variety of contracts grafted upon the original "whole life" or "ordinary life" form, as the basic contract is designated. But for whatever change of form there may be, whatever of special conditions may be exacted, there must be a corresponding increase in the premium paid.

Four of the American companies are doing business in foreign countries and have been wonderfully successful. Their active and aggressive methods have enabled them to meet in competition the native companies, and generally to excel them in the volume of business written year by year. This has led to restrictive legislation in some countries calculated to restrain the activities of the American companies, but they have been found equal to the emergencies and have generally conformed to all lawful requirements.

In some States the law requires that a life insurance company, before beginning business shall have a certain amount of capital paid up, for the protection of its policyholders, but before the enactment of such law, some companies were organized on the purely mutual plan, without capital. Of the 102 existing companies, including the latest additions to the number, 38 are mutual, while the others possess capital varying from $25,000 to $2,000,000. Dividends to stockholders are generally limited to 7 per cent, all profits in excess being apportioned among the policyholders. In 1904 the capital stock of all the stock companies amounted to $16,919,930; the dividends paid to capital were $916,824, while dividends to policyholders were $33,579,020. Policyholders thus participate in the profits of the companies, whether stock or mutual, according to the varying terms of their contracts. Dividends to policyholders are computed on the anniversaries of the dates of the policies and passed to their credit, to be applied to the payment of future premiums, to increasing the amount of insurance, or in some other way inuring to the benefit of the insured, as he may direct. The insured not only provides insurance upon his life for the benefit of his dependents, but he becomes a member of a dividend-paying corporation, with an interest in all its assets. No better testimony in favor of life insurance can be adduced than is to be found in the figures above quoted, showing the millions upon millions of dollars distributed among the beneficiaries of persons insured. The funds so distributed usually reach the beneficiaries in the hour of their direst need, when death has visited the home and removed the prop that supported it.

CLIFFORD THOMSON,
Editor 'The Spectator,' New York.

Insurance, Marine. American marine insurance business had its birth at about the close of the 18th century, but suffered heavily when the American flag began to disappear from the high seas. For the past quarter of a century it has had a hard struggle to keep itself anywhere near the old standard of prosperity. To do this it has had to draw for the greater part of its returns upon foreign commerce, and been forced to compete with English companies.

New York's marine-insurance history is that of all the other seaboard States, for in nearly all marine insurance once flourished, but has now succumbed to English competition. The golden period of American marine insurance was between the years 1840 and 1860, when the clipper sailing ship was developed and perfected. In those times the leading merchants owned their own ships, and frequently a member of the firm would go to China or the East Indies to supervise the proper distribution of the cargo, and to secure a remunerative one for the return. The ship and cargo were insured with an American company, and as it might be as long as nine months before the vessel was heard from, the risk was considerable and rates were high. As much as five or six per cent was charged for insurance in those times. The rate on dry goods from Liverpool to New York in the old packet sailing ships was placed at two per cent. This trade was carried in American ships, and the insurance, both on the vessel and on the cargo, was naturally placed in American companies.

But the rates of insurance have changed with the transformation of the ocean-carrying service. The East India goods are now shipped across the Pacific to San Francisco, and thence east via rail. The cost of insurance on these is now

only three quarters of one per cent. Rates on the Atlantic have likewise declined. Insurance on dry-goods and like merchandise carried in the modern "liners" is placed at two tenths of one per cent. In other classes of goods depreciation in rates is in like proportion.

Marine underwriters do not ascribe the decline in American marine insurance to any trouble from unwise laws or legislative interference, but to the changed business conditions and to English competition. The bulk of the carrying trade of the world has passed into British hands, and a British merchant and ship owner insures in a British company. The English marine companies have, as well, invaded American soil, and have secured a large portion of the American business. When the English companies first established themselves in America, along in the early seventies, they began cutting rates. The American companies did not effect any combination to prevent this, but followed their example. The American companies were also placed somewhat at a disadvantage by the laws governing the admission of foreign marine-insurance corporations. The foreign companies are required to make a deposit before they can write American business; but in New York State, which has stringent insurance laws, the amount is fixed at the minimum capitalization allowed a home company, namely, $200,000. So much of the carrying trade of the world is done under the British flag and with the aid of British credit, and with countries under British control, that the American underwriter, working against all these disadvantages, is seriously handicapped. Therefore, there being no national or local tariff associations among marine underwriters, the American companies are worsted in this rate war. There are now not enough of them to form any sort of an association which would wield much power.

Despite the work of the American companies to hold their own, through loss of prestige on the ocean and active rivalry on land, there are a number of stock and mutual American marine-insurance companies which continue to do a flourishing business. The largest and one of the oldest is the Atlantic Mutual of New York, which has over $12,000,000 of assets, and has been most carefully managed throughout its career. It was formed in 1842, at the time when many stock companies were turned into mutual companies, and by which change the profits accrue to the policy-holders instead of the stockholders. The company is noted for retaining its faithful and tried officers until their death. The late John P. Jones was connected with the company for 50 years, and was its president for 40. In his life-work of building up the company he was ably assisted by Vice-presidents W. H. H. Moore and A. A. Raven, who have been with the company 30 and 40 years respectively. Among the other large companies which still do a thriving business are the two Boston corporations, the China Mutual and the Boston Marine.

There have never been many marine Lloyds in the United States, though this form of marine insurance has been most in vogue in marine underwriting in Great Britain. The origin of the term is both interesting and peculiar. The name of Lloyd originated in old Lloyd's Tavern, in Tower Street, London, far back in the days of Queen Anne. It was the practice of many shipowners and traders to drop in at the tavern and talk over their prospective profits; and gradually a custom developed of inscribing their names on a blackboard, certifying that the men signing would be jointly liable for the loss of a vessel during a certain voyage. From this crude beginning have grown the world-famous associations in the British Isles. In the United States there are a few Lloyds, two of the principal ones being located in New York — the United States Lloyds and the New York Marine Underwriters.

The scope and definition of a marine policy is, of course, entirely different from a land fire policy. The risks insured against are many, and may be summarized as including all perils of the sea. There are two classes — a voyage and a time policy; the former is generally used in insuring vessels, and the latter for cargoes. There are naturally many clauses governing marine-insurance policies, such as capture, seizure, war, and so on. The life of the insurance on a ship begins at the port from which it is insured until moored for 24 hours at the port to which it is insured. When an insurance is made on freight to be carried under a charter, the policy attaches as soon as the vessel sails, although she may be destined to a distant port for her cargo.

Though single losses to marine underwriters have been small, compared with some of those of fire underwriters, there have been shipwrecks that have lived in marine insurance men's memories. One of the greatest losses to American marine insurance was that of the American steamer Central America, which foundered off the Cuban coast in September 1857. The Central America was bound from Aspinwall, now Colon, to New York, and was loaded principally with treasure from the California gold-mines. She carried insurance amounting to between $700,000 and $800,000, all of which had to be paid by American underwriters. Another notable loss was that of the steamer Erie, which sailed from Pernambuco, Brazil, loaded with coffee, on 1 Jan. 1893, and was burned at sea. Coffee prices were high in those days, and the Erie went down with $500,000 insurance.

Two losses which not only made inroads on the American marine companies, but which also seriously crippled the growth of American steam transatlantic service, were the sinking of the steamer Arctic, off Newfoundland, in 1854, by collision, and the disappearance of the steamship Pacific, which sailed from Liverpool for New York in January 1856, and was never heard from. Both steamships belonged to the Collins Line, which was the first one to put on steam-vessels for the Atlantic trade. These early losses were particularly detrimental to American marine insurance, because the companies carried extremely heavy lines in those days. Among the recent heavy losses was that of the steamer Oregon, which was run into and sunk off the Long Island coast in 1886. American marine underwriters had between $700,000 and $800,000 on the Oregon's cargo. The loss of the Oregon also showed underwriters how quickly even a properly constructed iron ship sinks. The introduction of iron in place of wood for building vessels has not made any material difference in the rates of insurance, for iron has hazards which wood has not, and *vice versa*.

As to the future of American marine underwriting, it is difficult to prophesy. As trade follows the flag, so marine insurance flourishes in the country with a prosperous merchant marine. The United States is again forging to the front as a great ship-building nation, and this gives American marine underwriters hope that American marine insurance may follow in the wake of the growth of American ship-building.

Insurance Patrol, an organization peculiar to New York and other large cities, which cooperates with the fire department, but is controlled by the combined insurance companies, who support it through the board of fire underwriters. The New York corps was organized in 1835, when there was an epidemic of incendiary fires. The patrol is provided with wagons and an equipment designed for its special work. Its most important service is in saving goods, which it does by removing them from burning buildings, or by covering them with rubber or oiled sheets, as a protection from water, dirt, or cinders. In some cities it is known as salvage corps, or protective association.

Insurance, Science and Economics of. Insurance, to-day, forms an integral element of our social and commercial life. From crude beginnings, the principle of providing, by the contributions of the many to a common fund against the financial consequences of individual losses due to the inherent uncertainties in human affairs, has been perfected until the modern practice of insurance includes all the more important contingencies affecting human welfare. In both science and economics insurance holds a most important position, which becomes more readily apparent as the practice and results of the business are inquired into and considered in their relation to individual and national well being. As a business insurance holds rank as one of the foremost enterprises of the age, equal in importance to banking and transportation. It would, without exaggerating, be as difficult to think of commerce without insurance as of transportation without railroads or the transmission of intelligence without the telegraph. Modern life has become so completely interwoven with the idea of insurance that there are few contingencies affecting life and property to which the principle of insurance has not been more or less successfully applied.

The scientific basis of insurance is the same in all its branches, that is, the laws of chance and probability. In considering any future event we are confronted by the uncertainty whether such an event will or will not happen, but from the facts of experience upon a large scale it is now possible to calculate with sufficient accuracy the monetary equivalent required to meet the risk assumed by an insurance company. The recognition of insurance as a science dates from 1747, when Corbyn Morris published his classical 'Essay Toward Illustrating the Science of Insurance,' wherein he attempted to "fix by precise calculations several important maxims upon this subject." Accuracy and precision is the essence of all scientific method which in its practical application to insurance does not differ in any important essential from the method which underlies all other scientific processes. The larger the mass of facts considered, the more definite must be the resulting conclusions, which for practical purposes are the equivalent of natural laws and confirmed by subsequent experience verifying the truth of the theory assumed.

Insurance science has thus far found its chief development in the department of life contingencies, due, no doubt, to the fact that the average duration of human life and its pecuniary value require to be determined with the greatest possible accuracy, since the contracts made dependent thereon extend, as a rule, over many years. In other forms of insurance, such as fire, marine, and accident, the contracts are generally for short periods, seldom of longer duration than a single year. Hence most of the scientific discussions and the numerous dissertations upon the subject relate chiefly to life contingencies, but there has been a decided improvement in this direction during recent years. The deliberations of associations of actuaries and insurance managers extending over many years, in particular the Institute of Actuaries of Great Britain, are fully entitled to rank, in thoroughness of research and grasp of fundamental principles, with the deliberations of other scientific bodies. It is, no doubt, due to this fact that insurance was included in the most recent classification of the sciences as represented at the International Congress of Arts and Science at Saint Louis, held in connection with the exposition of 1904.

Insurance as a science is a branch of economics, although only a few of the more recent writers on the subject have given careful attention to the theory of risk and insurance in its relation to public welfare. A fairly complete explanation of the economic theory of insurance is to be found in an essay by Allan H. Willett, published by Columbia University in 1901. He holds, and very properly so, that "as a general rule uncertainty exercises a repellent influence in human life, and the existence of risk in an approximate static state causes an economic loss, while (on the other hand) the assumption of risk is a source of gain to society." From this point of view the business of insurance does not differ essentially from general commercial enterprises. Risk is assumed in mining and agriculture in much the same manner as risk is assumed in the business of insurance, but in life insurance, for illustration, the assumption of a risk and the equivalent premium payments required are determined by the theory of probability and the established laws of human mortality and observed experience. In general commercial enterprise the risk assumed is, as a rule, created, while in insurance the risk is pre-existing. This marks the broad division between gambling and insurance. Insurance is not "in the nature of a bet," for in insurance an effort is made to eliminate an existing individual risk by its assumption on the part of the many, while in gambling a non-existing risk is created with resulting uncertainty and needless loss to society.

Insurance companies are chartered institutions with their powers of existence and rights of transacting business derived from the State. They are subject to supervision by special departments in charge of commissioners or superintendents of insurance, who have ample power to inquire into every important detail of office administration. At first the burdens of State supervision were light, since the companies transacted but little business outside of their home

State, but within the last generation the business operations of most of the companies have of necessity been extended to other States and territories. There has, as a result, been developed a vast system of over-supervision, accompanied by an immense amount of over-legislation, much of which is inimical to the highest and broadest development of the business. The position of the commissioner is, as a rule, a political one, subject to the changing fortunes of the parties, and new men have frequently come forward with radical ideas, which, if carried to the extreme, would have resulted disastrously to the companies and their policy-holders. It has been very ably pointed out by Senator John F. Dryden, in an address on 'The Regulation of Insurance by Congress,' that "Insurance is to-day a universal institution reaching all classes and affecting more or less all commercial interests. It is an essential element of human progress and a method and means for the uplifting of the masses to a higher level of economic security. It has become national in character, and few companies confine their operations to a single State; in fact, if operations were so limited they might prove disastrous and make the conduct of the business impossible."

The taxation of insurance is a difficult problem and a matter of serious concern to the companies. In its final analysis the incidence of insurance taxation falls upon the policy-holders and the cost of insurance is correspondingly increased. The fact is overlooked that insurance itself is in the nature of a tax and that additional tax burdens are a needless hindrance to the largest development of the business. In life insurance alone the annual amount paid in taxes, fees, etc., is not far from $10,000,000 and the proportion of taxes to income is constantly increasing, due to additional burdens placed upon the companies as a convenient source of public revenue. A tax upon premiums is an unjust burden upon the business, and is both inexcusable and unscientific. This tax falls alike upon new premiums for risks just incurred and upon renewal premiums upon risks assumed years ago. Since risks assumed years ago were calculated to produce a certain result on the assumption of a known mortality and 4 per cent interest, taxes upon premium payments must necessarily and considerably decrease the returns to participating policy-holders, and increase, in consequence, the cost of insurance. If carried to the extreme, especially in the case of companies which issue only non-participating policies, it is possible that the companies may ultimately be unable to meet their obligations in consequence of a policy on the part of the State which is as unwise as it is unnecessary.

Insurance by government is not a new proposition, but it is only during the last half century that there has been an effective effort to establish an insurance department by government in active competition with private companies. In life insurance the experiments of England and New Zealand are the most valuable because the results are, on the whole, fairly comparable with those of non-governmental institutions. Post-office life insurance in England was established in 1864, and the life insurance department of New Zealand in 1869. The former employs no agents or solicitors, while the latter, in all essentials conforms to the methods and usages of private companies. The premium rates and the results to policy-holders have been about the same, averaging fairly with those of regular companies of good standing. The business results in England have been insignificant, while in New Zealand a fair measure of success has been achieved. In New Zealand at best and at most, the results have not been better, the cost has not been lower, and the security has not been superior to that offered by private institutions, which have increased their business in force at the rate of 51 per cent during the past nine years, against an increase of 16 per cent for the government department. The private companies are gradually gaining on the government, and while in 1894, 49 per cent of the total policies in force were with the government, in 1902 the proportion was only 42 per cent. To those who believe that the government which governs best is the government which governs least, and that the limit of State duties is unduly enlarged by State trading in such directions as these, the New Zealand experiment is conclusive evidence that State effort in the field of life insurance is not likely to produce results superior to those which have made commercial life insurance the most successful business of the age.

As distinct from voluntary insurance by government or private companies, the so-called system of compulsory insurance for workmen holds a unique and important place in the social economy of certain European nations, particularly Germany. The term compulsory insurance is seriously misleading, for as a matter of fact, the system is not insurance at all, but a state provision for workmen against the financial consequences of accidents, sickness, invalidity, and old age. In its inception the German system of government insurance was a measure designed to counteract the socialistic tendency in opposition to the monarchy. In its development it has been made to include nearly the entire body of workmen and as a theory of government and social reform it has unusual attractions. Critically examined, the system is little else than poor relief under another name, and inadequate in many respects as all methods of compulsory thrift must necessarily be. It is insurance in name, but not in fact, for it is not by the sole contributions of the beneficiaries that the required funds are provided, but by the joint and compulsory payments of employer and employee, plus a state subsidy or grant from the general revenue raised by taxation. The evidence as to the economic and social results of this system is so involved and conflicting and subject to such different interpretations, that no final conclusion for or against the system can be advanced at the present time. This much, however, it is safe to say, that the anticipated benefits have not materialized, and the socialistic agitation, although much modified and of a somewhat different character, is to-day more pronounced in Germany than ever before. Nor has compulsory insurance solved the labor problem and brought about a substantial improvement in the relation of capital and labor. The most serious economic aspect is the burden of the system upon German industry and the resulting handicap upon competition in international trade. This explains the anxiety of the German government to induce other nations to follow its example and by means of exhibits,

illustrations, and literature advance the cause of government insurance abroad. Even at the present time the system is but in its initial stage, and time alone can prove whether it will ultimately result to the advantage of the German people or otherwise. In the opinion of Prof. Farnam of Yale, an impartial student of the subject, "the supporters of the German system are claiming for it more than the facts of the case as they now stand warrant," and that "The German experience with this kind of insurance seems to show that, while it is possible with a highly trained intelligent administration to carry through a scheme which will compel provision against various contingencies, it has thus far been impossible to create the instinct of forethought and care which is implied where insurance is voluntary. There are many facts which go to create a strong presumption that the result of this governmental care is actually to make people less careful of the future, and less judicious in their expenditure."

Insurance had its origin in private enterprise and it has attained its commanding position as a world force for the betterment of the social condition of mankind through the initiative, ability, and courage of a group of men as much deserving of immortal fame and glory as any other class of benefactors of the human race. State trading in the field of insurance has never advanced the cause by a single important innovation or by a new theory or a material improvement in practice. The necessary reforms and changes as dictated by experience have been brought about by the companies and it is due to these and these alone that the insurance business has become one of colossal magnitude and world-wide extent. The amount of insurance of all kinds in force in the United States has been estimated by the Committee on Insurance Law of the American Bar Association to approximate $50,000,000,000. The aggregate assets of the companies approximate $3,000,000,000, and the American people pay annually for insurance of all kinds approximately $1,000,000,000, while they received from the companies during the year ended 31 Dec. 1904, approximately $800,000,000. These figures are exclusive of the business of many fraternal associations and local mutual fire insurance companies, of which there is no trustworthy or complete record.

No other business so completely enjoys public confidence and has so successfully stood the test of long experience. As the scientific principles of insurance are examined and the highly specialized administration of the companies is considered and the results are measured by a fair standard of benefits in proportion to cost, the verdict of science and economics will agree with that of the mass of mankind, that our social and commercial progress would have been impossible without insurance. Resting upon this broad foundation of human experience and public confidence, the colossal business of modern insurance challenges the admiration of the world.

Bibliography.— Insurance has a literature of its own and a most interesting history extending over more than four centuries, with suggestions of at least a conception of the insurance idea among the most ancient people of whom there is a recorded history. The limitations of this article preclude more than a brief reference to the more recently published works, among which, however, I may mention Willett, 'Economic Theory of Risk and Insurance' (Columbia University Press, New York 1901); the Yale Insurance Lectures 2 vols., C. C. Hine Company, New York 1904); Alexander, 'The Life Insurance Company' (Appleton & Co., New York 1905); Young, 'Insurance' (Isaac Pitman & Sons, London); Dean, 'Fire Rating as a Science' (J. M. Murphy, Chicago 1901); Phelps, 'History of American Insurance During the Last Decade' (American Underwriter, New York 1904); Vance, 'Handbook of the Law of Insurance' (West Pub. Co., St. Paul, Minn., 1904); Wolfe, 'Investments of Insurance Companies' (The Insurance Press, New York 1905). These are but a few of the many books on insurance which have been published during recent years. In addition there are the Insurance Year Books on life, fire, and miscellaneous insurance, published by The Spectator Company, New York, the annual reports of insurance commissioners, some of which contain critical observations on insurance problems of the day, the annual proceedings of underwriters' associations, and the national conventions of insurance commissioners, the special publications of insurance companies, their histories, etc., the discussions on State supervision and Federal regulation of insurance, of which the two more important are an address by John F. Dryden, president of the Prudential Insurance Company of America (1904), and a report of the Committee of the American Bar Association on Insurance, by Ralph W. Breckenridge, chairman, Omaha, Neb. (1905). But the chief source of information regarding insurance practice, the progress of the business, the organization of companies, etc., is to be found in the technical and general insurance periodicals, the 'Insurance Monitor,' 'The Spectator,' the 'Weekly Underwriter,' and the 'Insurance Press,' of New York, the 'Baltimore Underwriter,' of Baltimore, the 'Standard,' of Boston, and many others. The principal publishers of works on insurance are The Spectator Company, New York, and C. and E. Layton, London.

FREDERICK L. HOFFMAN,
Statistician of the Prudential Insurance Company of America.

Insurrec'tion, the act of rising against governmental authority, active opposition to the power of the state. In the United States, power to suppress insurrections by employing the militia is given to Congress by the Constitution, Art. I., Sec. 8, Clause 15. In 1792 and 1807 acts were passed giving the President power to call forth the militia when notified by an associate justice of the Supreme Court or a district judge that the execution of the laws is obstructed, and on application of a legislature or a governor, when the legislature could not be convened, and to employ also the land and naval forces of the United States. The Whiskey Insurrection (q.v.) was directed against the Federal authority and the President employed force to suppress it on notification by the Federal judge. During the Buckshot War (q.v.), in 1838, between the Whigs and Democrats in Pennsylvania, the governor of that State asked for assistance, but it was refused. The governor of Rhode Island made a similar application during the Dorr Rebellion (q.v.) and the regulars were held ready for action, but their aid proved unnecessary. These last two cases came under Art. IV., Sec. 4,

of the Federal Constitution, which provides "that the United States shall protect" each State on application of the legislature, or of the executive, against domestic violence.

When the Civil War began the President was obliged to take prompt steps in calling out the militia, though no application had been made to him as required by the acts of 1792 and 1795. His action was justified by Art. II., Sec. 3, of the Constitution, providing that "he shall take care that the laws be faithfully executed," but Congress on 6 Aug. 1861 formally validated and made legal all of President Lincoln's previous acts, proclamations, and orders. The Force Bill (q.v.) of 20 April 1871 gave the President special power to use military force in certain contingencies. In the South during the reconstruction period, and in the North, during strike riots, Federal troops have been used.

Integral Calculus. See CALCULUS, INFINITESIMAL.

In'tellect. See MIND; PSYCHOLOGY.

Intent, a legal term signifying the end or object which a person had in the performance of an act, the making of an engagement, or the drawing up of a will. Generally the legal consequences of an act are considered quite independently of the intention of motive of such an act. A wrong done to the person or property of another is punishable at law without consideration of the intentions of the person committing the violence or trespass. But when an engagement has been made by person, or a written disposition of property executed, the intention of the person making the engagement or signing the deed is fair matter for legal inquiry. In this connection a subsequent stipulation by word of mouth is not competent to nullify or modify the terms of a written engagement. Intent also forms an important part in suits for defamation, fraud and negligence. Negligence must have intent to make it criminal, so must defamation and fraud and malicious mischief. Consult Thayer, 'Preliminary Treatise on Evidence' (1898); Black, 'Construction and Interpretation of Laws' (1896); Hardcastle, 'Rules which govern the Construction and Effect of Statutory Law' (1900).

Intent, in psychology, according to James, is that which intelligent consciousness "means or intends"; the intent is a feeling in consciousness which is usually identified or practically identical with the object of consciousness at a particular time. By others, however, the word intent is meant to apply to a certain point of view from which an object may be regarded. Thus when our conscious processes have a unity of interest, there is, as a rule, a certain amount of unity of object. If the interest is divided, more particularly to the attainment of a definite or a vivid knowledge, the object as it becomes more perfectly known is identical with the object as previously less perfectly known; and as one's conscious thought is directed constantly toward the object, it receives, little by little, further and further definite specification, the detail being more or less in the background; yet the detail is all the time in consciousness, as it were inevitably associated with the object itself. The detailed object, considered by Baldwin as the goal of conscious endeavor, may be called the intent of consciousness. The end pursued becomes defined in the pursuit of it, and so far as it is yet indefinite, and therefore only partially developed in consciousness, it is an intent. Consult Baldwin, 'Dictionary of Philosophy and Psychology,' Vol. I.

Intercollegiate Athletics. See EDUCATIONAL ATHLETICS.

In"tercolumnia'tion, in Greek architecture, the space between two columns. This space is measured in diameters of the foot of the column. Vitruvius mentions five varieties of intercolumniation. These are the *pycnostyle* (that is, with columns thickly ranged) of one diameter and a half, which are least frequently found; the *systyle* (that is, with columns harmoniously ranged) of two diameters, the *diastyle* (that is, with columns far apart) of three diameters, the *areostyle* (that is, with columns sparsely ranged) of four diameters; and the *eustyle* (that is, with columns a due distance apart) of two and a quarter diameters.

Intercontinen'tal Railway, or Pan-American Railway, a proposed line of standard gauge, to connect the railway systems of the United States and Mexico with those of the Argentine Republic, utilizing as far as practicable existing systems in Central and South America. At the first International Conference of American States, held in Washington (1889–90) the committee on railway communications said in their report, "That a railroad connecting all or a majority of the nations represented in this conference will contribute greatly to the development of cordial relations between said nations and the growth of their material interests." President Harrison on 19 May 1890 recommended that Congress should make an appropriation for the share of the United States in the expenses of a preliminary survey. Congress complied, and the Intercontinental Railway Commission began its work with A. J. Cassat as chairman and H. G. Davis at the head of the finance committee. The commission spent about $360,000 for surveys, maps, etc., three corps of engineers making experimental surveys between the north of Guatemala and Argentina in 1892, 1893, and 1894. It was found that the approximate length of the line to connect the southeastern boundary of Mexico with Buenos Ayres would be: in Guatemala, 230 miles; Salvador, 220; Honduras, 70; Nicaragua, 224; Costa Rica, 363; Colombia, 1,372; Ecuador, 635; Peru, 1,671; Bolivia, 774, and Argentina, 1,143; total, 6,702. The distance from New York to the Guatemalan frontier is 3,769 miles, and thus the total from New York to Buenos Ayres is 10,471 miles. Links between the termini of the Argentine and Mexican systems: In Bolivia, 192 miles; in Peru, 151 miles; in Nicaragua, 31 miles; in Salvador, 20 miles; in Guatemala, 30 miles. This statement shows that about half of the distance between New York and Buenos Ayres was covered by railways then existing. On 27 Nov. 1901 the Pan-American Railway committee of the Second International Conference held in Mexico City stated that "some additional railroad has been built that could be utilized as a part of a continental system"; that not more than 5,000 miles of road would have to be constructed to establish railway communication between the systems of North and South Amer-

ica; that $200,000,000 would be ample for this work; and that the surveys made by the engineers of the commission demonstrated the practicability of constructing all of the missing links. The concluding assertion, however, should be received with caution. In Central America the proposed line runs along the volcanic coast; on entering South America it is continued among the enormous volcanic Andes, still paralleling the Pacific shore, but further inland. Recommendations made by the committee on 27 Nov. 1901 were that a permanent committee on Pan-American Railway should be appointed "to further the project after the adjournment of the conference"; also that the United States should take the lead in sending "competent and reliable persons whose duty it shall be to determine accurately the resources of the different countries and the condition of railway lines in operation . . . and the prospects for business for an intercontinental line . . . and also to ascertain what concessions or assistance each of the respective governments is willing to grant to the enterprise." The permanent committee appointed by the president of the conference comprised Ex-Senator Henry G. Davis and four others. A special commissioner was sent to the Latin-American republics, as suggested.

In'terdict, an ecclesiastical decree which forbids the performance of certain acts of public worship. When an interdict was laid upon a town, district, or country, all the churches were closed, the bells were silent, the sacraments, except infant baptism and extreme unction (and sometimes even these), were withheld, the rites of burial were not performed, and all the public ceremonies of religion were suspended. Interdicts may be general, as applied to a country or city; particular, as applied to a parish or diocese; personal, as applied to a person, or some class of persons. The bishops seem to have anciently exercised the right of publishing interdicts; for in 870 Hincmar, bishop of Laon in France, issued one against a parish in his diocese. One of the earliest censures of this sort on record was imposed upon the city of Rouen in the 6th century on account of the murder of the Archbishop Pretextatus by order of Queen Fredegonda. In 997 Gregory V. laid the kingdom of France under an interdict because King Robert had married his cousin, and the king was abandoned by most of his court. The same penalty was inflicted upon the kingdom of England under Stephen (1147) by Eugenius III., under John (1207) by Innocent III., under Henry VIII. (1535) with little effect by Paul III., and under Elizabeth (1587) by Sixtus V. Adrian IV. laid Rome under an interdict for the purpose of compelling the Romans to drive out Arnold of Brescia. Gregory IX. made use of the same instrument of compulsion in his quarrel with the emperor Frederic II. During the middle ages the interdict was a powerful engine of attack for the popes in their contests with sovereigns, as the popular dread of its effects was so great that kings were often forced by rebellions to submit to almost any conditions in order that it might be taken off. From the time of the reformation general and local interdicts have become rare. When Paul V. laid Venice under an interdict in 1606, the churches were not closed, and only a minority of the bishops submitted to it.

Interest ("it concerns"— the party in issue — originally an award of damages, later used to evade the anti-interest laws), a charge for the use of money, by custom computed annually, on a basis of so many out of each 100 units loaned; but without diminishing the capital. It is possible to pay interest without loss, because, under conditions now general, the borrowed money can be employed in productive industry, from which a return equal to or greater than the interest can be obtained; or because comfort, prestige, or moral advantages of many kinds are derivable, justifying the expenditure when enough is left. Such borrowing is now useful on the whole, because civilization has ingrained a self-restraint in the masses which makes them in most cases manage money soberly and prudently. But in the early ages this was not so, except in a few developed commercial cities: Babylon carried on business by interest loans, and even bottomry bonds on shipping. Tyre probably did so, the great Athenian commerce was built up entirely by it, as Demosthenes explicitly says, but the mass of people were not fit to have the use of money, had no remunerative employment for it, and borrowed it only to use in self-indulgence, or in desperation because any rate was a choice of evils. There was little property to pledge, and the security was mostly the debtor's person; foreclosure meant selling him for a slave, and the grievance which called for Solon's legislation was the debt-slavery of a large section of the citizens. Hence arose a violent prejudice against the system altogether, as immoral in itself; the law of Moses prohibited it between Jew and Jew; Aristotle says it is essentially immoral, because money cannot breed money (this in the age of Athenian commerce), and never was meant for any such use; the Christian Church inherited the reprobation from the Jewish, and for many centuries forbade its members to take "usury" (money for the use of money, that is, interest at any percentage), and the secular laws were correspondent. In England interest did not become legal till the time of Henry VIII., but had been actually practised for many generations, by legal fictions of partnership or breach of contract, etc.; previously it was in the hands of the Jews — who were so indispensable as financial agents that a Jew who was converted to Christianity had all his property confiscated — and later of the Lombards. The first English permissive statutes fixed 10 per cent as the legal limit that might be charged; early in the 17th century it was set at 5. No serious doubt of the power of governments to regulate the current rate of interest obtainable was entertained till Bentham wrote his 'Defence of Usury' in 1786, proving that the laws could not possibly have any effect; because if the legal rate fixed was equal to or greater than the current rate it could not work any change in it; and if less, holders of money would not lend without obtaining their price plus an insurance for the risk of legal punishment. The doctrine was violently disliked, and has not even yet overcome the determination of the mass to show their dislike of usury by statute, or their belief that they can affect rates; but in a few American States of late years the anti-usury laws have been abol-

ished. Of course a legal rate is always provided in default of contract.

Interest is not a natural right, but a matter of law or contract. The holder of a note payable without stipulation of interest cannot claim any until the note has become due and remains unpaid; thenceforward it draws money at the legal rate. The United States pays no interest on its debts, except where bonds are issued specifying it.

Of the separate States and Territories there is no legal restriction on the rate allowable by contract in Arizona, California, Colorado, Connecticut, Maine, Massachusetts, Montana, Nevada, Rhode Island, Tennessee, Utah or Washington; the legal rate in each is 6 per cent except with Colorado (8), Montana (8), Nevada (7), Utah and Washington (8). The others have rates as follows, the legal rate coming first, then the contract rate permitted: Alabama, 8, 8; Arkansas, 6, 10; Delaware, 6, 6; Florida, 8, 10; Georgia, 7, 8; Idaho; 7, 12; Illinois, 5, 7; Indiana, 6, 8; Iowa, 6, 8, Kansas, 6, 10; Kentucky, 6, 6; Louisiana, 5, 8; Maryland, 6, 6; Michigan, 5, 7; Minnesota, 6, 10; Mississippi, 6, 10; Missouri, 6, 8; Nebraska, 8, 8; New Hampshire, 6, 6; New Jersey, 6, 8; New Mexico, 6, 12; New York, 6, 6; North Carolina, 6, 6; North Dakota, 6, 12; Ohio, 6, 8; Oklahoma, 7, 12; Oregon, 8, 10; Pennsylvania, 6, 6; South Carolina, 7, 8; South Dakota, 7, 12; Texas, 8, 10; Vermont, 6, 6; Virginia, 6, 6; West Virginia, 6, 6; Wisconsin, 7, 10; Wyoming, 8, 12. The rates in the District of Columbia are 6, 10.

That these provisions are more the result of tenacious tradition than of any very exact reasoning is shown by their terms. Only in three States — Illinois, Louisiana, and Michigan — has there been any recent attempt to keep down by law the rate of contractual interest to the rate actually current in the community; in the others, unspecified debts bear 6 to 8 per cent interest while the current rate is 5. As to the contract interest, 11 States stick to the attempt to forbid anything beyond the legal rate; but that assumed interest being above current rates, some leeway is left. One of these, moreover — New York — favors its peculiar interest by allowing any contract rate on "call loans" over $5,000. Sixteen make the rate so high — from 10 to 12 per cent — that any one with the least pretense of credit or security can contract freely; above that, we have to deal with pawnbrokers and "fences," the former protected by tacit allowance, the latter amenable only to criminal legislation.

The theories of interest, like most economic principles, are much disputed by economists. The chief theories are those of "abstinence," holding interest to be a reward of abstinence from using up the capital in enjoyment (a variant of this regards it as a result of the general appreciation of the present above the future); of "productivity," holding it to be the return for production by capital in the same way that wages are a return for production by labor; the combination of the two, regarding the return as fixed by supply and demand, the latter depending on productivity and the former on abstinence; and the "monopoly" theory, which considers it a toll levied on the product of labor by the capitalists who control the means of production.

Interest, in psychology, is a term by which at least two or three different things may be meant. On the one hand interest may be defined as the consciousness which accompanies mental tendencies of any sort so far as they are concentrated on mental objects. It is manifested by a certain amount of voluntary attention to which it may be considered a stimulus. The exploiting habit, curiosity, the desire to know, may be defined as primary forms of interest, as distinguished from custom and habit and one's way of regarding things, the former being regarded by Baldwin in the nature of a stimulus to the intellectual function, the latter as frequent performance of a process.

The word also, in the vulgar sense, applies loosely to what is meant by personal advantage; as, for instance, it is "to a man's interest" to obtain such and such.

In pedagogics interest is often looked upon as a form of amusement, a stimulus through the play-instinct to induce intellectual effort. In the science of teaching, the ideal is to awaken an interest in the ends for which pupils study, and that a permanent interest in the ends should be fostered through the means. Baldwin well says that when interest attaches to the end, but not to the means of reaching it, we have drudgery, as in the case of workmen who think only of the dollar, taking no interest in the labor that wins it; on the other hand, when there is interest in the means, but not in the end, we have play, we do not work. When, however, there is interest in the end to be obtained, and also in the means for reaching the end, the ideal of work desirable in education is reached. See Herbart, 'Science of Education'; 'Doctrines of Interest'; Baldwin, 'Story of the Mind'; 'Educational Review,' Vol. X.; Baldwin, 'Dictionary of Philosophy and Psychology,' Vol. I.

Interfer'ence, in physics, is a phenomenon exhibited by wave motion of all kinds, and consists in the coming together of waves having different phases, in such a way that the effects of the waves are either increased or diminished. Interference may be observed when two different trains of waves come together upon the surface of water or any other liquid. Where the crest of a wave belonging to one system coincides with the crest of a wave of the other system, the elevation of the water surface is sensibly equal to the sum of the heights that the separate waves would have if each existed in the same place alone. When a crest of one of the waves coincides with the trough of another, the disturbance of the water surface is reduced, and the elevation (or depression) which results is equal to the difference between the elevation of one of the component waves and the depression of the other one.

The kinds of interference that are of the greatest practical importance in physics are those which occur among sound waves, or among waves of light. The phenomena in these cases are ultimately of the same general sort as those observed upon the surface of water. In the case of sound, interference may even produce entire silence in certain regions, when two trains of sound waves, of equal intensity, are brought together in a suitable manner. A more familiar result of the interference of sound waves, however, is the production of "beats," when two or

more trains of waves, having but slightly different wave-length, come together while the two are moving in nearly the same direction. This phenomenon is exhaustively treated in Helmholtz's 'Sensations of Tone,' and it also receives a more or less adequate treatment in all of the better works on physics.

The more familiar of the interference phenomena that are afforded by light are those which are observed in connection with soap bubbles and with very thin plates of transparent solids. Light, upon striking the soap bubble or the thin plate, is reflected toward the eye from both surfaces, and the trains of light waves that reach the eye from these two sources, since they have a slight difference of phase (which varies, moreover, from point to point of the bubble or the plate), interfere with one another so as to produce effects that are often very beautiful and striking. A soap bubble, when viewed by monochromatic light, often appears to be covered with dark striæ; the dark lines being due to the fact that at the points that appear dark the two trains of light-waves, coming respectively from the inner and outer surfaces of the soap bubble, nearly or completely neutralize each other. When the bubble is viewed by white light, we do not commonly see the dark striæ, their places being taken by bands of color. This is because the different colors that compose white light have different wave-lengths, so that at any given point in the bubble only a portion of the colors are destroyed by interference, leaving the remaining constituents of the white light to produce their full chromatic effect upon the eye. See LIGHT; SOUND; PHYSICAL CRYSTALLOGRAPHY.

Inte'rior, Department of the, one of the executive departments of the United States government whose heads are cabinet secretaries. The "home department," long existent in all European governments, was only constituted in this country by act of 3 March 1849. Its functions had previously been exercised by bureaus or officials of nearly all the other departments: patents, copyrights, public documents, and the census belonged to the State Department; public lands, mines, and judicial accounts, to the Treasury; Indian affairs, to the War Department; and pensions to the War and Navy, each for its own pensioners. By later laws the Interior was given charge of education, public surveys (including the geological survey; but the coast and geodetic survey belongs to the Treasury), subsidized railroads, Territories, national parks and reservations, returns of public contracts made by several other departments, some charitable institutions in the District of Columbia, and a number of other matters. The secretary makes an annual report of the number of public documents received and distributed. He has a salary of $10,000, and two assistant secretaries. His office has seven divisions: appointments, disbursements, lands and railroads, Indian affairs, pensions and miscellaneous, public documents, and stationery and printing. Although most of these are managed by commissions appointed by the President, their work is under the secretary's direction, and their reports are made through him. Most of the clerks and subordinate officers in the bureaus are appointed by him. All patents issued by the United States must be signed by him. The first secretary was Thomas Ewing of Ohio.

Interlaken, ĭn'tĕr'läĸ ĕn ("between the lakes"), Switzerland, village in the canton, and 26 miles southeast of the town of Berne, one mile southeast of Unterseen, beautifully situated near the left bank of the Aar, in the valley of Boedeli, between the lakes of Thun and Brienz. It contains a beautiful old castle and numerous hotels. It is visited annually by 80,000 to 100,000 tourists. Pop. about 2,500.

Internal Improvements, the construction and reparation of roads, bridges, canals, harbors, lighthouses, etc., at the expense of the United States government. The Constitution not having made any provision for such improvements, the execution of public works of this character became subject to the vicissitudes of party politics. Yet since 1789 funds have been perpetually appropriated by Congress for the carrying on of improvements throughout the country, so long as these lay strictly within Federal jurisdiction. Such would include lighthouses, buoys, beacons and public piers, rivers and harbors. The Federalist party, and after it the Democratic party, opposed all improvements on rivers and roads, the benefit of which passes to the several States. Yet in 1806 an appropriation was made for the construction of the Cumberland Road, which should penetrate the Western States and facilitate the mail service, as well as open up unsettled territory to the increasing tide of immigration, and serve for the transportation of troops and army supplies. The Federal Government, about the same time, undertook the construction of a road through Georgia toward New Orleans. In 1898 Congress passed a resolution in which it claimed the power to make appropriations for such internal improvements as the construction of roads and canals, and the maintenance and direction of water courses. Such roads and canals as the President should consider of Federal importance were ordered by Congress to be surveyed, and $300,000 was subscribed to stock of the Chesapeake and Delaware Canal. But there was a wide difference of opinion with regard to the constitutionality of such legislative action, and in May 1822, President Monroe vetoed the Cumberland Road bill. He supported this procedure by the declaration that Congress had acted *ultra vires*. That body, he maintained, had no right under the Constitution to carry out such internal improvements at Federal expense. President Jackson in 1830 followed Monroe's example and vetoed the Maysville Turnpike Road bill. Henceforth, the matter of such internal improvements was left to the legislation of the various States. Jackson had somewhat mitigated the force of his veto by advocating the distribution of the Treasury surplus among the various States, but when the Whigs tried to put this into execution in 1841, President Tyler by his veto put a stop to any such attempts, and they have never since been repeated. The introduction of railroads under the management of private corporations did away with the call for road appropriations, although something like a bonus was given to the projectors of new lines by the vast grants of lands which were made to them. Tracts of 40,000,000 and 50,000,000 acres were thus transferred to railroad companies. At

present both the great political parties are inclined to reclaim so much of the public lands thus granted, as has not been earned by a strict fulfilment of the conditions on which the grant was made. The appropriations for internal improvements under the head Rivers and Harbors for the year 1903 was $32,540,199.50 as against $7,046,623.00 in 1902.

Internal Revenue System, of the United States, properly all taxation except that of foreign goods at customs offices; but in use restricted to what were formerly termed excises (q.v.), on internal trade and manufactures, through a bureau of the Treasury Department, organized 1862. Before that time, though excises had been imposed, they were unpopular and brief. An intense dislike to them had been inherited from England, where they traditionally connoted an independent revenue for the sovereigns to free them from popular control, and arbitrary interference with private business and persons by irresponsible officials, the raw state of trade and manufacture in this country made a general excise system very injurious; and the customs dues amply provided for the expenses.

The first occasion when they were resorted to was just after the adoption of the Constitution. The assumption of the State debts, and other expenses of the new government, compelled Hamilton to recommend an excise, though in the 'Federalist' and elsewhere he had strongly urged its impolicy; he was also anxious to test the power of the government to enforce taxation, which the Articles of Confederation could not. On 3 March 1791 a bill was passed taxing distilled spirits of domestic manufacture. In the then West (western Pennsylvania) the still was like the New England cider mill, but much more important, because the long distances and bad roads made corn unprofitable unless condensed into whiskey, hence there was open revolt, which had to be put down by national troops (1794). Direct resistance ceased, but the tax was largely evaded, and it was two years before it was extended to Kentucky and Tennessee, while the collections in North Carolina were poor. In 1794 the system was extended in fear of a war with England, but owing to unskilful choice of articles or provisions in detail, the only one which produced much was that on sugar, from the high import duty, which gave the home market to the domestic manufacturers, so that what went into excise came off customs. Stamp taxes were laid in 1797, but were of odious associations. With the election of Jefferson as President the whole system came under ban, the Democrats having always opposed it, and on 6 April 1802 the entire internal taxes were repealed, with nearly $700,000 outstanding and uncollected, and which remained so. The dislike was not to the taxes as such, but to the inquisitorial methods of collection involved; and this persisted. But the War of 1812 compelled a renewal of them: unfortunately they were laid so late that the war was over before they began to produce much. They were needed to pay off the war debts, however, and were retained till 23 Dec. 1817. Thence till the Civil War no internal tax of any kind was levied in the United States.

The first real "system" — for the others included but few articles — and which has become a standing part of our system of taxation, was inaugurated 1 July 1862, others followed, placing an enormous and very ill-distributed burden on the people, which they bore uncomplainingly for the end in view. It is almost too complimentary to call it a system, as it was an indiscriminate heaping of taxes upon every stage of every article, on labor and tools, raw materials and finished products, processes and professions. Articles paid sometimes a dozen taxes on the various stages, and another on the final one, before reaching even the wholesaler to begin a round of middemen's profits. "The only principle recognized," says David A. Wells, "if it can be called a principle, was akin to that at Donnybrook Fair, "Wherever you see a head hit it." "Wherever you find an article, a product, a trade, a profession, or a source of income, tax it!" Within the period 1861–7 no less than 25 revenue bills were passed by Congress. The incessant endeavor was to find new objects of taxation. The industrial effects of the sudden huge unequal burdens, and the political effects of the enormous revenue to spend at discretion, cannot be discussed here. The taxes did not begin to produce largely at once; in 1863 the receipts were $37,640,787.95; in 1864, $109,741,136.10; in 1865, $209,464,215.25; in 1866, the summit, $309,226,813.42. Then the items began to be stricken off, the total sinking by 1873 to $113,729,314.14: able business men have attributed part of the inflation, and consequent panic, to the sudden removal of burdens to which business had adjusted itself. The next year it touched bottom, $102,409,784.90. The taxes by this time had been reduced to about the present status, and tended to increase with the growth of the country, even rising somewhat through the bad years 1875–9. The income tax, though fairly productive — the height being $37,775,873 in 1870 — was dropped in 1872; no other tax was ever so unpopular, from its prying into private secrets, and its working through informers. It is also the one which bears hardest on the most heavily burdened class of the community, the moderately salaried men in various callings. Protection leaders have repeatedly urged or hinted at repeal of all internal taxes, to prevent any reduction of customs duties; but the moral feeling reinforces the economic sense of the people in insisting on liquors and tobacco being taxed. Attempts have been made to increase the revenue from liquors by raising the tax; but the result is the reverse, the premium on fraud being too great. In 1894 the income tax was re-established, but the Supreme Court decided it unconstitutional under its particular terms. On 1 July 1898, to provide for the expenses of the Spanish War, fresh internal taxes were laid; of which the most fertile were stamps on all mercantile papers, telegrams, etc., and on patent medicines, and wines, which yielded in the ensuing fiscal year $43,837,816.66. Special taxes on bankers and amusements, and some other things, yielded several millions. The total receipts in 1899 were $273,484,571.44. In 1901 and 1902 the new taxes were all abolished.

International Brotherhood of Maintenance-of-Way Employees, an American labor union, having a department of fraternal insurance. It was founded at Demopolis, Ala.,

in 1887, and had a membership in 1903 of 40,000. Since its organization the society has disbursed $500,000 in death and disability benefits. It has secured increased wages for maintenance-of-way employees to the amount of $6,000,000 annually. It was actively engaged in the great strike on the Canadian Pacific Railway in 1901. The strike was settled after a struggle lasting 11 weeks, with the understanding that all members of the brotherhood would be reinstated in their former positions within two weeks; the question of wages to be left to arbitration. Sir John A. Boyd, Chief Justice of Ontario, was chosen chairman of the Board of Arbitration and awarded the employees an increase of 20 per cent over previous wages. The brotherhood holds a charter of affiliation with the American Federation of Labor, and publishes the 'Advance Advocate,' a magazine devoted to the interests of maintenance-of-way employees. See RAILWAY LABOR ORGANIZATIONS.

International Councils of Women. See NATIONAL AND INTERNATIONAL COUNCILS OF WOMEN.

International Date Line, an imaginary line

Map of the world, showing the International date line.

drawn through the Pacific Ocean somewhat irregularly, but tending in a general northerly and southerly direction, and separating the islands of the Pacific Ocean in such a way that all those which lie to the east of it carry the same date as the United States, while all those on the west of it carry the same date as Japan and Australia. The nature of this line may be made clear by the following illustration: A traveler leaves New York city at noon on Sunday, and proceeds westward just as fast as the earth turns on its axis, so that he follows the sun in its apparent westward progress with such precision that he keeps it always directly south of him. It will be noon, therefore, at every place he passes. If, however, he asks the day of the week at every point of his journey, he will be told that it is Sunday at all points in the United States, and even as far west as Hawaii. This can not hold true indefinitely, however, because when he has gone entirely around the world, and has returned to New York, he will have been gone 24 hours, and will therefore be told that it is Monday noon. Everywhere in Europe, too, he would have been told that it is Monday noon.

Yet it has always been the same day to him, and there must have been some place on the journey where he was told, for the first time, that the day was Monday instead of Sunday. At this place, if he wishes to be in accord with the people that he meets, he must arbitrarily change the name of his day from Sunday to Monday. Mariners are in the habit of making the change upon crossing the 180th meridian from Greenwich, England; but this fact is of no service to us if we wish to compare the date carried on one of the Pacific Islands with the corresponding date (say) at New York, because the mariners pay no attention to the local dates on the islands that they pass. The ideal way to find out where the date actually does change would be to canvass the entire Pacific Ocean, so as to find out what date is actually in use on every one of its islands at some given instant. A line drawn from pole to pole in such a manner as to keep all islands bearing one date on one side and all islands bearing the other date on the other side, would afford a perfectly definite basis for the comparison of dates, and would be the true "International Date Line."

No such canvass has yet been made. As a general rule, it may be said that the date now in use upon most of the different islands or groups, is the date which results from the one carried there by the first European or American colonists; and this date will presumably be different according as the colonists came from the east or the west. This is not true universally, however, because arbitrary changes in the date are known to have been made in a number of cases. For example, Alaska was first colonized by the Russians, who brought with them the Russian date. When the American settlers moved there, they carried with them the date of the United States, and this led to some considerable confusion, the Sunday of the Americans being the Monday of the Russians, in spite of the fact that the Russians still use the Julian calendar. In 1867, when Alaska was purchased from Russia, the date in use there was made to conform to that used in the United States. Again, the Philippines were discovered by Magellan, in 1521, and Manila was founded by Lagaspi in 1571. Magellan brought his date from the east, and after the islands were colonized they kept the same date as the Spanish possessions on the opposite side of the Pacific; and they therefore carried a different date from that prevailing on the neighboring Asiatic coast. This was changed in 1844, by the omission of the 31st day of December in that year from the Philippine calendar; this change bringing the date in use in the Philippines into harmony with that prevailing at Hong Kong and other Asiatic ports. The best data at present available indicates that the date line follows substantially the course shown upon the accompanying map.

which is prepared from data furnished by the United States Naval Observatory. This date line is subject to modification, as our knowledge of the dates carried on the various Pacific Islands increases.

International Law. International law as embodied in the practice of states begins with the Peace of Westphalia (1648), which gave rise to modern international society. International law as a branch of jurisprudence begins with the publication in 1625 of the epoch-making treatise of Hugo Grotius entitled 'The Laws of War and Peace' (*De Jure Belli ac Pacis*), although the earlier works of Albericus Gentilis entitled 'De Legationibus' (1585) and 'De Jure Belli' (1588–9, enlarged ed. 1598) were important contributions to the subject, and furnished Grotius with the pattern for a portion of his great book. After the Peace of Westphalia the teachings of Grotius made rapid conquest, and in 1661 the first chair of the law of nations was founded at Heidelberg, with Samuel Pufendorf as the first incumbent. He afterward became professor of jurisprudence at Lund, in Sweden, and while there published his work entitled 'De Jure Naturæ et Gentium' (1672). During the 18th century the publications of Bynkershoek, Wolff, Vattel, Moser, and de Martens contributed to advance and popularize the subject in the schools and among statesmen and military leaders. The work of Vattel in particular became deservedly popular for its practical value as embodying the law of nations as it then was (1758); it has been translated into most of the languages of Europe, and is still frequently referred to and cited. The first half of the 19th century made numerous additions to the list of authoritative writers, among whom may be especially named Henry Wheaton in the United States and Robert Phillimore in England. Of more recent writers the works of Bluntschli, Heffter, Calvo, Pradier-Fodèrè, Hall, Lawrence, and Taylor are especially worthy of mention. David Dudley Field drafted an 'Outline of an International Code,' which is interesting as an attempt to codify the whole field of international law.

The term "Law of Nations" was formerly used to denote the body of doctrines governing the relations of independent states or sovereignties. The modern term "International Law" was first coined by Jeremy Bentham, in 1780, and is now everywhere adopted; it has been extended to include both public international law and private international law, but is here employed only in the first and more accurate sense. The phrase "conflict of laws" is better adapted than "private international law" to describe the doubt that may arise in a local court as to whether, in a case involving private rights, the local, territorial law should govern or a foreign, exterritorial law should be applied.

International law consists of that body of rules by which states are habitually controlled in their relations with one another, and by which arbitrators are controlled when authorized to determine international disputes. While it has not all the sanction of municipal law, it is, as one writer has well said, binding on states in their international relations with a force comparable in nature and degree to that binding the conscientious person to obey the laws of his country, and it is also enforceable by appropriate means in case of infringement. These means are diplomatic negotiations, arbitration, withdrawal of diplomatic relations, so-called pacific blockade, seizure of property, and actual war. In addition, some parts of international law are enforced in the courts. The Supreme Court of the United States has recently said: "International law is a part of our law, and must be administered by the courts of justice of appropriate jurisdictions, as often as questions of right depending upon it are duly presented for their determination. For this purpose, where there is no treaty, and no controlling executive or legislative act or judicial decision, resort must be had to the customs and usages of civilized nations; and, as evidence of these, to the works of jurists and commentators, who, by years of labor, research, and experience, have made themselves peculiarly well acquainted with the subjects of which they treat. Such works are resorted to by judicial tribunals, not for the speculations of their authors concerning what the law ought to be, but for trustworthy evidence of what the law really is." (Paquete Habana v. United States, 175 U. S., 677.)

Owing to the absence of a common superior or sovereign to declare or to enforce the rules of international law, a school of jurists, led by John Austin, and known as the analytical school, has denied that it is law at all and has relegated the system to the domain of international morality. The historical school of jurists, of whom Savigny and Sir Henry Maine are brilliant exponents, has combated this view and has made clear that there have been and still are systems of municipal law in which it cannot be said that there is either a sovereign or a sanction, and that international law corresponds to all systems of law at some stage of their development and to certain archaic survivals still to be observed among primitive peoples. English legal thought has been profoundly influenced by the Austinian conception of law, but on the Continent, and even among English and American jurists of to-day, the historical conception is generally accepted. With the assertion of the primacy of certain great powers and with the establishment of an international tribunal, international law is tending toward an analogue of the common superior and the definite sanctions that now characterize municipal law in the more highly civilized states. There are those who now dream of an authoritative international legislative body, compulsory arbitration, and the enforcement of arbital decrees; but it is doubtful whether these indicia of municipal law are adapted to the peculiar conditions of international relations. It is probable that the same ends will be worked out by international conferences and conventions, and by voluntary arbitration compelled and enforced by enlightened public opinion.

The early publicists sought the basis of international law in the so-called "law of nature," or those principles of justice in which the speculative philosopher affects to see an abstract body of doctrine written in the very nature of man and of society. But the law of nature of the international jurist rested upon a firmer basis than the concepts of speculative philosophy. The 'Jus Gentium' (Law of the Peoples) of the Roman jurists was "the sum of the common ingredients of the customs of the old Italian

tribes." It was upon this storehouse of determined and common customs that Grotius and his successors drew for the definite and practical rules of international law, and added them to such customs of modern states as were generally accepted and acted upon in international affairs. Thus arose the law of nations which, under the influence of the revival of Greek thought and speculation, was philosophized into the law of nature. Modern international law has escaped from the domination of speculative philosophy and now speaks in the language of the practical jurist; it is regarded as a branch of jurisprudence and the business of lawyers rather than a branch of philosophy and the concern of schoolmen.

International law rests, then, upon custom, and in this respect differs not at all from municipal law. In the last analysis the practices of states is the authoritative test. As evidence of such practices resort is had to the decisions of courts upon points that may be brought before them for determination, to the decisions of international tribunes to which questions have been referred for arbitration, to treaties and conventions of general application, to the writings of jurists, and to the arguments of statesmen in diplomatic correspondence and state papers. In comparatively recent times there have been negotiated numerous international conventions which correspond to legislative acts and put into definite form the rules to be observed. These sometimes codify the customary law, sometimes change it, and sometimes add to it. Among such great international documents may be named the Declaration of Paris (1856), the Geneva Red Cross Convention (1864), the Declaration of St. Petersburg (1868), the Convention for the Protection of Industrial Property (1883), the Convention for the Protection of Submarine Cables (1884), the Convention for the Repression of the Slave Trade (1890), the Universal Postal Convention (1891), The Hague Convention for the Pacific Settlement of International Disputes (1899), The Hague Convention with respect to the Laws and Customs of War (1899), The Hague Convention to extend to Maritime Warfare the provisions of the Geneva Red Cross Convention (1899). This growing body of international conventions indicates the method by which, in the future, international law may be expected to progress. The common law of international law is not likely to expand beyond its present content; it has either been settled by concurrent custom or its disputed problems have given rise to conflicting schools. It remains for states by international agreement to codify, to reconcile, and to extend the doctrines of the customary law.

Independent, sovereign states are the parties to international law. States whose external sovereignty has been wholly yielded up, as is often the case with members of a confederation or union, cease to have any independent international status. States whose external sovereignty has been limited, but not wholly extinguished, have an international status subject to the limitation imposed, as for example Bulgaria or Cuba. Certain states, like Belgium and Switzerland, have been neutralized, and while still parties to international law are forbidden to engage in offensive warfare. Any limitation upon freedom of international action tends to reduce the state so restricted below the normal status of the parties to international law.

Of the independent, sovereign states only those whose municipal law is essentially similar to that originating in Europe can be said to enjoy to the fullest extent the rights and privileges of international law. With states whose law is of non-European origin, the European and American states have insisted upon treaties under which they exercise through their consular courts an exterritorial jurisdiction inconsistent with the full international equality of such states. Outside of Europe and America only Japan can be said to enjoy full international equality. In Europe the position of Turkey is anomalous. While admitted by the Treaty of Paris (1856) to participate in the advantages of the public law and system of Europe, the powers still maintain there consular courts with exterritorial jurisdiction, as they do in most Asiatic and African states. On the other hand, such exterritorial jurisdiction has been abandoned in Japan, whose municipal law is now modeled upon that of Europe. While other states like China and the Asiatic and African Moslem states, are dealt with in general upon the principles of international law, and are expected to observe the obligations imposed by it and are entitled to its privileges, there is a specific reservation as to some parts of the system, and an underlying, though often unrecognized, difference in the whole spirit of their international relations.

Theoretically the principles of international law rest upon the postulates of the independence and the equality of the states that are parties to it. Practically six states in Europe, one in America, and one in Asia are dominant, and can, and often do, impress their will upon the other states within the sphere of their influence. Great Britain, Germany, France, Russia, Austria-Hungary, and Italy constitute the concert of Europe and settle or leave unsettled questions of European law and politics. The United States occupies the same dominant position in America and has the final voice in the settlement of American questions. Japan has very recently assumed the same dominant position in Asiatic affairs, but it is yet too early to predict how potent or lasting her influence will be in that quarter. While international law may be said to have well defined principles throughout the greater part of its field of action, the play and counterplay of international politics, as practiced by these eight powers, must continue profoundly to influence its application in specific cases of general importance and to determine its progress through international conferences and conventions.

The normal relation of states is that which exists when they are at peace with one another. An abnormal relation is created when two or more of them engage in war, so far at least as their relation to each other and to the neutral states is concerned. If we assume a war to be going on between State A and State B, the normal relation continues among all other states, but the relation of State A to State B is governed by the laws of war, while the relation of each to all other states is affected by the laws of belligerency and of neutrality. There are, then, three situations: the relation of peaceful states to each other; the relation of enemy states to

each other; and the relation of belligerent states to peaceful states. Each has its own special code of laws.

Peaceful Relations.—States in times of peace sustain toward each other a relation similar to that of well-disposed citizens in civilized societies. Each possesses and enjoys its own rights with a due regard to the corresponding rights of others. These rights if infringed call for appropriate remedies, the gravest of which is that of self-help or self-defense. Modern states tend more and more to the avoidance of this ultimate form of redress, and the past century, and particularly the past quarter-century, has shown an increasing resort to peaceful arbitration when diplomatic negotiations have proved ineffective. The establishment in 1899 of a permanent arbitration tribunal at The Hague marks a decisive victory for the principle of arbitration. See HAGUE CONFERENCE.

A state may be said to possess these fundamental rights; to preserve its independence and integrity; to determine its own form of government; to acquire and dispose of territory; to protect itself and its citizens or subjects from unjust aggression; to exercise jurisdiction over persons and property within its territory, unless they be exempted by law or by treaty; to exercise jurisdiction over its public and private vessels on the high seas; to exercise jurisdiction over its public vessels, over its legations, and over persons connected with its public vessels and legations, even within the territory of another state. A visiting sovereign or head of a state is also exempt from local jurisdiction.

Some of these rights may be limited by treaty, as in the case of the consular jurisdiction exercised in Oriental states, or by the doctrines of intervention as illustrated by the action of the concert of Europe in numerous cases involving the balance of power or of the United States in cases involving the Monroe Doctrine (q.v.). Especially has the right to acquire or dispose of territory been limited by considerations of international politics.

Intervention is a doctrine of vague limits. Although usually based upon the asserted right of self-preservation, it has been justified upon the grounds of humanity, as in the case of the intervention of the powers in behalf of Greece in 1827 and of the United States in behalf of Cuba in 1898. In such instances it is a moral rather than a legal right, and has been aptly described as "a high act of policy above and beyond the domain of law." The Monroe Doctrine has as one of its purposes the prevention of European intervention in the affairs of the independent American states. On the other hand, the United States has as a fundamental maxim of its diplomacy that of non-intervention in the political affairs of Europe.

The territorial jurisdiction of a state extends to three miles of open sea adjoining its coast. This limit was fixed when that was approximately the distance that could be defended from the shore. With the increase in the range of guns, a proposition to extend the limit to six miles, or even more, has been advanced, but has not been acted upon. Such a change in the law could now be made only by a general international agreement. Bays and gulfs not more than six miles wide from headland to headland are within the jurisdiction of the state owning the shores, and some whose mouths are wider than this are conceded to be within the jurisdiction of the local state, especially where the indentation is deep, as in the case of Chesapeake and Delaware bays. Straits not more than six miles wide are within the jurisdiction of the state or states owning the shores; but if they connect waters open to free navigation other states are entitled to navigate them subject to reasonable regulations. The three-mile territorial waters are also free for the innocent navigation of other states, but not for fishing or for naval warfare. Interoceanic canals are regulated by treaty. The Suez Canal is regulated by the treaty of 1888, signed by the six great powers and by the local power, Turkey; the Panama or other possible isthmian canal is regulated by the Hay-Pauncefote treaty of 1901; both are by treaty to be open in time of war or peace to every vessel, public or private, without distinction of flag. River navigation is now, as to all the great rivers flowing through two or more states, also regulated by treaty; prior to such treaties many disputes arose as to the right of an upper riverian state to navigate through the territory of the lower owner to the sea.

Exterritoriality is the name applied to the exercise by one state of jurisdiction within the limits of another state. It extends to visiting sovereigns, diplomatic agents and their families and suites, and visiting public vessels. It is also by The Hague Convention extended to the judges of an arbitration tribunal organized under that convention. Consuls do not enjoy the privilege unless by treaty. In Oriental countries the citizens and subjects of European and American states are by treaty generally subject to the jurisdiction of their own consular courts. In all the above cases the persons concerned are exempt from all local judisriction both civil and criminal. Moreover, local process will not run upon the deck of a visiting public vessel nor within the gates of an embassy or legation. This gives rise to the right of asylum by which political offenders often escape, especially in South American and Oriental countries, by taking refuge in a legation or on board a public vessel. This is a right which is guardedly exercised and is, or should be, never extended to ordinary criminals.

Extradition is the delivery up by one country of criminals who flee to its territory from another. It is regulated by treaty; no state is bound, except under treaty stipulations, to deliver up criminal refugees, and it is doubted whether any constitutional power is lodged anywhere in the United States to do so except under a duly ratified treaty. Political offenders are not subject to extradition.

A state has jurisdiction over aliens within its borders, except those representing another state. It may exclude aliens, and if it admits them it may fix the conditions of such admission. When admitted they are subject to the local laws, except, perhaps, that they cannot be compelled to render military service. But if a state deals unjustly with an alien, or fails to use due diligence to protect him, the state to which he owes allegiance may seek or compel redress.

If a subject of one state is naturalized in another state, a question of double allegiance may be raised. Formerly European states asserted

the doctrine of indelible allegiance and did not recognize that a subject could expatriate himself without the consent of the parent state. This seems to have been the common law and is so announced by American writers and judges. But Congress, in 1868, passed an act declaring expatriation to be a natural and inherent right and that any order or decision to the contrary by any officer is inconsistent with the fundamental principles of government. Great Britain in 1870 enacted that any subject who becomes naturalized in a foreign state shall be deemed to have ceased to be a British subject. The United States has treaties with some governments fixing the status of its naturalized citizens. Where there are no such treaties the matter often becomes a delicate and difficult one in case the naturalized citizen returns to his parent state and military service, or some other obligation of citizenship, is there demanded of him.

The high seas are free to all and no state can claim any exclusive jurisdiction in them. The struggle for the establishment of this principle has been a long and difficult one, but with the Bering Sea arbitration of 1893 it may be said to have ended, when the claim of the United States to a property right in fur seal beyond the three-mile limit was decisively rejected. Vessels on the high seas are free from interference in time of peace unless suspected of piracy or slave-trading. Piracy is justiciable everywhere. Slave-trading is not piracy and vessels engaged in it cannot lawfully be visited, searched, or seized by vessels of other nations unless such right be given by treaty. The international convention for the repression of the slave-trade gives such a right within a specified zone adjacent to the coasts of Africa. All neutral merchant vessels are liable to visit and search in time of war by a public vessel of either belligerent. If carrying contraband of war or intending to run a blockade, a neutral merchantman is liable to seizure and detention until a prize court has determined the validity of the capture and whether the vessel or any part of its cargo is subject to condemnation as prize of war.

Relation of Belligerents to Each Other.— War suspends all civil intercourse between states. Formerly the subjects of enemy states were regarded as enemies, but this doctrine is now confined to rendering illegal all contracts and commerce requiring any communication across the lines of hostilities. But a subject of one belligerent residing in the territory of the other is permitted to remain and to carry on business there so long as this does not embarrass the state of his domicile with reference to his protection or the conduct of hostilities. If required to depart or if desirous of doing so, the alien enemy is given a reasonable time in which to withdraw himself and his family and property. The last instance of the forcible detention of alien enemies who were non-combatants was the exercise of this now obsolete right by Napoleon against resident subjects of Great Britain in 1803.

War suspends all executory treaties between the belligerents except those negotiated with a view to hostilities. At the close of the war executed treaties or those of a permanent nature remain undisturbed, but those of a transient nature and subject to change or extinction do not revive unless by express stipulation.

The laws governing armed hostilities on land have been the subject of much codification. The first was that of Professor Lieber, prepared for the American Civil War and adopted in 1863 for the government of the armies of the United States. In 1874 an international European conference at Brussels framed and recommended a code for general adoption, but its work was not ratified. In 1880 the Institute of International Law recommended one prepared by M. Moynièr. In 1899 The Hague Conference adopted and recommended one based largely on the Brussels code, and this has been ratified by the United States and many other powers. The United States in 1900 promulgated a Naval War Code for the guidance of its naval officers and forces. No international naval code has yet been framed.

Modern warfare seeks to distinguish between combatants and non-combatants, and to give every possible immunity to the latter, while providing for the humane treatment of the former. To this end the laws of war define combatants, provide against unnecessarily cruel weapons or missiles, against the refusal of quarter, and for the proper care of prisoners and of the sick and wounded. The Geneva Red Cross Convention neutralizes hospitals, surgeons, and nurses in land warfare, and The Hague Convention extends the principle to naval hospital ships and their attendants. Non-combatants who refrain from all participation in the war are free from molestation, although when a territory is occupied by the enemy they are required to give a temporary war-allegiance to the conqueror. Non-combatants engaging in hostilities are liable to punishment.

Save in the case of a levy *en masse* to resist invasion, persons in order to be regarded as combatants and entitled to privileges as such, must be commanded by a responsible officer, wear a fixed distinctive emblem recognizable at a distance, carry arms openly, and conduct their operations in accordance with the laws and customs of war.

All weapons are forbidden which cause needless suffering. By the Declaration of Saint Petersburg (1868) no projectile of less weight than 400 grams that is explosive or is charged with fulminating or inflammable substances may be used. By a declaration of The Hague Conference (1899) the launching of projectiles or explosives from balloons was forbidden for five years, but this has now expired by time limitation. The Hague Conference also declared against projectiles the object of which is the diffusion of asphyxiating gases and against bullets which expand or flatten easily in the human body, but the United States delegates did not assent to these propositions.

It is forbidden to use poison, to kill treacherously, to refuse quarter, to make improper use of a flag of truce or a Red Cross badge or ensign, to bombard undefended towns, or to pillage a captured place. The United States Naval Code forbids the use of false colors, though such a deceit has been deemed to be allowable under the older practices.

Private property on the land is now regarded as exempt from capture except in case of military necessity. Pillaging and freebooting are

strictly prohibited. Requisitions may be levied for the support of an invading army with a due regard to the resources of the country. It has been found difficult to reconcile the doctrine of the inviolability of private property with the right to levy contributions, and no satisfactory rules have yet been framed to limit the exercise of this right.

Naval warfare has partaken more of the character of freebooting than modern land warfare. Private property is liable to capture. Privateering was long permitted, and is now theoretically admissible unless the belligerents have by treaty agreed to forego it. The Declaration of Paris (1856), assented to by most civilized nations, forbids it. The United States is not a party to this, but in two wars in which it has been engaged since the declaration was issued, it has observed it. Mr. Marcy, secretary of state, offered to assent to it provided the declaration was amended to read, "Privateering is and remains abolished, and the private property of the subjects or citizens of a belligerent on the high seas shall be exempt from seizure by public armed vessels of the other belligerent, except it be contraband." This was not assented to by the other powers. Since that time the United States has frequently sought to secure such an exemption of private property from capture, but as yet without success. All private and public vessels and property of the enemy are liable to capture except hospital ships, coast fishing craft, vessels on voyages of science or discovery, and property devoted to science, education, religion, and art. It is usual to exempt also vessels on voyage to or from a port of the captor at the outbreak of the war and to permit those in its ports a reasonable time to depart. All enemy merchandise in an enemy vessel is liable to capture, but the Declaration of Paris exempts enemy goods in a neutral vessel and neutral goods in an enemy vessel except contraband of war.

Vessels and cargoes captured during the war are taken into a prize court for adjudication. But if the captor cannot spare a prize crew, or there is danger of recapture, they may be sold or destroyed if clearly enemy property, and the papers and other testimony sent to the prize court in order that a judicial decree may be entered. Title to captured property changes only by decree of a competent court. The personnel of a captured merchant vessel of the enemy may be detained as prisoners of war, or as witnesses, or they may be released. Passengers are released at the first convenient port.

Relation of Belligerents and Neutrals.— The doctrines of neutrality have received their chief application since the foundation of the American Republic, and foreign writers give to the early statesmen of that Republic the credit of having done most to ascertain and establish the sound principles upon which neutrals should act toward belligerents. Jefferson summed up the whole matter in one of his felicitous phrases: "It is the right of every nation to prohibit acts of sovereignty from being exercised by any other within its limits. It is the duty of a neutral nation to prohibit such as would injure one of the warring powers." The conduct of M. Genet, the French minister, in using our ports as a base of naval operations in 1793 and in setting up prize courts in them, called for the rigorous application of the doctrines of neutrality, and led to that attitude on the part of our government which has elicited the admiration of all publicists. In 1794 Congress passed an act forbidding American citizens to enlist in the service of a foreign state at war with another state with which the United States is at peace and prohibiting the fitting out of ships of war or armed expeditions within the territory of the United States. This and its amendments were consolidated into the Foreign Enlistment Act of 1818, and the latter has served as a model for similar legislation by other states.

On the one hand each belligerent must observe the inviolability of neutral territory and territorial waters, and on the other the neutral must observe a strict neutrality and impartiality in its attitude toward both belligerents. It may admit their war vessels to its ports, but must so regulate the length of the visit and the amount and nature of supplies as to preserve its neutral duties. The usual rule is a visit of 24 hours, or, if a vessel of the other belligerent is in the same port, 24 hours after the latter has departed. The supplies furnished must be only sufficient to take the vessel to the nearest home port and are not to be again furnished within three months. It cannot be said that the letter of these rules is universally accepted, but the principle involved in them is admitted. An international agreement may be necessary to define them with precision.

To permit a ship of war to be built and equipped by one belligerent in a neutral port is a breach of neutrality. This was so adjudged by the Geneva Arbitration Tribunal in the case of the Alabama, Florida, and Shenandoah, which were built or adapted in England by order of the Confederate government during the American Civil War, and their equipment sent out from England in transports. It has been contended that a ship of war is a legitimate article of commerce, as much so as guns, ammunition, and the like, and that it is merely contraband of war; but the distinctions are marked enough to lead to the rule that neutral states must use due diligence to prevent the fitting out, arming or equipping of such vessels within its jurisdiction.

A neutral state is not bound to prevent its citizens from engaging in contraband commerce with the belligerents; but they do so at the risk that the contraband articles may be captured and condemned. Non-contraband commerce between a neutral state and a belligerent state cannot be interfered with, except by the establishment of an effective blockade.

The right of a belligerent to cut submarine cables has been much discussed of late. Those between belligerent points may be cut anywhere, but it is contended that those between a belligerent and a neutral point can be cut only in belligerent territory, and that those between neutral points cannot be cut at all. This is the provision of the United States Naval Code, but it is likely that an international agreement may be necessary to secure uniformity of action.

Relation of Neutral Individuals to the Belligerents.— Citizens of a neutral state may engage in commerce with either belligerent, subject to the right of the other belligerent to capture neutral vessels carrying contraband of war or intending to run a blockade. But neutral citi-

zens who render belligerent or unneutral service, such as carrying military dispatches, military officers or forces, transmitting signals, and the like, may be treated as quasi-belligerents and their vessels and property may be confiscated. When Messrs. Mason and Slidell, agents of the Confederate government, were taken from the British steamer Trent on a voyage between Havana and England, the British government contended that the act was unwarranted. The United States government, while contending that the agents might lawfully be captured, admitted that in case of capture the vessel must be taken to a prize court and the legality of the capture judicially determined, and as this was not done, released the captives. The penalty for unneutral service is the confiscation of the vessel engaged in it. It is usually stated that neutral mail vessels may be searched for belligerent dispatches, but this right is very cautiously exercised.

Contraband of war consists of goods having a belligerent destination and purpose. It is impossible to fix a definite list or a specific classification of articles deemed contraband. Some are clearly so because their sole purpose is for military operations. Some are clearly not so because their use is exclusively peaceful. Between these lie many important articles which may be used for military or for peaceful purposes, and these are classed as conditionally contrahand. The United States Naval Code declares the following to be conditionally contraband: "Coal, when destined for a naval station, or a ship or ships of the enemy; materials for the construction of railways or telegraphs; and money, when such materials or money are destined for the enemy's forces; provisions, when actually destined for the enemy's military or naval forces." Such a list might be extended by including clothing, balloons, bicycles, barbed wire, or any other articles used in warfare and destined for a belligerent. A neutral vessel carrying contraband is liable to capture. If the vessel belongs to the owner of the contraband it also is condemned, but otherwise it is released and the contraband condemned.

The United States Supreme Court decided during the Civil War that contraband goods shipped from England to Nassau, W. I., but with the intent to tranship them there and send them into a Southern port were liable to capture. This is known as the doctrine of "continuous voyage," and has been condemned by some publicists who argue that the destination of the ship should be conclusive as to the destination of the goods. Great Britain seems to have acted upon the same principle, however, in the case of goods shipped to Delagoa Bay during the Boer War in South Africa.

Neutral vessels destined for a blockaded port are liable to capture. Blockades in order to be binding must be effective, that is, they must be maintained by a force sufficient to render hazardous the ingress to or egress from a port. A neutral vessel must have notice of the blockade before being liable to capture. This may be given by a general notification to the government of the neutral; but if the vessel sailed before such general notification it is entitled to a special notification which is entered upon its ship papers. Neutral vessels in a port when it is blockaded are allowed a reasonable time to load and depart. The penalty for an attempt to run a blockade is confiscation of vessel and cargo. The officers and crew are not to be deemed prisoners of war but may be detained as witnesses for the hearing of the prize court.

When a vessel is captured it is the duty of the captor to take it into a convenient home port and deliver it into the custody of a prize court. In the United States the district courts are vested with admiralty jurisdiction. Any claimant may appear and contest the legality of the capture. If the vessel or cargo is condemned it is sold and the proceeds paid into the public treasury. Formerly the captors were by law entitled to a portion of the prize money, but by an act passed in 1899 Congress repealed this provision.

The right to capture contraband and to capture vessels bound for a blockaded port carries with it the right to visit and search neutral vessels. A neutral claim has been pressed in recent times to the effect that private merchant vessels under convoy of a public vessel of the same nationality are not subject to visit and search in case the commander of the public vessel certifies that the merchantmen have on board no contraband articles. While this is in some dispute, the United States Naval Code directs naval officers to accept such certificate. A neutral vessel is bound to submit to visit and search unless under convoy, and any attempt to escape or resist, or to destroy her papers or present fraudulent ones, renders her liable to capture. See Alien; American Diplomacy; Arbitration; Hague Conference; High Seas; Law, Maritime; Neutrality; United States — *Diplomacy.*

E. W. Huffcut,
Dean of the Cornell University College of Law.

International Peace Conference. See Hague Conference.

International Workingmen's Association, an organization of the workingmen of all countries for the advancement of the interests of labor and the emancipation of the working classes. It grew out of a visit of French workingmen to the World's Exposition at London in 1862. In 1864 an organization was formed in London, and an 'Address and Provisional Rules' published; the rules provided for a general congress to be held annually and a central council appointed by that congress to sit in London; workingmen's societies were to join the International in their corporate capacity. The principles and policy were not then definitely announced; the first congress held at Geneva in 1866 passed resolutions favoring the limitation of the working day and the abolishing of child labor; at the next congress at Lausanne (1867) socialistic principles were first definitely announced; from this time the influence of Marx and his followers grew in the organization. In 1868 at the Brussels congress the International announced its opposition to war, and favored the general strike; at the Basel congress in 1869 Bakunin and the anarchists were admitted; but they were expelled from the association in 1872 at the congress at The Hague; this same congress transferred the seat of the General Council to New York. The anarchists held a separate congress at Ge-

neva in 1873. In 1867 the International rendered substantial aid to the strike of the bronze workers in Paris, and the next year to the strike of the Geneva builders; it assisted the English workmen by preventing the importation of underpaid laborers from the Continent in time of strikes. The International was accused of complicity in the Paris Commune, and while the two had no official connection many of the leaders of the Commune were Internationalists, and its principles and aims were defended by the International. In the United States the Social Party, a socialist political organization, was affiliated with the International in 1868, and later some individual trades-unions were also affiliated; finally the North American Federation of the International was formed and held its first national congress in 1872; its organization was in local sections of at least ten members, with a Federal Council of nine elected by the annual congress. Shortly after the transfer of the General Council to New York the Internationalists took a prominent part in the eight-hour day demonstration in New York. The formal organization of the International was dissolved in 1875; in Europe the Social Democratic parties of the different countries grew out of it, and in the United States the Socialist-Labor party. The anarchist faction in the United States split into two organizations, the International Workingmen's Association and the International Working People's Association. The International was important in the history of the labor movement as being the first expression of the recognition of the common interests of labor in all countries, and as being the means of spreading widely the knowledge of the principles of the Marxian socialism. Consult: Ely, 'French and German Socialism,' and 'The Labor Movement in America'; Villetard, 'History of the International'; Zacher, 'The Red International.'

Interstate Commerce Commission. See COMMERCE, INTERSTATE.

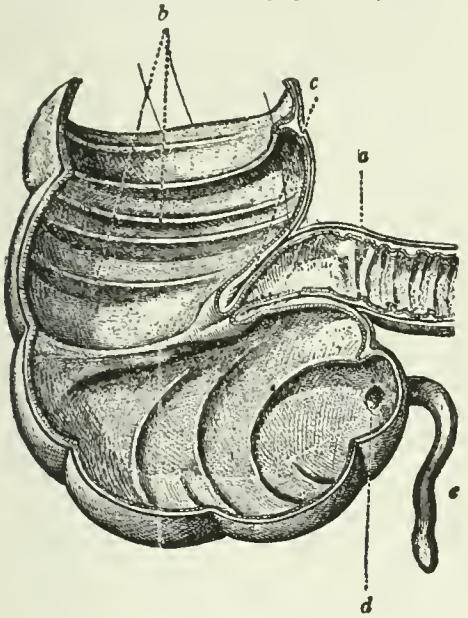
Interstate Commerce Law. See COMMERCE, INTERSTATE.

In'terval, in music, is the distance or difference of pitch, arithmetically expressed, between any two tones of a given scale. Occidental nations, including America, employ the diatonic scale (see SCALE), an octave comprising five tones and seven semitones, named after the first seven letters of the alphabet. The affix of a flat or sharp before a note denotes its quality but does not affect its name, and the eighth note being in unison commences a new octave. Taking the scale in the key of C major, the various intervals are: minor second = E–F or B–C; grave major second = C–D, F–G, A–B; grave minor third = D–F; minor third = E–G, A–C, B–D; major third = C–E, F–A, or G–B; perfect fourth = C–F, D–G, E–A, G–C′, or B–E′; acute fourth = A–D′; acute augmented fourth = B–F; grave diminished fifth = B–F′; grave fifth = D–A; perfect fifth = C–G, E–B, F–C′, G–D′, A–E; minor sixth = E–C′, A–F′ B–G′; major sixth = C–A, D–B, G–E′; acute major sixth = F–D′; grave minor seventh = D–C′, G–F′, B–A′; minor seventh = E–D′, A–G; seventh = C–B, F–E′; octave = C–C′, D–D′, etc. By taking various notes of the diatonic scale as starting points, and measuring known intervals from these, we arrive at intermediate notes of the scale, of which the following are examples: C♯ minor third below E; D♯ minor second below E; E♭ minor third above C; A♭ minor sixth above C; B♭ minor seventh above C; B♯ 3 major third above C. The difference of pitch between C and C♯ or between D and D♭ is called a semitone, and an interval increased or diminished by a semitone is said to be augmented or diminished. This applies especially to the interval of a fourth or a fifth, which with the octave are said to be perfect, because any augmentation or diminution mars their consonance. The major sixth or third may, however, be diminished to a "minor" sixth or third without destroying the consonance; and the term "minor" is also applied to the diminished second or seventh. Intervals confined within the octave are simple, when they exceed it compound; the octave beginning a new series, the ninth is the octave of the second, and so forth.

Intes'tacy, the legal state of a person dying without having disposed of his property by last will and testament. In Great Britain intestacy does not affect real estate, which is disposed of in accordance with the rule of descent. The effect of intestacy in Great Britain is merely that no directions have been left for the distribution of personal property. The effect of intestacy in the United States varies in accordance with the laws of inheritance fixed by each of them. Intestacy may be complete, as when a valid will is not left by the dead proprietor; or partial, when the extant will only provides for the distribution of part of the property. In these cases the property passes to the heirs or next of kin of the decedent in accordance with the laws of the place where the property is. See DESCENT; HEIR; INHERITANCE.

Intestine, Bowel, or Gut, the alimentary tube, in the higher animals limited to that portion between the stomach and the outlet at the anus. The human intestine is divided into the small and large intestine, the two parts varying in structure, movement, and function. The small intestine starts at the pylorus of the stomach, as the duodenum, and the first eight or ten inches are so distinguished. This portion is the widest and most deeply placed of the parts of the small intestine. About three or four inches below the pylorus the ducts of the gall-bladder and pancreas open conjointly into the bowel. The duodenum emerges from the cover of the peritoneum and becomes the jejunum. The remainder of the small intestine constitutes the jejunum (about two fifths) and the ileum. Between these divisions there is little difference, except that the jejunum is more freely movable, occupies the upper left portion of the abdomen more than the lower and right, and has thicker walls. The lumen of the small intestine gradually grows less from the duodenum, where it is two inches and a half in diameter, to little more than an inch where the ileum empties into the large intestine. The ileum is inserted several inches above the actual beginning of the large intestine, so that a blind pouch is formed below the point of juncture; this pouch, called the cæcum, gives off the appendix vermiformis (see APPENDICITIS) from its lower and back part. From the cæcum the large bowel passes up to the under surface of the liver as the ascending colon (see COLON), thence across the abdomen

below the lower border of the stomach as the transverse colon, turns down to the iliac fossa as the descending colon, forms a peculiar S-shaped curve, the sigmoid flexure, which passes over the brim of the pelvis, where it is called the rectum (q.v.). The large bowel is about six feet in length. Both bowels have four coats, the mucous coat, the submucous, the muscular, and over most of the bowel an investment of peritoneum forming the serous coat. In the small intestine the mucous membrane is thrown up into permanent folds, each extending over half-way around the inside of the bowel. In this way a large surface is exposed for the absorption of food. Furthermore, the inner surface is covered with finger-like projections called villi, each having a large absorbing vessel in its centre. At the bases of the villi are tubular (of Lieberkuhn) and branching glands (of Brunner) that dip down into the mucous membrane. Scattered over the surface there are tiny collections of lymphoid tissue, called solitary follicles, and here and there collections of these follicles into groups one to three inches long, called Peyer's patches. It is these spots that are attacked and ulcerated in typhoid fever. The muscular coat consists in an inner layer running around the bowel and an outer longitudinal coat. The large bowel differs from the small in the absence of the folds and villi, and is but slightly movable within the abdomen, being bound down to the abdominal wall posteriorly by the peritoneum. (See PHYSIOLOGY.)



Section of the Ileum and Cæcum: *a*, ileum; *b*, cæcum; *c*, ileocæcal valve; *d*, opening of the appendix; *e*, appendix.

Diseases of the Intestine.— These may be disturbances of the function of the bowels without actual inflammation, or they may be inflammations in different parts and of different kinds; but with inflammations there is necessarily a disturbance of the various functions, and differentiation frequently becomes a matter of difficulty. Diarrhœa and constipation (qq.v.) are symptoms of many different conditions, as are also deficiencies of secretion and absorption. The nervous mechanism of the bowels may be changed, giving rise to abnormal sensations and disturbance of all the functions. True inflammation of the intestines is the most common cause of abnormal action, and therefore is described in detail.

Acute Intestinal Catarrh is an inflammation of the mucous membrane that varies much in its symptomatology with the part of the bowel affected and the causative agent. Among the causes may be mentioned the eating of tainted fruits and other foods; the overeating of any food; overdrinking, particularly of very cold liquids; the injestion of chemical or mechanical irritants; "catching cold"; and the poisons of the infectious diseases. The bowel is inhabited by numerous forms of micro-organisms, many of which are entirely harmless; but when any of the various agencies mentioned above affect the mucous membrane, the micro-organisms are able to attack the damaged surface. Many forms of bacteria produce particular types of disease when they find such lodgment, because they invade the system with their peculiar products. (See CHOLERA INFANTUM; CHOLERA; DYSENTERY.) But to the growth of bacteria must always be ascribed some of the symptoms in any intestinal catarrh. The attack usually starts in acutely with fever, general bodily discomfort, and abdominal pain. If the inflammation be confined to the upper part of the small intestine there may be constipation; but this is uncommon, and diarrhœa is the rule. Inflammation of the small intestine is spoken of as enteritis, but this is usually associated with more or less inflammation of the large bowel, called colitis (q.v.), although it may occur alone even in its last portion, the rectum. The pain in colitis is apt to be confined to the sides of the abdomen, and when the inflammation is low down there is constant desire to defecate, pain accompanying the act. Passage of mucus alone also indicates an inflammation low down in the rectum. The stools in acute intestinal catarrh vary much with the cause of the trouble; in some observed cases of dysentery the discharges are like rice-water. Treatment of these conditions depends upon the severity and location of the inflammation. The mild cases, with ordinary loose movements, recover without medication with abstinence from food for 24 hours. Castor-oil or small doses of calomel will cleanse the intestine of irritating substances. The more severe cases are kept in bed and allowed small amounts of milk after the first day, and are given small doses of castor-oil or mixtures of bismuth, opium, and other sedative drugs. If the large intestine is found to be involved, irrigation with common salt in water (teaspoonful to the quart) is valuable. Great care must be used in the selection of diet for some time.

Duodenitis occurs associated with acute gastritis (q.v.), and has the same symptoms, except for the presence of jaundice due to the closure of the bile-ducts. The disease runs its course ordinarily in a few weeks without any treatment except rest in bed for a few days, simple diet, and mild cathartics to relieve the constipation. *Chronic intestinal catarrh* results from a severe attack of acute inflammation in which the mucous membrane is left with permanent changes, or from repeated attacks of inflammation. Cases

of chronic inflammation may occur without previous evidence of acute attacks. The symptoms vary much in kind and intensity, but pain, flatulence, and disturbance of the bowels are usually complained of. There may be pronounced constipation, alternating constipation and diarrhœa, daily unformed movements not distinctly diarrhœal, or, what is most common, a constant diarrhœa. More or less admixture of mucus in the stools is usually observed. Sooner or later there is apt to be a loss of flesh and strength. When the large bowel is much involved in such a process there is usually a coating of the stools with mucus, or the passage of clear mucus.

In the treatment it is best to rely mainly on carefully regulated life — exercise, baths, fresh air, sufficient rest, avoidance of exposure, and properly selected diet. In diet the objects sought are the regulation of the bowels and the avoidance of irritation. When there is diarrhœa it is wise to avoid fruits, salads, cabbage, coarse-fibred breads, sugars, honey, pastry, sour and sweet wines, and carbonic beverages. In cases attended with constipation most of these may be allowed, but sausages, rich dressings, cucumbers, cabbage, and very coarse-fibred breads should be forbidden. Mineral waters are frequently used with success, such springs as Carlsbad and Vichy for the diarrhœal cases, and such as Marienbad, Hathorn, and Congress for those attended with constipation. Chronic catarrh of the large bowel is treated with small doses of castor-oil and irrigations of the bowel with water, to which may be added antiseptics or astringents.

Intestinal Hemorrhage, or blood passed from the bowel, may be due to piles, tumors, dysentery, colitis, typhoid fever, tuberculosis of the intestinal tract, ulcers of the duodenum, portal obstruction as in cirrhosis of the liver, hæmophilia, purpura, and the hemorrhagic forms of the infectious diseases. When blood coming from the stomach or high up in the small intestine is passed by rectum it is changed to a tarry appearance. This is due to the action of the digestive juices and bacteria. The farther down the intestine the blood starts, the brighter red is it found when passed.

Intestinal Obstruction.— This is a term that includes a great variety of conditions in the abdomen having the common feature of obstruction to the passage of the contents along the bowel; and in addition there is in the acute condition some injury to the bowel resulting in special symptoms. Two varieties are differentiated, the acute and the chronic. Acute intestinal obstructions are caused by foreign bodies, gall-stones, and hardened or large collections of fæces in the canal; by contracting scars, or tumors of the wall, twists of the gut (volvulus), intussusceptions (invagination of a portion above into the part below); by adhesions of the peritoneum, causing constricting bands; and by strangulations of portions of the bowel contained in hernia. Besides these causes, from local or general peritonitis there is apt to be a condition of paralysis of a portion of the bowel, giving rise to the same state. The symptoms vary considerably with the cause of the obstruction and the part of the bowel affected, but in general the symptoms are pain — frequently of a colicky sort — constipation, inability to pass gas — with resulting tympanites — vomiting, first from the shock, and later from reversed peristalsis, until at length the vomitus is bilious and finally even fæcal. Because of these symptoms and the injury to the nerves of the intestine resulting in "shock," there is a gradually increasing prostration. Certain features indicating that the obstruction is in the small intestine are early vomiting, the passage of fæces from the lower bowel, and the greater swelling of the centre of the abdomen. Absolute constipation from the first is apt to mean an obstruction low down in the large bowel. The cause of the obstruction may be indicated by the presence of a tumor, or by something in the previous history. Intussusception is the most common cause of the obstruction in children; a tumor may be felt on the outside, or the bowel may be felt in the rectum. Fæcal impaction is indicated by a long history of constipation, and rectal examination shows the hardened masses. If intestinal obstruction be not relieved, the patient may die of shock, with gradual exhaustion, from gangrene of the bowel — the blood-supply being usually shut off — and sometimes from peritonitis.

Medical measures for the relief of most forms of the malady are not successful, and temporizing is attended with danger; but rest of the body as a whole, and especially of the intestinal tract, must be absolute. Some authorities advise the use of opium for further quieting the intestine when the diagnosis is certain. Lavage of the stomach is of great value, and large enemata may be curative when the cause of the trouble is intussusception, foreign body, or hardened fæces. Most forms of obstruction require the opening of the abdomen, search for the cause of the obstruction, and attempts at removal. Results depend on the quickness with which operation is undertaken; death may ensue, in spite of the removal of the obstruction, if interference be too long postponed. Chronic intestinal obstruction is caused by about the same conditions as the acute variety. The symptoms include various digestive disturbances, flatulency, constipation, and, when due to malignant growths, the general loss of flesh and strength.

Intestinal Parasites.— Three principal forms of these affect man — tapeworms, roundworms, and pinworms (qq.v.) The list of symptoms attributed to the presence of tapeworms in the human intestine is long and varied, but even loss of nutrition from such a parasite's presence is usually slight. Finding the worms or their eggs in the stools is the only convincing symptom. Treatment of this condition consists first in the preparation of the intestine by light diet for 24 hours before the tænifuge is given and six or eight hours before, allowing a liberal diet of onions, salty herring, and garlic; this rather loosens the worm's hold. Mild purgatives may also be given at this time. Early on the following morning the selected drug is taken, and this may be either male-fern, pomegranate, pumpkin-seed, kousso, or kamala. After about 12 hours a brisk cathartic is taken and the worm is passed. Careful search must be made for the head, for unless it is passed treatment must be started again while the worm is yet weak. Santonin and purgatives effect expulsion of roundworms. In the treatment of pinworms it is customary to take advantage of the fact that the females deposit their eggs in the large intestine and rectum. Santonin

and cathartics aid in gathering the worms where they may be killed by injections of benzine (20 drops to the pint of water), or by solutions of quinine, though further catharsis may be necessary.

DUDLEY D. ROBERTS, M.D.,
Brooklyn, N. Y.

Inton'ing, the practice of delivering prayers in the recitative form. Intoning differs little from chanting: in the latter case the cadence is more developed, the divisions more rhythmical, and the music in continuous harmony. In intoning the greater part of the prayer is recited on one note, and then sung by several voices in unison, the closing words of the sentence being sung to the proximate notes of the scale and in harmony. The practice of intoning prevails in the Greek, Roman, Anglican, and Lutheran Churches.

Intoxica'tion (literally poisoning, commonly restricted to poisoning by means of alcohol, for a discussion of which latter see ALCOHOLISM). Intoxication in the sense of poisoning may result from poisons having their origin outside of the human body (exogenous poisoning), or from poisons which may be developed within the body itself (endogenous poisoning, or autointoxication). Some of the most important problems connected with the infectious diseases concern themselves with the study of the intoxications that result from the formation of toxins by specific bacteria distributed throughout the human body during the course of a disease. From the same point of view many of the most complicated intoxications result from variations in the normal metabolism of the body. Thus in diabetes mellitus (q.v.) there is developed an acid intoxication (diabetic coma), which is due to the inability of the body properly to neutralize by its alkaline salts the excessive amounts of acid produced as a result of the perverted metabolism of this disease. Similarly in Bright's disease a type of intoxication (uræmic poisoning) results from failure of the kidneys to eliminate poisonous products from the human body. It seems not unlikely that a number of diseases such as migraine (sick headache), some forms of epileptic convulsions, different types of skin-eruptions, and some of the mild insanities result from autointoxication (q.v.). See TOXICOLOGY.

Introduced Species. A long catalogue might be made of species of animals and plants which have been transferred by accident or design from their native country or locality to other regions. Sometimes, as in the case of salmon in New Zealand, rabbits in Australia, the European house-sparrow in America and elsewhere, or western fishes in eastern waters, this is done by design; but in the great majority of cases the introduction is accidental and unwelcome, as in the case of the hundred and more species of injurious insects brought into the United States from foreign lands (or the fewer sent abroad from here), and the very many species of «weeds» naturalized on our and other shores. Such introductions are in the main accidental, the eggs or seeds or grown individuals passing from one region to another in ships or railway trains, or cargoes or discharged ballast; so many plants have been introduced by the latter means that botanists class the group of alien weeds as «ballast plants.» See ACCLIMATIZATION; ZOOGEOGRAPHY.

Intuba'tion, the introduction of a tube into an orifice or an organ, as the larynx, to keep it open. Specially designed tubes for such a purpose are sometimes used in cases of croup, diphtheritic obstruction, etc., as a substitute for tracheotomy.

In'ulin, a substance resembling starch, but intermediate in nature between that body and the gums. It occurs in the roots of elecampane, dandelion, and certain other plants, and also in the Jerusalem artichoke and the common potato. When pure it is a tasteless white powder consisting of spherical particles. Its chemical formula is probably a multiple of $C_6H_{10}O_5$, though $C_{72}H_{124}O_{62}$ has been suggested. It is insoluble in alcohol, and but slightly soluble in cold water, although it is very hygroscopic. It dissolves freely in hot water. It melts at 320° F., becoming thereby converted into a different substance known as «pyro-inulin.» It is not fermentable, and does not reduce Fehling's solution. Iodine renders it brown or yellow.

Invariants and Covariants. 1. These terms were introduced, and are still ordinarily employed, in connection with a special mathematical theory, namely, the theory of the linear transformation of algebraic forms developed by Cayley and Sylvester during the middle third of the nineteenth century. The central idea, however, is a very general one, which has been applied in recent years to almost all branches of mathematics. It deserves, in fact, to be ranked with such fundamental concepts as function and group. We therefore divide our sketch into three parts as follows: (1) The general concept of invariant; (2) The theory of algebraic forms, or invariants in the narrow sense; (3) Other invariant theories.

THE GENERAL CONCEPT.

2. The suggestion for the formation of the concept comes from the familiar observation, at the bottom of all science and philosophy, that, while the world about us is in a continual state of change, there are yet certain aspects or properties which are unaltered. To find the permanent in the changing is the most general statement of the problem of invariants. Abstractly, the idea may be explained more definitely as follows: Consider a set of objects or elements O of any conceivable kind, finite or infinite in number; and a set of operations or transformations T, each of which interchanges the objects in a definite manner. Then a property of an object O is said to be *invariant*, provided it holds for all the objects obtained from the given O by the transformations T. Similarly, any relation between a number of O's which holds for the transformed O's is said to be an invariant relation, that is, an invariant relation of the given objects with respect to the given transformations.

The idea of *covariant* involves nothing essentially new. An object $\overline{O}$ is said to be a covariant of a given number of objects O_1, O_2, etc., provided $\overline{O}$ is invariantly related to O_1, O_2, ... In this case, if any one of the transformations T converts $\overline{O}$ into $\overline{O}'$, O_1 into O_1', O_2 into O_2', etc., then the relations connecting $\overline{O}'$ with O_1', O_2', etc., are the same as those connecting $\overline{O}$ with O_1, O_2, etc.

3. The idea is best illustrated by examples from geometry. Consider a number of points P_1, P_2, . . . , connected with a solid body. When the body is displaced, its points take new positions, P_1', P_2', ... Many such positions are possible, since the displacement may be made in an endless number of ways. But in every case, of course, the distance between P_1' and P_2' is the same as that between P_1 and P_2. That is, distances between points are invariant with respect to rigid displacement.

Suppose next that the solid carrying the points is not only displaced but is magnified (or diminished) according to any scale. (We may, for example, picture such a change as produced by subjecting the homogeneous solid to a higher or lower temperature.) The solid is then converted into one of different size but of the same shape, that is, a similar solid. Distances are changed in the same ratio. Hence $P_1'P_2'/P_2'P_3' = P_1P_2/P_2P_3$. That is, the ratio of any two distances is invariant with respect to similitude transformations.

4. In both examples, points on a straight line are converted into points on a straight line. Collinearity is then a relation which is invariant with respect to displacements and similitude transformations. A more general type of transformation for which this is true is the homographic or projective transformation. We consider, for simplicity, only the case of figures drawn in a plane M. From a fixed point (termed the center of projection) outside of M draw lines to the various points of M until they intersect a second plane M'. Thus, every point P in M is associated with a definite point P' in M'. The operation of passing from a figure in M to the corresponding figure in M' is termed projection. Concretely, we may think of the center of projection as a source of light and the figure in M' as the shadow of that in M.*

If we consider three points P_1, P_2, P_3 on a straight line in M, they are converted, by projection, into points P_1', P_2', P_3' on a straight line in M'. But in general the distances and also the ratios of distances will differ. In fact, three points have no invariant, since they may be converted into three points at arbitrarily assigned distances by a suitable projection. If, however, we take four points (on a straight line) it may be shown that, for any projection,

$$\frac{P_1P_3}{P_3P_2} : \frac{P_1P_4}{P_4P_2} = \frac{P_1'P_3'}{P_3'P_2'} : \frac{P_1'P_4'}{P_4'P_2'}.$$

In each member of this equation we have a combination of the distances between four points which is termed their cross ratio (anharmonic ratio). Hence the cross ratio of four collinear points is invariant with respect to projective transformation.

5. Let the figures considered be all the ellipses of a plane. With respect to displacement an ellipse has two invariants, the major and the minor axis. With respect to similitude transformation, there is one invariant, the ratio of the axes, or what is essentially the same, the eccentricity. Finally, in the projective theory there are no invariants, since one ellipse may be converted into any other (and even into any proper conic).

* It is however necessary to include the ideal shadow formed by producing the rays away from M.

In this connection we may illustrate the notion of a covariant. The center of an ellipse is a covariant with respect to displacement and magnification, but not with respect to projection. For if the plane containing an ellipse E and its center C is displaced or magnified, so that ellipse E is converted into another ellipse E' and the point C is converted into a point C', then C' is necessarily the center of E'; while under projection this is not the case. A similar result holds for the center of gravity of any figure, plane or solid.

6. Another well-known type of transformation is that known as inversion. Take a fixed circle F with center C and radius r, and suppose that any point P of the plane is converted into the point P' situated on the line CP, so that $CP \cdot CP' = r^2$. The points P, P' are then said to be inverse with respect to the circle F. By the inverse of a curve is meant the locus of the points inverse to the points of the curve. The collinear relation of points is no longer invariant, for a straight line (not passing through C) is converted into a circle. An arbitrary circle is converted into a circle, but the center of the circle is not a covariant point. The most important property of the transformation is this: the angle at which any two curves intersect is equal to the angle at which the inverse curves intersect. Angles are invariant with respect to geometric inversion.

7. We pass now to a few simple examples of the general definition in No. 2, in which the objects and transformations are analytic instead of geometric.

Let the objects O be functions of any number of variables, and let the operations T performed on these functions be the permutation of the variables involved. A function written down at random, for example x^2+2yz, changes its form when say x and y are interchanged. There are exceptional functions, like $x^2+y^2+z^2$ and $xy+yz+xz$, which are not altered by interchanging the variables in any way, and are termed symmetric. The symmetric functions are invariant with respect to permutation of the variables.

In the differential calculus it is shown that the exponential function e^x has the property of being its own derivative. The only functions which are invariant with respect to the process of differentiation are in fact those of the form ae^x, where a is a constant. It is obvious that if the first derivative is equal to the original function, all the higher derivatives will also be equal to the function.

The trigonometric functions have a period of 2π or 360°. Such a function $f(x)$ is unaltered in value when x is replaced by $x+2\pi$. It is obvious that the double application of the operation, that is, the replacing of x by $x+4\pi$, will also leave $f(x)$ invariant. The periodic character thus involves the invariance of the function with respect to all the operations $(x,\ x+2k\pi)$ (this denotes the replacing of x by $x+2k\pi$), where k is any integer. We note here that if one of these operations, say that of adding $2k'\pi$ to the angle, is followed by another, say that of adding $2k''\pi$, the result is the same as the single operation of adding $2(k'+k'')\pi$, which is a member of the set. The set of operations thus possesses the essential property of a GROUP.

8. In general, if an invariant is found with respect to certain operations, T_1, T_2, . . . , the

invariance also holds for all combinations of these operations. Adding these combinations to the original operations, a set is finally obtained with the group property; this is then termed the group generated by the given operations.

Thus, in connection with No. 6, since angles are unaltered by inversion with respect to any circle, it follows that they are unaltered by successive inversion with respect to a number of circles. The inversions themselves do not constitute a group; but the totality of combinations is the important group of circular transformations which are expressed analytically by the linear transformations of a complex variable and of its conjugate.

9. The general problem of the mathematical theory of invariants may now be restated as follows: Given any group of transformations, and any set of configurations (mathematical objects) which are converted into one another by these transformations, to find the properties of the configurations which remain unaltered. There are thus as many types of invariant theories as there are types of groups and types of configurations. The distinction according to groups is the more fundamental.

10. The relation between the concepts invariant and group is thus very intimate. Suppose that instead of assigning transformations and seeking invariants, the question is inverted: Given a property or a function, find the transformations which leave it invariant.

Thus, if space is to be deformed so as to leave the distance between every pair of points unaltered, the deformation must be simply a displacement. The totality of displacements forms a group; for if one displacement is followed by a second, the effect is the same as that due to a single displacement. In general the totality of transformations defined by one or more invariants is a group. Many groups are defined in this way.

11. In connection with any group this question may be asked: Given two configurations, is it possible to convert the one into the other by a transformation belonging to the assigned group? If this is the case, the configurations are said to be *equivalent* with respect to the group.

Thus, two figures are equivalent with respect to the displacement group when they are congruent; they are equivalent with respect to the similitude group when they are similar. The study of equivalence with respect to the projective group is the main object of projective geometry; its systematic analytic treatment depends upon the theory of algebraic forms considered below.

The importance of the notion of equivalence depends upon the fact that equivalent configurations necessarily have the same invariant functions and properties. Thus in studying the projective properties of (proper) conics, it is sufficient to consider the case of a circle. The circle may thus be taken as the *type* or *canonical form* of the class of conics.

The Theory of Algebraic Forms.

12. This part of modern algebra deals with the invariants of algebraic forms with respect to the group of linear transformations. It has been variously termed the theory of forms, the algebra of quantics, the algebra of linear transformations, the linear or projective invariant theory. Traces of the idea may be found in papers by Lagrange, Gauss, and Cauchy; and simple results on quadric forms were given by G. Boole (1841); but the construction of the systematic theory begins with the memoirs of A. Cayley (1845–) and J. J. Sylvester * (1851–). The recent developments are due mainly to German and Italian mathematicians.

13. The objects considered are algebraic forms. A *form* or *quantic* is a rational integral homogeneous function of any number of variables. Forms are classified according to the number of variables and the degree in which they are involved. A *binary* form involves two variables; a *ternary*, three; a *quaternary*, four; in the general case of p variables the adjective p-ary is employed. The degree in which the variables enter is termed the *order* of the form; we denote it in general by n. If n is one, the form is linear; if two, quadric (or quadratic); if three, cubic; if four, quartic (biquadratic); etc.

Thus the binary cubic form is

$$ax^3+bx^2y+cxy^2+dy^3,$$

where x, y are the variables and a, b, c, d the coefficients. It is usual, however, to distinguish the variables and the coefficients by subscripts, a notation which has the advantage of generality and symmetry; also binomial coefficients are introduced. Thus the above form is written

$$a_0x_1^3+3a_1x_1^2x_2+3a_2x_1x_2^2+a_3x_2^3.$$

The ternary quadric is

$$a_{11}x_1^2+a_{22}x_2^2+a_{33}x_3^2+2a_{23}x_2x_3+2a_{13}x_1x_3+2a_{12}x_1x_2.$$

The general binary form is

$$(1)\quad a_0x_1^n+\frac{n}{1}x_1^{n-1}x_2+\frac{n(n-1)}{1\cdot 2}x_1^{n-2}x_2^2+\ldots+a_nx_2^n.$$

14. The group employed consists of the totality of linear transformations of the variables. A linear transformation from the original variables $x_1, x_2, \ldots x_p$ to the new variables $X_1, X_2, \ldots X_p$ is defined by p equations of the first degree, as follows:

$$\begin{aligned} x_1&=l_{11}X_1+l_{12}X_2+\ldots+l_{1p}X_p,\\ x_2&=l_{21}X_1+l_{22}X_2+\ldots+l_{2p}X_p,\\ &\ldots\ldots\ldots\ldots\\ x_p&=l_{p1}X_1+l_{p2}X_2+\ldots+l_{pp}X_p. \end{aligned}$$

The determinant

$$\Delta=|l_{ij}|,$$

whose elements are the p^2 coefficients in these equations, is termed the *modulus* of the transformation. It is assumed that Δ does not vanish; for in the latter case the X's cannot be expressed in terms of the x's, that is, the transformation is not reversible.

We shall deal mainly with binary variables and then employ the simpler notation

$$(2)\quad x_1=l_1X_1+m_1X_2,\quad x_2=l_2X_1+m_2x_2.$$

The modulus is $\Delta=l_1m_2-l_2m_1$.

* Most of the technical terms employed (including invariant, covariant, form) are due to Sylvester, who gloried in the title of "The Mathematical Adam."

15. When a linear transformation is carried out on a form, the latter is converted into a form of the same order containing the new variables. The coefficients of this transformed quantic depend of course upon the transformation employed. Thus if in the quadric

$$f \equiv a_0 x_1^2 + 2a_1 x_1 x_2 + a_2 x_2^2$$

we make the substitution (2), the result is a new quadric,

$$F \equiv A_0 X_1^2 + 2A_1 X_1 X_2 + A_2 X_2^2,$$

where

$$A_0 = l_1^2 a_0 + 2l_1 l_2 a_1 + l_2^2 a_2,$$
$$A_1 = l_1 m_1 a_0 + (l_1 m_2 + l_2 m_1) a_1 + l_2 m_2 a_2,$$
$$A_2 = m_1^2 a_0 + 2m_1 m_2 a_1 + m_2^2 a_2.$$

It is easy to verify that

$$A_0 A_2 - A_1^2 = (l_1 m_2 - l_2 m_1)^2 (a_0 a_2 - a_1^2).$$

According to the general definition in No. 2, the function $a_0 a_2 - a_1^2$ is not an invariant function, since it is not equal to $A_0 A_2 - A_1^2$; but the relation $a_0 a_2 - a_1^2 = 0$ is invariant, since its fulfillment necessitates $A_0 A_2 - A_1^2 = 0$. This is sometimes expressed by saying that the function is a *relative* invariant.

It is usual, however, to modify somewhat the general definition as follows: A function of the coefficients of a quantic is said to have the invariant property when it is equal to the same function of the coefficients of the transformed quantic, except for a factor depending only upon the coefficients of the linear transformation. Thus if $\phi(a)$ is such a function, where a denotes the coefficients collectively, and if A denotes the coefficients in the new form, then

$$\phi(A) = M\phi(a), \tag{3}$$

where M depends only on the transformation coefficients.

All such functions can be expressed in terms of rational integral functions with the same property. These are termed simply invariants. Thus an *invariant* is a rational integral function of the coefficients with the property expressed by (3).

16. A *covariant* of a quantic differs from an invariant only in that it involves both the coefficients and the variables. Its defining property is expressed by

$$\phi(A, X) = M\phi(a, x). \tag{3'}$$

Thus the binary cubic

$$a_0 x_1^3 + 3a_1 x_1^2 x_2 + 3a_2 x_1 x_2^2 + a_3 x_2^3$$

has the covariant

$$(a_0 a_2 - a_1^2) x_1^2 + (a_0 a_3 - a_1 a_2) x_1 x_2 + (a_1 a_3 - a_2^2) x_2^2;$$

for when the cubic is linearly transformed, it is found that the corresponding expression

$$(A_0 A_2 - A_1^2) X_1^2 + (A_0 A_3 - A_1 A_2) X_1 X_2 + (A_1 A_3 - A_2^2) X_2^2,$$

built from the new coefficients and variables, reduces to the original expression multiplied by $(l_1 m_2 - l_2 m_1)^2$.

17. Invariants and covariants are collectively termed concomitants or, more simply, *comitants*. We give now a few of their important general properties.

A comitant is homogeneous in the coefficients (a) and in the variables (x). Its dimension in the former is termed its degree (d); its dimension in the latter, its order (m). For an invariant, of course, $m = 0$.

The factor M produced by the linear transformation is for every comitant an entire power of the modulus Δ. Hence

$$\phi(A, X) = \Delta^w \phi(a, x). \tag{4}$$

The exponent w is termed the *weight* of the comitant.

The proof of the first theorem depends on the use of linear transformations of the special type $x_1 = \rho X_1$, $x_2 = \rho X_2$; that of the second theorem depends on the group property of linear transformations and the fact that Δ is not factorable.

18. The weight w, order m, and degree d of any comitant of a binary n-ic are connected by the relation

$$2w = nd - m.$$

This holds in the example given in No. 16, where $n = 3$, $m = 2$, $d = 2$, $w = 2$.

Taking $m = 0$ and n odd, we have the corollary: A binary form of odd order cannot have an invariant of odd degree.

When n is even, so is m. Hence a binary form of even order cannot have a covariant of odd order.

19. The preceding definitions and theorems may readily be extended to *simultaneous* comitants, that is, invariants and covariants of two or more forms.

20. An important process for the formation of simultaneous comitants depends on this principle: If in an invariant $\phi(a_0, a_1, \ldots a_n)$ of a single form f, we substitute $a_0 + \kappa b_0$ for a_0, $a_1 + \kappa b_1$ for a_1, etc., and expand the result according to powers of κ, the first term is the original invariant $\phi(a)$, the coefficient of κ^d is the corresponding invariant $\phi(b)$ of a form g with coefficients $b_0, b_1, \ldots b_n$, and the remaining coefficients are simultaneous invaraints of f and g.

For example, when this principle is applied to the invariant $a_0 a_2 - a_1^2$ of a quadric $f = a_0 x_1^2 + 2a_1 x_1 x_2 + a_2 x_2^2$, we have

$$(a_0 + \kappa b_0)(a_2 + \kappa b_2) - (a_1 + \kappa b_1)^2$$
$$= a_0 a_2 - a_1^2 + \kappa(a_0 b_2 - 2a_1 b_1 + a_2 b_0) + \kappa^2 (b_0 b_2 - b_1^2).$$

It follows that $a_0 b_2 - 2a_1 b_1 + a_2 b_0$ is a simultaneous invariant of f and $g = b_0 x_1^2 + 2b_1 x_1 x_2 + b_2 x_2^2$.

The coefficient of the first power of κ, by Taylor's theorem, is

$$b_0 \frac{\partial \phi}{\partial a_0} + b_1 \frac{\partial \phi}{\partial a_1} + \ldots + b_n \frac{\partial \phi}{\partial a_n}.$$

Hence if the operation $b_0 \dfrac{\partial}{\partial a_0} + b_1 \dfrac{\partial}{\partial a_1} + \ldots + b_n \dfrac{\partial}{\partial a_n}$

is applied to an invariant of a single form, the result is an invariant of two forms. The operation is known as the *Aronhold process*.

21. In the domain of simultaneous comitants the distinction between invariants and covariants may be said to disappear. All the covariants of a form f may be obtained from the simultaneous invariants of f and a linear

form $u_1x_1 + u_2x_2$ by the substitution of x_2 for u_1 and $-x_1$ for u_2.

22. *Geometric Interpretation.*—If a binary form f of nth order is equated to zero, the resulting equation, by the fundamental theorem of algebra, determines n values of the ratio $x_1 : x_2$. Taking $x_1 : x_2$ as homogeneous coordinates of a point on a straight line, we thus obtain a definite set of n points corresponding to the form f. Conversely, if a set of n points is given, the form f is determined (except for a numerical factor).

Linear transformation of x_1, x_2 has the same effect upon the points of the line as the projection of the given line upon a second followed by the displacement of the second line upon the first. Hence an invariant of f equated to zero represents a projective relation between the corresponding n points, that is, a relation not altered by the process of projection. Similarly, a covariant of order m represents a set of m points projectively related to points defined by f.

Thus, the vanishing of the invariant $a_0a_2 - a_1^2$ of a quadric form means that the two root points coincide. Again, the vanishing of $a_0b_2 - 2a_1b_1 + a_2b_0$, derived in No. 21, means that the pairs of points represented by the two quadrics are situated harmonically.

The interpretation often suggests the invariant character of complicated algebraic functions. For example, the *resultant* of two equations, $f=0$, $g=0$ (that is, the expression which vanishes when and only when the equations have a common root), is a simultaneous invariant of f and g. The condition that the equation $f=0$ shall have equal roots leads to an invariant termed the *discriminant* of f.

23. *Absolute Invariants.*—By considering fractional instead of integral functions of the coefficients, it is possible to obtain *absolute invariants*, that is, functions which are unaltered by linear transformation. The factor M in (3) is then unity. An absolute invariant is necessarily the ratio of two (relative) invariants having the same weight. We give an example in connection with the form of fourth order. Here there are two invariants I and J with weights 3 and 2 respectively. Linear transformation affects them as follows: $I' = M^3I$, $J' = M^2J$. Hence $I'^3/J'^2 = I^3/J^2$. That is, I^3/J^2 is an absolute invariant.

Geometrically, every absolute invariant of any number of forms is expressible in terms of cross ratios of the corresponding points.

24. *The Symbolic Notation.*—The most powerful method for attacking the general problem of our subject, the determination of all the comitants of any number of forms and their interrelations, is the so-called *symbolic* method. The origin of the method is to be found in Cayley's hyperdeterminants (1845), but the symbolic notation itself is due to Aronhold (1859). The general theory was developed by Clebsch and Gordan (1870–).

A binary form of nth order is represented by the nth power of a linear form,

$$f = (a_1x_1 + a_2x_2)^n.$$

Here the a's are merely symbols which have a real meaning only in the combinations

$$a_1^n = a_0,\ a_1^{n-1}a_2 = a_1,\ a_1^{n-2}a_2^2 = a_2,\ \ldots,\ a_2^n = a_n.$$

The Roman letters denote real coefficients and the Greek letters symbolic coefficients. The latter were termed *umbrae* (shadows of quantities) by Sylvester.

A combination of a's of dimension $<n$ has no real meaning. On the other hand, if the dimension is a multiple of n, there are several corresponding real quantities. Thus $a_1^{2n-2}a_2^2$ represents both a_0a_2 and a_1^2. This ambiguity is removed by introducing several equivalent sets of umbral quantities, each entering in precisely the nth dimension. We abbreviate by writing $\alpha_1x_1 + \alpha_2x_2 = \alpha_x$, $\beta_1x_1 + \beta_2x_2 = \beta_x$, etc. The given form is then

$$f = \alpha_x^n = \beta_x^n = \gamma_x^n, \text{ etc.}$$

The fundamental theorem is as follows: Every comitant of binary forms f is expressible symbolically as a combination of determinants of the type $(\alpha\beta) = \alpha_1\beta_2 - \alpha_2\beta_1$ and linear factors of the type $\alpha_x = \alpha_1x_1 + \alpha_2x_2$. In the case of invariants, only the determinants are involved. Conversely, all combinations of these two types (in which each set of symbols is involved in the proper dimension) represent comitants.*

Thus the quadric $f = \alpha_x^2 = \beta_x^2$ has the invariant $(\alpha\beta)^2$. Expanding, we have

$$(\alpha_1\beta_2 - \alpha_2\beta_1)^2 = \alpha_1^2\beta_2^2 - 2\alpha_1\alpha_2\beta_1\beta_2 + \alpha_2^2\beta_1^2 = a_0a_2 - 2a_1a_1 + a_2a_0,$$

which is simply twice the discriminant $a_0a_2 - a_1^2$.

25. *Transvectants.*—Among the comitants of two forms, $f = \alpha_x^n$, $g = \beta_x^m$ (here α and β are non-equivalent symbols), those represented by $(\alpha\beta)^\kappa\alpha_x^{n-\kappa}\beta_x^{m-\kappa}$ are of special importance, since they are of the first degree in each set of coefficients. They are termed the *transvectants* of f and g and are denoted by $(f, g)_\kappa$. Gordan has shown that all comitants may be derived by the repeated application of the process of transvection.

The first transvectant of two forms is termed their *Jacobian;* its non-symbolic value is $\frac{\partial f}{\partial x_1}\frac{\partial g}{\partial x_2} - \frac{\partial f}{\partial x_2}\frac{\partial g}{\partial x_1}$. The transvectant $(f, f)_2$ is termed the *Hessian* of f; its non-symbolic value is $\frac{\partial^2 f}{\partial x_1^2}\frac{\partial^2 f}{\partial x_2^2} - \left(\frac{\partial^2 f}{\partial x_1 \partial x_2}\right)^2$.

26. *Complete Systems.*—In general, a set of forms has an infinite number of comitants. Thus any entire power of a comitant, or a product of powers of two comitants, is also a comitant. It is evident, however, that there cannot exist an infinite number of algebraically independent comitants, since all are functions of a finite number of coefficients and variables. The following result is fundamental in the systematic theory: For a given set of forms there exist a finite number of comitants such that every comitant of the forms is a rational integral function of the selected comitants. The latter constitute the *complete system* of the given forms.

The proof was first given by Gordan (1870) by means of the symbolic method. It has since been simplified and generalized by numerous investigators—in particular, Hilbert.

27. We now give the complete systems for the forms of order 1, 2, 3, 4:

* Sylvester observed certain formal analogies between this symbolism and that employed in chemistry, and developed a so-called chemico-algebraic theory. See Grace and Young, (Algebra of Invariants,) Cambridge, 1903, p. 366.

Linear form. No invariant; the only covariant is the given form $f=\alpha_x$.

Quadric form. One invariant (the discriminant) $D=(\alpha\beta)^2$; one covariant $f=\alpha_x^2$.

Cubic form. The only invariant is the discriminant $R=(\alpha\beta)^2(\alpha\gamma)(\beta\delta)(\gamma\delta)^2$; in addition to $f=\alpha_x^3$, there are two covariants, $H=(\alpha\beta)^2\alpha_x\beta_x$ (the Hessian of f) and $Q=(\alpha\beta)^2(\alpha\gamma)\beta_x\gamma_x^2$ (the Jacobian of f and H).

Quartic form. Two invariants, $I=(\alpha\beta)^4$, $J=(\alpha\beta)^2(\beta\gamma)^2(\gamma\alpha)^2$; three covariants, the given form $f=\alpha_x^4$, its Hessian $H=(\alpha\beta)^2\alpha_x^2\beta_x^2$, and the Jacobian of f and H, namley, $T=(\alpha\beta)^2(\alpha\gamma)\alpha_x\beta_x^2\gamma_x^3$.

Every invariant of the quartic form is thus a rational integral function of I and J; every comitant is a rational integral function of I, J, f, H, T.

28. The systems given are *irreducible;* that is, no member of a system can be expressed as a rational integral function of the other members of the system.

Complete irreducible systems have been calculated for single forms up to the order 10, and for pairs of forms up to the order 4. The system of the quintic contains twenty-three members.

While the finiteness of the system is assured, no general formula for the exact number of irreducible comitants is known.

29. *Ternary Forms.*—Many of the results stated for the binary case apply with little change to ultrabinary forms. There are, however, certain aspects of the general theory which are disguised when only the binary case is studied.

Consider a ternary form $f(x_1, x_2, x_3)$ of nth order. (The symbolic representation is α_x^n, where $\alpha_x=\alpha_1x_1+\alpha_2x_2+\alpha_3x_3$.) If x_1, x_2, x_3 are taken as the homogeneous coördinates of a point in a plane, the equation $f=0$ defines a curve of nth order. The vanishing of an invariant denotes a projective property of the curve. A covariant defines a curve which is projectively related to the original curve.

The principle of duality suggests the introduction of line coördinates u_1, u_2, u_3. When the x's undergo a linear transformation, the u's undergo another linear transformation which is said to be *contragredient* to the first. A function involving the u's and having the invariant property is termed a *contravariant* of f. Geometrically it represents a curve considered as the envelope of its tangent lines. A *mixed* comitant is one involving both point coördinates and line coördinates; geometrically it defines a so-called *connex*.

The complete system of the ternary quadric $f=\alpha_x^2$ consists of the covariant f, the invariant $D=(\alpha\beta\gamma)^2$, the contravariant $F=(\alpha\beta u)^2$, and the so-called identical form u_x. (Here $(\alpha\beta\gamma)$ represents a determinant of third order $|\alpha_1\beta_2\gamma_3|$.) Geometrically, $f=0$ represents a conic considered as a point locus, $F=0$ represents the same conic regarded as line envelope, and $D=0$ denotes that the conic degenerates to a pair of straight lines.

30. *Quaternary Forms.*—Here the essentially new feature is that in addition to point coördinates (x_1, x_2, x_3, x_4) and the dual plane coördinates (u_1, u_2, u_3, u_4), it is necessary to consider line coördinates $(p_{12}, p_{13}, p_{14}, p_{34}, p_{42}, p_{23})$. Comitants may contain, besides the coefficients of the given form, any combination of these types of variables. Little advance has yet been made in the complete treatment of even the simpler cases.

31. Gordan's method for proving the existence of a complete system applies only to binary forms. The proof for forms of any kind (including multiple forms containing two or more sets of variables) was first given by Hilbert (1890). The basis of his method is the following theorem, which has many important applications:

In any assemblage containing an infinite number of forms it is possible to select a finite number of members $F_1, F_2, \ldots, F_r$, so that every member can be written $F=P_1F_1+P_2F_2+\ldots+P_rF_r$, where the P's are forms not belonging necessarily to the given assemblage.

Other Invariant Theories.

32. *Special Linear Transformations.*—Forms have been treated with respect to linear transformations of special type. Thus the transformations $x_1=\alpha X_1+\beta$, $y_1=\alpha Y_1$ lead to the so-called *seminvariants* of binary forms.

Again, the formulas for passing from one system of rectangular coördinates to another,

$$(5)\qquad \begin{aligned} x&=X\cos\theta-Y\sin\theta+h,\\ y&=X\sin\theta+Y\cos\theta+k,\end{aligned}$$

constitute a special linear group. Invariants with respect to this group are termed Cartesian or metric or orthogonal. In the case of the conic $ax^2+bxy+cy^2+dx+ey+f=0$, there are three such invariants, $a+c$, b^2-4ac, and the discriminant. The latter is the only one which is invariant in the projective theory. If $a+c=0$, the conic is a rectangular hyperbola; if $b^2-4ac=0$, it is a parabola.

For any number of variables the linear transformations which leave a given quadric form unchanged constitute a type of group which arises in many applications (line and circle geometries, geometry on a quadric surface, etc.).

33. The general method of finding the invariants of any continuous group involving a finite number of parameters is due to Sophus Lie. An r parameter group is generated by r independent infinitesimal transformations; these determine a set of r partial differential equations whose solutions are the invariant functions.

34. A *differential invariant* is one that contains the derivatives of the variables. Thus for the group (5) the expression $\frac{y''}{(1+y')^{\frac{3}{2}}}$ is a differential invariant. It represents in fact the curvature of an arbitrary curve at a point; this is obviously independent of the system of axes to which the curve is referred.

35. Special theories of invariants have been constructed in connection with *differential equations.* Thus an ordinary linear equation,

$$\frac{d^ny}{dx^n}+p_1(x)\frac{d^{n-1}y}{dx^{n-1}}+\ldots+p_n(x)=0,$$

is converted into an equation of the same kind by the substitution $x=\phi(X)$, $y=Y\psi(X)$. The totality of substitutions here forms an infinite continuous group, since ϕ and ψ are arbitrary functions. By an invariant of the equation is meant a function of the coefficients p_1, $p_2\ldots$ and their derivatives, which retains its value (except perhaps for a factor depending on the transformation) when formed from the coefficients of the new equation.

36. *Differential Forms.*—In the theory of surfaces the distance between two consecutive points of the surface is given by the formula

$$ds^2 = E(u, v)du^2 + 2F(u, v)du\,dv + G(u, v)dv^2.$$

The second member is a binary quadratic differential form. Such forms possess a theory of invariants with respect to arbitrary change of variables. Any change is expressed by $u = \phi(U, V)$, $v = \psi(U, V)$, where ϕ, ψ are arbitrary functions. The simplest example of an invariant is the expression, depending on E, F, G and their partial derivatives, which represents the Gaussian curvature.

37. *Arithmetical Theory of Forms.*—In this theory, inaugurated by Gauss, the coefficients and variables involved are supposed to be whole numbers. Attention has been confined mainly to the binary quadratic $ax^2 + 2bxy + cy^2$. The transformations are defined by $x = \alpha X + \beta Y$, $y = \gamma X + \delta Y$, where the coefficients α, β, γ, δ are integers such that $\alpha\delta - \beta\gamma \neq 0$. In this case, then, the group is discontinuous.

38. *Automorphic Functions.*—Such discontinuous groups arise also in the theory of functions. Thus in No. 7 it was seen that the trigonometric functions are unaltered by the substitutions $x = X + 2k\pi$. Similarly, a doubly periodic function (of a complex variable) is invariant with respect to $z = Z + k_1w_1 + k_2w_2$, where w_1, w_2 are the given periods and k_1, k_2 are arbitrary integers. The modular function is invariant with respect to the linear group $z = (\alpha Z + \beta)/(\gamma Z + \delta)$, where α, β, γ, δ are integers such that $\alpha\delta - \beta\gamma = 1$. The problem of finding all functions which admit an infinite discontinuous group of linear transformations is one of the most important in recent investigation. Such functions are termed *automorphic*. They have been classified by Poincaré into Fuchsian and Kleinian according as the defining group involves real or complex coefficients.

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EDWARD KASNER,
Instructor in Mathematics, Columbia University.

Invasion, the entry into a country by a public enemy. As early as 1795 Congress provided by law for protection against the invasion of the United States by any foreign nation or Indian tribe. The act made it lawful whenever there should be an invasion, or imminent danger of one, for the President to call out such number of the militia of the State or States convenient to the place of invasion as he might think necessary to repel it. This, strengthened in some respects by amendments, has been in force ever since. An invasion has usually all the elements of war, and the invaders may be dealt with as persons at war with the country invaded, in accordance with usages of warfare without the declaration of war by Congress. The Supreme Court of the United States has decided that a State is invaded when there is a domestic rebellion within its territory, and that the same rules of law may be enforced as in the case of an invasion by external foes. This decision practically abolishes all distinction between invasion and insurrection, and the same rules which furnish a remedy for invasion can be applied in the suppression of an insurrection or local rebellion. In case the State militia is not sufficiently strong, or not easily available, the standing troops of the United States may be ordered out by the President, if indeed it be necessary to call upon the State troops before resorting to the regular troops of the United States. It is not necessary that actual armed violence shall be resorted to in order to constitute insurrection. Any combination of persons too powerful to be suppressed by the ordinary course of judicial proceedings is tantamount to insurrection, and warrants the use of the effective measures provided for by law for its suppression.

As regards the rights of the invader many rules have been laid down, carefully distinguishing between invasion and conquest, especially with respect to private and public property. It is now held that public money, military stores, and public buildings with their contents are lawful sources of plunder, and telegraph and railway property may be used as needs require. The unwarranted burning of the capitol and other public buildings in Washington by the British in 1814; the removal of the Palatine libraries during the Thirty Years' War; the confiscation of the astronomical instruments in the Observatory of Peking by the Germans during the operations of the Allies against the Chinese capital—all these were in direct violation of the accepted rules of invasion. The levying of supplies, labor, forage, transportation facilities, etc., upon the native people is strictly within the lawful confines of invasion; for example, during the wars of Frederick the Great, both the Austrians and the Prussians were mainly supported by these enforced contributions of supplies. Napoleon was probably the greatest exponent of the belief that a war should support itself, either during the conflict, or by imposing a large indemnity, or both; hence we see that he exacted of Prussia, after the battle of Jena, more than a hundred million francs, and Spain was also forced during the Peninsular War to pay a similar amount. The pillage of private property is strictly prohibited, but should the owners give aid to their country, the property may be sold at the discretion of the invading general.

Inventions. The progress of the world in its numerous vast industries and arts has been founded, to a very large extent, upon inventions and discoveries and their subsequent development. Under the American patent law and system, inventors all over the world are stimulated to make public their inventions by reason of receiving in exchange a monopoly in the form of a patent on the invention for a

period of 17 years. The remarkable increase in the number of protected inventions is shown by the records of the United States Patent Office, as follows: At the end of the first year (1790) 3 patents were issued. In the year ending 1902, 27,136 patents were granted. The total number of patents issued from April 1790 to November 1903 was 752,774.

An invention is recognized to be any new or useful mechanical contrivance or article, method, discovery, composition of matter, or system not previously known or used, or any improvement on any known machine, art, method, or system. Below is given in chronological order a list of important inventions beginning with the 16th century, with the title of the invention, the year it was made, the name of the inventor and his nativity:

Inventions	Date	Inventor	Nativity
Discoveries of Electrical Phenomena.. Won the title of "founder of the science of electricity."	1560 to 1603	William Gilbert	England
Screw printing-press.	1620	Blaew	Germany
Spirally grooved rifle barrel	1620	Koster	England
Iron furnaces	1621	Lord Dudley	England
The use of steam.... The first authentic reference in English literature to the use of steam in the arts.	1630	David Ramseye	England
Bay Psalm Book, first book published in the Colonies....	1640		Mass.
Barometer	1643	Torricelli	Italy
Steam engine, atmospheric pressure ...	1663	Thomas Newcomen	England
Machine for generating electricity.....	1681-6	Otto von Guericke	Germany
First paper mill in America	1690	William Rittenhouse	Penna.
First steam engine with a piston.....	1690	Denys Papin	France
The manufacture of plate glass established	1695		France
First to discover difference between electric conductors and insulators.....	1696 to 1736	Stephen Gray	England
The first practical application of the steam engine.....	1702	Thomas Savery	England
First newspaper in America "Boston News Letter".....	1704	John Campbell	Mass.
First to produce electric spark.....	1708 to 1716	Dr. J. Wall	England
Thermometer	1709	Fahrenheit	Danzig
Electrometer, the well known pith ball...	1718 to 1772	John Cantor	England
The "Franklin" printing-press	1725	Benjamin Franklin	Utd. States
Electrical glass plate machine	1727 to 1772	Martin de Planta	France
Stereotyping	1731	William Ged	Scotland
First to discover that electricity is of two kinds	1733-9	Cisternay du Fay	France
Flying shuttle in weaving	1733	John Kay	England
Rotary 3-color printing-press (Multi-Color)	1743	Platt & Keen	England
Electric or Leyden Jar	1745	Kleist	Germany
Substitution of coke for coal in melting iron	1750	Abraham Darby	England
Lightning conductor.	1752	Benjamin Franklin	Utd. States
Spinning jenny	1763	James Hargreaves	England
Piano forte, played in public in England in	1767		England
Drawing rolls in a spinning machine..	1769	Richard Arkwright	England
The introduction of the "Hollander" or beating engine for pulping rags in the manufacture of paper	1773		
The mule spinner...	1774	Samuel Crampton	England
Cut nails.....	1775	Jeremiah Wilkinson	Utd. States
Circular wood saw...	1777	Miller	England
Embryo bicycle.....	1779	Branchard & Magurier	France
Steam engine, the basis of the modern engine	1782	James Watt	Scotland
Gas balloon	1783	J. E. & J. M. Montgolfier	France
Puddling iron	1783-4	Henry Cort	England
Plow, with cast iron mold board, and wrought and cast iron sbares.....	1784	James Small	Scotland
Power loom.....	1785	James Cartwright	England
First steam-boat in the United States..	1786	John Fitch	Utd. States
Steam road wagon... (First automobile).	1787	Oliver Evans	Utd. States
Grain thrashing machine	1788	Andrew Meikle	England
Uranium discovered..	1789	Klaproth	Germany
Hobby-horse, forerunner of bicycle.....	1790		England
Rotary steam power printing-press, the first idea of.....	1790	Wm. Nicholson.	England
Wood planing machine	1791	Samuel Bentham	England
Gas first used as an illuminant	1792	Wm. Murdoch	England
Cotton gin.....	1794	Eli Whitney	Utd. States
Art of Lithography..	1796	Alois Senefelder	Germany
Machine for making continuous webs of paper.....	1800	Louis Robert	France
Steam coach	1801	Richard Trevithick	England
Wood Mortising Machine	1801	M. J. Brunel	England
Pattern loom	1801	M. J. Jacquard	France
First fire proof safe..	1801	Richard Scott	England
Steamboat on the Clyde, "Charlotte Dundas"	1802	William Symington	England
First photographic experiments	1802	Wedgewood & Davy	England
Planing machine.....	1802	J. Branch	England
The application of steam to the loom..	1803	William Horrocks	England
Steel pen.....	1803	Wise	England
Steam Locomotive on rails	1804	Richard Trevithick	England
Application of twin screw propellers in steam navigation..	1804	John Stevens	Utd. States
Process of making malleable iron castings	1804	Lucas	England
First life preserver..	1805	John Edwards	England
Electro-plating	1805	Luigi Brugnatelli	Italy
Knitting machine, the latch needle in the	1806	Jeandean	France
Steamboat navigation on the Hudson River	1807	Robert Fulton	Utd. States
Percussion or detonating compound..	1807	A. J. Forsyth	Scotland
First street gas lighting in England....	1807	F. A. Winsor	England
Band wood saw	1808	Newberry	England
Barium, strontium and calcium	1808	Sir Humphry Davy	England
Polarization of light from reflection....	1808	E. L. Malus	France

Inventions	Date	Inventor	Nativity
Voltaic arc	1808	Sir Humphry Davy	England
First steamboat to make a trip to sea, the "Phœnix"	1808	John Stevens	Utd. States
Homeopathy introduced	1810	S. C. F. Hahnemann	Germany
Revolving cylinder printing-press	1810	Frederick Koenig	Germany
Breech-loading shotgun	1811	Thornton & Hall	Utd. States
Storage battery	1812	J. B. Ritter	Germany
Dry Pile (prototype of dry battery)	1812	Zamboni	
First practical steam rotary printing press, paper printed on both sides	1814	Frederick Koenig	Germany
First locomotive in Scotland	1814	George Stephenson	England
First circular wood saw made in this country	1814	Benjamin Cummings	Utd. States
Heliography	1814	Jos. N. Niepce	France
Discovery of Cyanogen	1814	Gay Lussac	France
Kaleidoscope	1814	Sir David Brewster	England
Miner's safety lamp	1815	Sir Humphry Davy	England
Seidlitz powder	1815		
Dry gas meter	1815	S. Clegg	England
Morphine, first organic alkaloid known	1816	Sertürner	Germany
Knitting machine	1816	Brunel	England
"Draisine" bicycle	1816	Baron von Drais	Germany
"Columbian" press, elbowed pulling bar, number of impressions per hour, 50	1817	George Clymer	Utd. States
Stethoscope	1819	Laënnec	France
Electro-magnetism discovered	1819	H. C. Oersted	Germany
Lathe for turning irregular wood forms	1819	Thomas Blanchard	Utd. States
The theory of electro-dynamics first propounded	1820	Andre Ampère	France
Quinine	1820	Pelletier & Caventon	France
Electroscope	1820	Bohenberg	Germany
The conversion of the electric current into mechanical motion	1821	Michael Faraday	England
Galvanometer	1822	Schweigger	Germany
Multi-color printing	1822	P. Force	Utd. States
Calculating machine	1822	Charles Babbage	England
Silicon	1823	James Berzelius	Switzerl'd
Discovery of thermo-electricity	1823	Prof. Seebeck	England
Liquefaction and solidification of gas	1823	Michael Faraday	England
Water gas, production of	1823	Ibbetson	England
Portland cement	1825	Joseph Aspdin	England
First passenger railway, opened between Stockton and Darlington, England	1825		
Electrical spur wheel	1826	Barlow	England
Bromine	1826	M. Balard	France
First railroad in United States, near Quincy, Mass.	1826		
The law of galvanic circuits formulated	1827	George S. Ohm	Germany
Friction matches	1827	John Walker	Utd. States
The reduction of aluminium	1827	Friedrich Wohler	Germany
Law of electrical resistance	1827	George S. Ohm	Germany
Improved rotary printing-press London Times, 5,000 impressions per hour	1827	Cowper & Applegarth	England
Hot air blast for iron furnaces	1828	J. B. Neilson	Scotland
Wood planing machine	1828	William Woodworth	Utd. States
Tubular locomotive boiler	1828	Séquin	France
Prism for polarized light	1828	Nicol	England
Spinning ring frame	1828	John Thorp	England
The "Washington" printing press, lever motion and knuckle joint for a screw, number of impressions per hour, 200	1829	Samuel Rust	Utd. States
First steam locomotive in United States, "Stourbridge Lion"	1829		
Double fluid galvanic battery	1829	A. C. Becquerel	France
Magnesium	1829	Adam Bussey	France
First portable steam fire engine	1830	Brathwaite & Ericsson	England
Magneto-electric induction	1831	Michael Faraday	England
Chloroform	1831	G. J. Guthrie	Scotland
First conception of electric telegraph	1832	Prof. S. F. B. Morse	Utd. States
First Magneto-electric machines	1832	Saxton	Utd. States
Rotary electric motor	1832	Wm. Sturgeon	England
Chloral-hydrate	1832	Justus von Liebig	Germany
Locomotive, "Old Ironsides" built	1832	M. W. Baldwin	Utd. States
Link-motion for locomotives	1832	Sir Henry James	England
Adoption of steam whistle for locomotives	1833	George Stephenson	England
Reciprocating saw-tooth cutter within double guard fingers for reapers	1833	Obed Hussey	Utd. States
"McCormick" reaper	1834	Cyrus H. McCormick	Utd. States
Rotary electric motor	1834	M. H. Jacobi	Russia
Carbolic acid discovered	1834	Runge	Germany
Horse shoe machine	1835	H. Burden	Utd. States
Constant electric battery	1836	J. P. Daniell	England
Acetylene gas discovered	1836	Edmund Davy	England
The revolver; a device "for combining a number of long barrels so as to rotate upon a spindle by the act of cocking the hammer."	1836	Samuel Colt	Utd. States
The screw applied to steam navigation	1836 / 1841	John Ericsson	Utd. States
The galvanizing of iron	1837	Henry Cranfurd	England
Indicator-telegraph	1837	Cooke & Wheatstone	England
Photographic carbon printing	1838	Mungo Ponton	France
Babbitt metal	1839	Isaac Babbit	Utd. States
Vulcanization of rubber	1839	Charles Goodyear	Utd. States
The first boat electrically propelled	1839	Jacobi	Germany
Daguerreotype	1839	Louis Daguerre	France
First to produce a direct photographic positive in the camera by means of highly polished silver surfaced plate exposed to the vapors of iodine and subsequent development with mercury vapor.			
Making photo-prints from paper negatives (First production of positive proofs from negatives).	1839	Fox Talbot	England

INVENTIONS

Inventions	Date	Inventor	Nativity
Photographic portraits. (Daguerreotype Process)	1839	Profs. Draper & Morse	Utd. States
Pneumatic Caissons	1841	M. Triger	France
Pianoforte automatically played	1842	M. Seytre	France
Steam hammer	1842	James Nasmyth	Scotland
Typewriting machine	1843	Charles Thurher	Utd. States
First telegram sent	1844	Prof. S. F. B. Morse	Utd. States
The use of nitrous oxide gas as an anæsthetic	1844	Dr. Horace Wells	Utd. States
The electric arc light (gas retort carbon in a vacuum)	1844	Léon Foucault	France
Automatic adjustment of electric arc light carbons	1845	Thomas Wright	England
Double cylinder printing-press	1845	R. Hoe & Co.	Utd. States
Pneumatic tire	1845	R. W. Thompson	England
Sewing machine	1846	Elias Howe	Utd. States
Suez canal started	1846	De Lesseps	France
Ether as an anæsthetic	1846	Dr. Morton	Utd. States
Artificial limbs	1846		
Gun cotton	1846	Schönbein	Germany
First pianoforte key board player	1846	Debain	France
Chloroform in surgery	1847	Dr. Simpson	Scotland
Nitro-glycerine	1847	Sobrero	
Time-lock	1847	Savage	Utd. States
Hoe's lightning press capable of printing 20,000 impressions per hour	1847	Richard M. Hoe	Utd. States
Match-making machinery	1848	A. L. Dennison	Utd. States
Breech gun-lock, interrupted thread	1849	Chambers	Utd. States
Magazine gun	1849	Walter Hunt	Utd. States
Steam pressure gauge	1849	Bourdon	France
Lenticular stereoscope	1849	Sir David Brewster	England
Latch needle for knitting machine	1849	J. T. Hibbert	Utd. States
"Corliss" Engine	1849	G. H. Corliss	Utd. States
Printing-press, curved plates secured to a rotating cylinder	1849	Jacob Worms	France
Mercerized cotton	1850	John Mercer	England
Collodion process in photography	1850	Scott Archer	England
American machine-made watches	1850		Utd. States
Electric locomotive	1851	Dr. Page	Utd. States
Self-raker for harvesters	1851	W. H. Seymour	Utd. States
Breech loading rifle	1851	Maynard	Utd. States
Icemaking machine	1851	J. Gorrie	Utd. States
The Rhumkorff coil	1851	Rhumkorff	Germany
Fire-alarm telegraph	1852	Channing & Farmer	Utd. States
Reticulated screen for half-tone photographic printing	1852	Fox Talbot	England
Soda process of making pulp from wood	1853	Watt & Burgess	Utd. States
Laws of magneto-electric induction	1853	Michael Faraday	England
Laws of electrostatics	1853	Michael Faraday	England
Electrolysis	1853	Michael Faraday	England
Duplex telegraph	1853	Gintl	Austria
Photographic roll films	1854	Melhuish	England
Diamond rock drill	1854	Herman	Utd. States
Four motion feed for sewing machines	1854	A. B. Wilson	Utd. States
Magazine firearm	1854	Smith & Wesson	Utd. States
Fat decomposed by water or steam at high temperature, since largely used in soap making	1854	R. A. Tilghman	Utd. States
Safety matches	1855	Lundstrom	Sweden
Iron-clad floating batteries first used in Crimean war	1855		
Cocaine	1855	Gaedeke	Germany
Process of making steel, blowing air through molten pig-iron	1855	Sir Henry Bessemer	England
Dryplate photography	1855	Dr. J. M. Taupenot	
Bicycle	1855	Ernst Michaux	France
Sleeping car	1856	Woodruff	Utd. States
Aniline dyes	1856	Perkins	England
Printing machine for the Blind (contains elements of the present typewriting machine	1856	Alfred E. Beach	Utd. States
Regenerative furnace	1856	Wm. Siemens	England
Refining engine in paper pulp making	1856	T. Kingsland	Utd. States
Coal-oil first sold in the United States	1857	Messrs. Stout & Hand	Utd. States
First sea going iron-clad war vessel, the "Gloire"	1857		France
Ground wood pulp	1858	Henry Voelter	Germany
Inclined elevator and platform in the reaper	1858	J. S. Marsh	Utd. States
Cable car	1858	E. A. Gardner	Utd. States
Breech loading ordnance	1858	Wright & Gould	Utd. States
Feed injector for Boilers	1858	Giffard	France
Storage or secondary battery	1860	Gaston Planté	France
Singing telephone	1860	Philip Reis	Germany
Ammonia absorption ice machine	1860	F. P. E. Carré	France
Improved stereotyping process	1861	Charles Craske	Utd. States
Shoe sewing machine	1861	George McKay	Utd. States
Driven well, a tube with a pointed perforated end driven into the ground	1861	Col. N. W. Green	Utd. States
Passenger elevator	1861	E. G. Otis	Utd. States
Barbed wire fence introduced	1861		Utd. States
Calcium carbide produced	1862	Frederich Woehler	Germany
Revolving turret for floating battery	1862	Theodore Timby	Utd. States
First iron-clad steam battery, "Monitor"	1862	John Ericsson	Utd. States
Gatling gun	1862	Dr. R. J. Gatling	Utd. States
Smokeless gunpowder	1862	J. F. E. Schultze	Prussia
Pneumatic pianoforte player (regarded as first to strike keys by pneumatic pockets)	1863	M. Fourneaux	France
Explosive gelatine	1864	A. Nobel	France
Rubber dental plate	1864	J. A. Cummings	Utd. States
Automatic grain binding device	1864	Jacob Behel	Utd. States
Process of making fine steel	1865	Martin	Utd. States
Antiseptic surgery	1865	Sir Joseph Lister	England
Web-feeding printing press	1865	William Bullock	Utd. States
Automatic shell ejector for revolver	1865	W. C. Dodge	Utd. States
The Atlantic cable laid	1866	Cyrus W. Field	Utd. States
Open-hearth steel process	1866	Siemens-Martin	England
Compressed air rock drill	1866	C. Burleigh	Utd. States
Torpedo	1866	Whitehead	Utd. States
Dynamo electric machine	1866	Wilde	England
Sulphite process for making paper pulp from wood	1867	Tilghman	Utd. States
Disappearing gun carriage	1868	Moncrief	England
First practical typewriting machine	1868	C. L. Sboles	Utd. States
Dynamite	1868	A. Nobel	France
Oleomargarine	1868	H. Mege	France

INVENTIONS

Inventions	Date	Inventor	Nativity
Water heater for steam fire engine..	1868	W. A. Brickell	Utd. States
Sulky plow.....	1868	B. Slusser	Utd. States
Railway air brake....	1869	George Westinghouse	Utd. States
Tunnel shield (operated by hydraulic power)	1869	Alfred E. Beach	Utd. States
A curved spring tooth harrow	1869	David L. Garver	Utd. States
Dynamo-electric machine	1870	Gramme	France
Celluloid	1870	J. W. & Isaac Hyatt	Utd. States
Rebounding gun-lock	1870	L. Hailer	Utd. States
The Goodyear welt shoe-sewing machine	1871	Goodyear	Utd. States
Photographic gelatino bromide emulsion (Basis of present rapid photography).	1871	R. L. Maddox	England
Continuous Web printing-press	1871	Hoe & Tucker	Utd. States
Grain binder	1871	S. D. Locke	Utd. States
Compressed air rock drill	1871	S. Ingersoll	Utd. States
Positive motion weaving loom	1872	J. Lyall	Utd. States
Theory that light is an electric phenomenon	1872	Clerk Maxwell	England
Automatic air brake	1872	George Westinghouse	Utd. States
Automatic car coupler	1873	E. H. Janney	Utd. States
The photographic platinotype process Prints by this process are permanent.	1873	Willis	England
Quadruplex telegraph	1873	T. A. Edison	Utd. States
Twine binder for harvesters	1873	M. L. Gorham	Utd. States
Gelatino bromide photographic emulsion (Sensitiveness to light greatly increased by the application of heat)..	1873	Charles Bennett	England
Self-binding reaper..	1873	Locke & Wood	Utd. States
Barbed wire machine	1874	Glidden & Vaughan	Utd. States
Siphon recorder for submarine telegraphs	1874	Sir William Thompson	England
Store cash carrier...	1875	D. Brown	Utd. States
Illuminating water gas	1875	T. S. C. Lowe	Utd. States
Roller flour mills....	1875	F. Wegmann	Utd. States
Middlings purifier for flour	1875	Geo. T. Smith	Utd. States
Ice making machine	1875	R. P. Pictet	Switzerl'd
Speaking telephone..	1876	Graham Bell	Utd. States
Electric candle ..... (The first step towards the division of the electric current for lighting.)	1876	Paul Jablochkoff	Russia
Continuous machine for making tobacco cigarettes	1876	Russell	Utd. States
Steam feed saw mills	1876	D. C. Prescott	Utd. States
The first Portland cement plant in U. S.....	1876		Coplay, Pa.
Phonograph	1877	T. A. Edison	Utd. States
Gas engine.....	1877	N. A. Otto	Utd. States
Carbon microphone..	1877	T. A. Edison	Utd. States
Telephone transmitter of variable resistance	1877	Emil Berliner	Utd. States
Carbon filament for Electric lamp..... (Beginning of the incandescent vacuum electric light.)	1878	T. A. Edison	Utd. States
Rotary disk cultivator	1878	Mallon	Utd. States
Decided advance in the "Expression" of self-playing pianofortes.....	1878	Gally	Utd. States
Automatic grain binder	1879	J. F. Appleby	Utd. States
Kathode rays discovered	1879	Sir Wm. Crookes	England
Steam plow.....	1879	W. Foy	Utd. States
Magazine rifle	1879	Lee	Utd. States
"Blake" telephone transmitter	1880	Blake	Utd. States
Hammerless gun.....	1880	Greener	Utd. States
Storage battery or accumulator	1880	Camille A. Faure	France
Typhoid bacillus isolated	1880	Eberth & Koch	Germany
Pneumonia bacillus isolated	1880	Sternberg	Utd. States
Button hole machine	1881	Reece	Utd. States
Improvement in "Expression" of self-playing pianofortes	1882	Schmaele	Utd. States
Hand photographic camera for plates..	1881	Wm. Schmid	Utd. States
Tuberculosis bacillus isolated	1882	Robert Koch	Germany
Hydrophobia bacillus isolated	1882	Louis Pasteur	France
Cholera bacillus isolated	1884	Robert Koch	Germany
Diphtheria bacillus isolated	1884	Loeffler	Germany
Lockjaw bacillus isolated	1884	Nicolaier	France
Antipyrene	1884	Kuno	Utd. States
Linotype machine ...	1884	Othmar Mergenthaler	Utd. States
The rear-driven chain safety bicycle.....	1884	George W. Marble	Utd. States
Chrome tanning of leather	1884	Schultz	Utd. States
Process of reducing aluminium	1885	Cowles	England
Gas burner	1885	Carl Welsbach	Germany
Hydraulic dredge ...	1885	Bowers	Utd. States
First electric railway in United States, Hampden and Baltimore, Md.....	1885		
Contact device for overhead electric trolley	1885	C. J. Van Depoele	Utd. States
Graphophone	1886	Bell & Tainter	Utd. States
Electric welding	1886	Elihu Thompson	Utd. States
Combined harvester and thresher	1886	Matteson	Utd. States
Band wood saw.....	1887	D. C. Prescott	Utd. States
Cyanide process of obtaining gold and silver	1887	McArthur & Forrest	Utd. States
System of polyphase electric currents ..	1887	Nicola Tesla	Utd. States
Incandescent gas light ..... The formation of a cone-shaped interwoven mantle of thread coated with a refractory rare earth and rendering the same incandescent by the heat rays of a Bunsen gas burner regardless of how the gas is produced	1887	Carl A. Von Welsbach	Austria
Process of annealing armor plate	1888	Harvey	Utd. States
"Kodak" snap-shot camera ..... Constructed to use a continuous sensitized ribbon film.	1888	Eastman & Walker	Utd. States
Process of making artificial silk	1888	H. DeChardonnet	France
Hertzian waves or electric wave radiation	1888	Heinrich Hertz	Germany

Inventions	Date	Inventor	Nativity
First rotary cement kilns in U. S.	1889		Coplay, Pa
Nickel steel	1889	Schneider	Utd. States
Process of making aluminium	1889	Chas. M. Hall	Utd. States
Electric plow	1890	W. Stephens	Utd. States
Improved linotype machine	1890	Othmar Mergenthaler	Utd. States
Bicycles equipped with pneumatic tires	1890		
Krag-Jorgensen magazine rifle	1890	Krag-Jorgensen	Utd. States
"Coherer" for receiving electric waves	1891	Edouard Branly	England
Rotary steam turbine	1891	C. A. Parsons	England
Cement lined paper pulp digester	1891	G. F. Russell	Utd. States
Round bale cotton press	1891	Brown	Utd. States
Microphone	1891	Emile Berliner	Utd. States
Power loom	1891	Northrup	Utd. States
Commercial application of Formic-aldehyde	1892	J. J. A. Trillat	France
Shoe-last lathe, for different lengths	1893	Kimball	Utd. States
Kinetoscope	1893	T. A. Edison	Utd. States
Process for making carborundum	1893	E. G. Acheson	Utd. States
Calcium carbide produced in electric furnace	1893	Thos. L. Willson	Utd. States
Argon, a chemical element	1894	Lord Rayleigh & Sir Wm. Ramsay	England
Process for liquefying air	1895	Carl Linde	Germany
Electric locomotive, B. & O. Belt Tunnel	1895		Utd. States
X-Rays	1895	Prof. W. C. Roentgen	Germany
Acetylene gas from calcium carbide	1895	Thomas L. Willson	Utd. States
System of wireless telegraphy	1896	G. Marconi	Italy
Foundation laid of science of radio-activity, i. e., emanation of penetrating rays from luminescent bodies	1896	Henri Becquerel	France
Use of ultra-violet rays in treating diseases	1896	Niels R. Finsen	Denmark
Nernst electric light	1897	Walter Nernst	Germany
Method of rendering a clay compound capable of conducting electricity and thence becoming brilliantly incandescent without a vacuum.			
Radium discovered	1898	Madame S. Curie	France
Mercury vapor electric light	1900	Peter Cooper Hewitt	Utd. States
An artificial light composed strictly of the ultra blue violet rays of the spectrum obtained by passing an electric current through a partial vacuum tube filled with mercury vapor, the latter acting as a conductor. Possesses remarkable actinic power for photographic purposes.			
Air-ship	1901	M. Santos-Dumont	France
Automobile mower	1901	Deering Harvester Co.	Utd. States
The first passenger steam turbine ship, "Edward VII."	1901	Denny & Brothers	England
The first oil burning steamship built in the United States, "Nevada"	1902		
English Pacific cable, Canada-Australia	1902		
American Pacific cable	1903		Utd. States

It is interesting to note that between the years 1872 and 1900 there were on what may be termed the honor roll of inventors 39 inventors each of whom had received over 100 patents. A few of the most important were:

Thomas A. Edison	742
Francis H. Richards	619
Elihu Thompson	444
Charles E. Scribner	374
Luther C. Crowell	293
Edward Weston	280
Rudolph M. Hunter	276
Charles J. Van Depoele (deceased)	245
George Westinghouse	239
Rudolph Eickemeyer (deceased)	171
Hiram S. Maxim	146
Philip Diehl	137
Hosea W. Libbey	127
Louis K. Johnson	114
Talbot C. Dexter	109
James H. Northrup	102

In the preparation of the foregoing statistics, credit is given to L. H. Campbell, of the United States Patent Office, for valuable assistance.

Frederick C. Beach, Ph.B.
Editor 'The Scientific American.'

In'ventory, a written list or schedule of goods, chattels and other personal property of an individual or estate, whether for use in legal proceedings, or for commercial purposes. The term is also employed to designate lists of assets prepared in cases of insolvency and bankruptcy, and lists of property made out by guardians of estates or infants. These inventory lists are usually filed with the court for public examination. After an administrator or other officer of the court files his inventory he becomes personally accountable for the property or goods so listed. See also Executor.

Inver'sion, a change of order whereby the first becomes last and the last first. (1) In rhetoric, a reversal of the natural order of words for the sake of euphony, emphasis, or the like; also the turning of one's own argument against him by an opponent in discussion. (2) In chemistry, a change in molecular structure which is usually induced by fermentation or by heating with a dilute acid, as in the case of starch, sugar, etc. Thus starch and dextrine are changed into glucose, cane-sugar into invert sugar, and maltose into glucose. (3) In geology, the overturning or folding over of strata by igneous agency, so that the order of their succession seems reversed. (4) In mathmatics, the operation of changing the order of the terms, so that the antecedent shall take the place of the consequent and the reverse, in both couplets. Thus, from the proportion $a : b :: c : d$, we have, by inversion, $b : a :: d : c$. (5) In music, the transposition of certain phrases having a common root. (*a*) The change of a chord by making one of the inner note act as a bass note, by which means as many inversions can be made as there are actual notes in the chord, not counting the root, the

harmony in such inversions remaining the same, though the order of component parts is changed; (*b*) alteration of intervals by making that which was the upper note the lower, and the reverse, the inversion of an interval within the octave being readily found in the difference between the figure 9 and the interval known; (*c*) the alteration of a subject produced by inverting the intervals of which it consists.

In'vertase, or **In'vertin,** an enzyme occurring in many fungi, notably in certain yeasts (for example, the saccharomyces), and also in the seed-plants. It transforms cane-sugar into a mixture of dextrose and levulose; this mixture being called "invert-sugar" because it turns the plane of polarized light to the left, while the cane-sugar from which it is obtained turns it to the right. According to some writers, a yeast cannot invert cane-sugar except by secreting invertase; but *Monilia candida* effects the inversion, and yet produces no invertase. In this case the action is probably due to some other enzyme, hitherto unidentified. Invertase probably plays a very important part in vegetable chemistry. Like other enzymes, it can apparently perform an unlimited amount of chemical work, without sensible diminution of its own substance. (See FERMENTATION.) Invertase is most active at a temperature of from 120° to 140° F., and in a slightly acid medium. It has been isolated in the form of a powder.

Inver'tebrates, a collective term for the lower divisions or phyla of the animal series, which agree in not having a vertebral column or back-bone, used in contradistinction to the highest group of the animal kingdom, to which the name *Vertebrata* or vertebrate animals is given. In the system of Cuvier the *Invertebrata* were divided into the *Radiata, Articulata,* and *Mollusca.* Further study revealed that these names did not distinguish natural groups; and the term *Invertebrata* has no longer any definite significance in classification (q.v.).

Inves'titure, in the feudal law, was the open delivery of a feud by a lord to his vassal, thus, by external proof, affording evidence of property. To use the words of Blackstone, "Investitures, in their original rise, were probably intended to demonstrate, in conquered countries, the actual possession of the lord, and that he did not grant a bare litigious right, but a peaceable and firm possession. At a time when writing was seldom practised, a mere oral gift, at a distance from the spot that was given, was not likely to be long or accurately retained in the memory of by-standers, who were very little interested in the grant." For this reason investiture was performed by the presentation of some symbol to the person invested, as a branch of a tree, etc. In the primitive church, after the election of a bishop, and his consecration, the early Christian emperors claimed a right of confirmation. Charlemagne is said to have introduced this practice, and to have invested the newly consecrated bishop by placing a ring and crozier in his hands. Gratian, indeed (Distinct. 63, cap. Adrianus), directly affirms that Pope Adrian positively conceded to the emperor the power of electing, even to the papacy, in 774; but neither Eginhard nor any other contemporary writer mentions this fact.

The custom, however, existed, nor does it appear to have been objected to or opposed during the lapse of two centuries from his reign. The disorderly state of Italy, which succeeded the death of Charlemagne, frequently interrupted the exercise of this right by the Carlovingians; but even so late as 1047, when the empire had passed to another line, Henry III. received an explicit admission of his prerogative, and repeatedly used it. The investiture in the lesser sees followed as a matter of course. Alexander II. issued a decree against lay investiture in general, which was revived by Gregory VII. (Hildebrand), who, having succeeded in annulling the prerogative of the emperors to nominate or confirm popes, sought to disjoin entirely the ecclesiastical from the civil rule. It was not, however, until the papacy of Calixtus II., in 1122, that the question was terminated, as it appears, materially to the advantage of the holy see. In France, even under the papacy of Hildebrand, the right of investiture does not appear to have been made a subject of open quarrel. In spite of the protests of the holy see, the kings exercised the power, but at length relinquished the presentation of the ring and crozier, and contented themselves with conferring investiture by a written instrument, or orally, upon which they were left in peaceable possession of the power. But in England Paschal II. was engaged in a contest little less fierce than that which he maintained with the emperor. Anselm, the primate, refused to do homage to Henry I. for his see. The king seems to have asserted an unqualified right of vestiture, which the pope, who was appealed to, as unqualifiedly denied. After a protracted struggle, and continued threats of excommunication, the controversy ended in England, as it did afterward in Germany, by compromise. Paschal offered to concede the objections against homage provided Henry would forego the ceremony of investiture. To this he agreed (1107).

Invin'cibles, an Irish secret society of 1882, an off-shoot of the Fenians. One of the objects of the Invincibles was to "remove" or assassinate government officers or others who might incur the displeasures of the association or its leaders. On 6 May 1882 the society succeeded in "removing" Lord Frederick Cavendish, who had just arrived from England as secretary for Ireland, and Thomas A. Burke, the under-secretary, in the Phœnix Park at Dublin. The plot was directed against the latter gentleman, and the former, interfering to protect his friend, shared his fate. On 20 Feb. 1883 20 persons charged with complicity in the Phœnix Park murders were put on trial; on 14 July, Joseph Brady, who had been convicted of actual perpetration of the murder of Mr. Burke, was executed, as were others subsequently. The leading witness, who revealed all the secrets of his fellow conspirators, was James Carey of Dublin. He was shot dead near Natal, on 29 July, by an Irishman, O'Donnell, who was subsequently tried, and executed for his crime.

Invocation of Saints. See SAINTS.

In'voice, a list or bill of goods; a detailed statement of merchandise in stock, or to be shipped. Very frequently an invoice accompanies a shipment of goods along with the bill of lading from the consignor to the consignee,

An invoice is a memorandum and is not a document of title nor a contract of sale, and has no value in law other than memoranda.

Io, ī'ō, in Greek mythology, a daughter of Inachus; according to others of Iasus or Peiren. Zeus (Jupiter) fell in love with her. Hera (Juno) perceived the infidelity of her husband, and resolved to be revenged on both. Zeus, to protect Io from the jealousy of Hera, changed her into a beautiful white heifer. Hera was not deceived, and set a gad-fly to torment her, and persecuted her without a moment's rest through the world. The wanderings of Io in this condition were a favorite subject with the poets of ancient Greece. Also, in astronomy (1) the first satellite of Jupiter, discovered by Galileo in 1610. (2) The name of the 85th asteroid, discovered by Peters at Clinton, N. Y., 19 Sept. 1865.

Iodine, ī'ō-dīn or -dīn, a non-metallic element, analogous in its general properties to chlorine and bromine. It was discovered by Courtois in 1811, in the mother-liquor of kelp that had been used for the production of sodium carbonate; occurring there in combination with sodium and magnesium. It is still obtained from the ashes of certain seaweeds, but the principal supply is now obtained from "caliche," a crude nitrate of sodium that occurs in immense quantities in northern Chile. In the preparation of the commercially pure nitrate of soda from caliche, the mother liquors, after the removal of the nitrate by crystallization, are found to contain large quantities of iodine, chiefly in the form of iodate of sodium, $NaIO_3$; and it is from this substance that the iodine of commerce is now chiefly prepared. The richest caliche contains about 3.5 pounds of iodine per ton.

In its ordinary form, iodine is a solid substance, melting at 237° F., and boiling at about 380° F. In a vacuum, iodine sublimes without melting. Solid iodine is soft, and dark gray in color, with a metallic lustre. The vapor is violet in color, from which circumstance the element takes its name (Greek, "like a violet"). Chemically, iodine has the symbol I, and an atomic weight of 126.85 for O = 16, or 125.9 for H = 1. Solid iodine has a specific gravity of about 4.95 at ordinary temperatures, and a specific heat of about 0.05412. Its volume increases, on account of thermal expansion, by about 0.00013 of its own value for a rise of temperature of 1° F. At temperatures not far above its boiling point, the vapor of iodine has a specific heat (at constant pressure) of 0.03369; and in this same region of temperature the ratio of its specific heat at constant pressure to the specific heat at constant volume is about 1.294. Iodine shows an important change in its vapor density at high temperatures. Thus, below about 1,200° F. the vapor has a density about 126 times as great as that of hydrogen under the same conditions of temperature and pressure; but as the temperature rises the density of the vapor, relatively to hydrogen, falls off, until it is only about 68 at 2,700° F. It is believed that this change in density indicates that the molecules of iodine vapor split in two as the temperature rises; a molecule, just above the boiling point, containing two atoms, while at the higher temperature the molecules are monatomic. Iodine is freely soluble in alcohol, ether, carbon disulphid, chloroform, and glycerin. It is only slightly soluble in pure water, but dissolves readily in aqueous solutions of the iodides. It is also soluble in benzine, acetic acid, and numerous other organic fluids. Iodine is a non-conductor of electricity.

With hydrogen, iodine forms the important compound HI, known as hydriodic acid. (See Hydriodic Acid.) With the metals it forms binary compounds called "iodides," which may also be regarded as salts of hydriodic acid. Of these the most important is potassium iodide, KI, which is largely used in medicine. It is prepared by dissolving iodine in a solution of caustic potash, evaporating to dryness, and igniting. This salt is very soluble, and crystallizes in cubes. The iodides of ammonium, sodium, strontium, and zinc are also used to a more limited extent. Iodoform, a yellow crystalline powder with a peculiar characteristic odor when warmed, is also much used as a dressing in surgery. It has the formula CHI_3, and is analogous in its chemical structure and deportment to chloroform. Iodoform may be prepared by dissolving iodine in an alcoholic solution of caustic potash, the iodoform that is produced separating out as a precipitate. It is also prepared in Germany, to a certain extent, by the electrolysis of a similar solution. (See Löb, 'Electrolysis and Electrosynthesis of Organic Compounds.') Iodine and its compounds are used to some extent in photography, and to a larger extent in synthetic chemistry, for the preparation of the coal-tar colors (q.v.), and other organic substances.

Iodine forms two important oxy-acids, known respectively as iodic acid, HIO_3, and periodic acid, $HIO_4 + 2H_2O$. These are analogous, in their chemical deportment, to chloric and perchloric acids.

Free iodine combines with starch to form a remarkable deep blue compound, whose production is a well-known test for the presence, in a given substance, of either starch or free iodine. To detect the presence of iodine in a solution, a few drops of thin, clear starch paste are added to the solution to be tested (which should be cold), and hydrochloric acid is added until the reaction is acid. A couple of drops of a concentrated solution of potassium nitrite are then added, when the dark blue color of iodide of starch will instantly be produced, if iodine is present. This test may readily be modified so as to serve for the detection of starch. The reaction is not given by dextrin, nor by other isomers of starch.

Iodine and Iodides in Medicine. Iodine and the iodides have been used in medicine since the Chinese are supposed to have introduced them, 2000 B.C. or earlier. The exact method of action of the iodides is not clear, but it would seem that iodine, being a normal constituent of the human body, is a very essential element in normal metabolism. It is found in comparatively large quantities in the thyroid gland, which is known to exercise a very important action in the general body-metabolism, and it is probably by means of the stimulation of the general metabolism of the body that the iodides manifest their beneficial action. The iodides are freely absorbed from watery solutions by mucous membranes throughout the body, particularly in the stomach and intes-

tine. They are taken up into the blood, pass through the tissues, stimulating the lymph-flow, and are excreted in the urine in the form of salts. Iodine itself possesses a local irritant action. It is soon converted into the iodides when taken internally, and causes similar internal changes.

When the iodides are taken in large doses, or even in small doses for a long time, a form of chronic poisoning known as iodism results. In this the chief symptoms, found in the air-passages, consist of a catarrh, especially of the nose, with profuse watery secretion, sneezing, and sometimes bronchitis. There is usually swelling and irritation of the throat and tonsils, and salivation. Nausea and gastric discomforts are common, and skin-eruptions are frequent. There is usually loss of weight, and if the iodide has been taken for a very long period a condition of cachexia, characterized by a great loss of flesh, weakness, depression, and restlessness, may result. The chief use of the iodides in medicine is in the treatment of syphilis, on which it has a specific effect. It is also very useful in the various joint-pains of a chronic character, usually known as chronic rheumatism. Iodine is valuable in the treatment of those diseases known to result from thyroid insufficiency, notably in myxœdema (q.v.), and in cretinism, its allied form in children. For stimulation of the respiratory and nasal passages, as in chronic bronchitis, asthma, and dry nasal catarrh, the iodides are of great value.

Io'la, ī-ō'la, Kan.— The city of Iola, Allen County, Kan., is located on the left bank of the Neosho River, about 40 miles west of the Missouri line, and about 100 miles south of Kansas City. The town is reached by the Atchison, Topeka & Santa Fé, the Missouri, Kansas & Texas, and the Missouri Pacific railroads.

History.— It was laid out by the Iola Town Company in 1859. A post-office was located there the same year and a small village soon grew up. During the war the town made but little progress. In 1865 it became the county-seat of the county, and grew steadily, although very slowly until 1895, when its population was 1,565. In 1896 natural gas was discovered on the town site, and as soon as it was shown that a large gas field existed in and near the town it began to grow rapidly, the population in 1904 exceeding 11,000. This rapid growth followed the location in and near Iola of nine large zinc smelters, a number of brick factories, two Portland cement plants and other manufacturing enterprises attracted to the place by the cheap fuel which the large field of natural gas supplied.

Churches, etc.— The leading church denominations are the Presbyterian, Methodist Episcopal, Christian, Baptist, Episcopal, Reformed, and Catholic. The city is well supplied with schools, its high school being one of the best in the State. There are two daily papers, the 'Record' and the 'Register.'

Business, Population, etc.— The city is surrounded by a well-settled and prosperous agricultural community, but its chief business is derived from the manufacturing industries already named. The population is almost wholly American, the exceptions being a few Poles and Swedes employed in the manufacturing plants. An electric road connects Iola with a number of suburban towns, aggregating a population of about (1904) 5,000

CHARLES F. SCOTT.

Io'na, or **Icolmkill**, an island on the west coast of Scotland, one of the Inner Hebrides, in the county of Argyle. Iona is about 3 miles long by 1½ miles broad; area, 2,000 acres, of which 600 acres are under cultivation, the remainder being hill pasture, morass, and rock. The island derives its interest and celebrity wholly from its history and its ancient ruins, and especially from its connection with Saint Columba, who took up his residence here after the middle of the 6th century (565). The existing ruins are all, however, of a much more recent date. Forty-eight kings of Scotland, four kings of Ireland and eight kings of Norway are said to have been buried on Iona Island, among them being King Duncan, made famous by Shakespeare. About 1900 the Duke of Argyle conveyed the entire island to the Church of Scotland under certain conditions of preservation and restoration.

Ionia, ī-ō'nĭ-a, that part of the seaboard of Asia Minor which was inhabited by Ionian Greeks, a beautiful and fertile country opposite the islands of Samos and Chios, which also belonged to it. According to tradition, the Greek colonists came over from Attica about 1050 B.C., and founded 12 towns, which, though mutually independent, formed a confederacy for common purposes. These included Phocæa, Ephesus, Miletus, etc., and latterly Smyrna. Commerce, navigation, and agriculture early rendered them wealthy and flourishing, but the country was made tributary by Crœsus, king of Lydia, and later by Cyrus, king of Persia (557 B.C.). With an interval of independence they remained under Persia until this empire was overthrown by Alexander the Great, 334–1 B.C., when they became a part of the Macedonian empire. Ionia, at a later period, became part of the Roman province of Asia. It was afterward totally devastated by the Saracens, so that few vestiges of its ancient civilization remain.

Ionia, Mich., city and county-seat of Ionia County; on the Grand River, and the Detroit, G. H. & M., the Pere M., and the Grand T. R.R.'s; 34 miles east of Grand Rapids. It contains the State house of corection, the State asylum for the dangerous and criminal insane, large railroad repair shops, and manufactories of pottery, furniture, machinery, edged tools, and clothing. The industrial interests are greatly promoted by excellent power furnished by the river. The city has a public high school, library, several daily and weekly periodicals, and an assessed property valuation of about $2,500,000. Under the revised charter of 1897, the government is administered by a mayor and city council elected annually. Ionia was settled in 1833 and incorporated in 1873. Pop. (1890) 4,482; (1900) 5,209.

Io'nian Islands, a number of islands belonging to the kingdom of Greece, in the Ionian Sea, off the coast of Albania and the western and southern shores of Greece, the most southern, Cerigo, and its dependent islets being off the southeastern extremity of the Morea. The principal islands, seven in number, are, reckoning from north to south, Kerkyra (Corfu), Paxos, Levkas (Santa Maura), Ithaki (Ithaca), Kephallenia (Cephalonia), Zakynthos (Zante), and Kythira (Cerigo). To each of these larger islands a number of smaller, scattered along their respective coasts, are attached, and in-

cluded in their several local jurisdictions. Area of the whole, 1,097 square miles. Pop. about 300,000. All these islands belong to the great calcareous formation of Greece. They are extremely mountainous, and do not contain enough arable land to produce the corn required by the population; and were it not for the vine, olive, and currant, all of which they produce, they could support but a small number of inhabitants. The climate is even more temperate than that of the neighboring mainland. Snow often falls in the winter, and lies on the mountains, but rarely on the plains. The staple exports are oil, currants, valonia, wine, soap, and salt. The few manufactures are chiefly textile and ornamental. The religion is that of the Eastern Greek Church, to which four fifths of the population belong. Each island has its own bishop, and at the head of the whole is an exarch or primate. The Ionian Islands, so called from lying in that part of the Mediterranean anciently known as the Mare Ionicum or Ionian Sea, often figure in the ancient history of Greece, but only singly, not collectively. In 1809–10 all the islands were overrun by the British troops except Corfu, which did not come into the hands of the British till it was assigned to them by the Peace of Paris in 1814, and the possession of the British was finally fixed and regulated by another treaty concluded at Paris in 1815. The seven islands were then formed into a republic, under the protectorate of Great Britain. In 1857 a wish was expressed by their representatives for reunion with Greece, and the islands, with the consent of the other European powers, were transferred to the kingdom of Greece in 1864.

Ionian Philosophy, the earliest school of Greek philosphy, a school which attempted to explain the phenomena of nature from the forces and attributes of matter itself. In order to do this the philosophers of this school followed two courses, some assuming a single original substance as the ground of all things, and explaining the development and formation of the phenomenal world by a process of condensation and rarefaction which they conceived as affecting the mode of existence of that substance; while others considered all things as formed by separation and combination out of a permanent and unalterable primitive form of matter. According to the view of the first class of Ionian philosophers, therefore, the original material principle was conceived as itself liable to change, and the changes which take place in it were held to give rise to the forms by which the world is known to us; while according to the view of the second class of Ionian philosophers the original material principle was looked upon as in its own nature and qualities unchangeable, and everything was explained by a change of external relations in space.

Ionian School, the school of philosophy which started from the Ionian city of Miletus. The leader of the school was Thales, who started from a disbelief in the current mythological fables of his day. Thales was born about 636 B.C. He was a man of political activity as well as of deep meditative habits. He was proficient in mathematical knowledge and founded the Ionian school which was principally concerned in an inquiry as to the constitution of the universe. He propounded the axiom that the basis of all phenomena was water, and perhaps he was just as near the truth as Huxley when he declared that everything came out of what he called, by a question-begging term, protoplasm. The next philosopher of the Ionian school was Anaximenes 529 B.C. He also was a materialistic philosopher and like Liebig believed that the origin and substance of everything was air. Diogenes of Apollonia went farther than his predecessor and taught that the basis of phenomena was mind. The Ionian school found its highest development in Anaximander of Miletus 610 B.C., who taught what has been the profoundest discovery of all philosophy ancient or modern that the basis of being was τὸ ἄπειρον, the Infinite.

Ionian Sea, that part of the Mediterranean communicating with the Gulf of Venice by the Strait of Otranto, and having Greece and part of European Turkey on the east; Sicily and the most southern part of Italy on the west. Its greatest breadth is between Cape Matapan in the Morea, and Cape Passaro in Sicily, which is about 400 miles.

Ion'ic Order. See ARCHITECTURE (*Greece*).

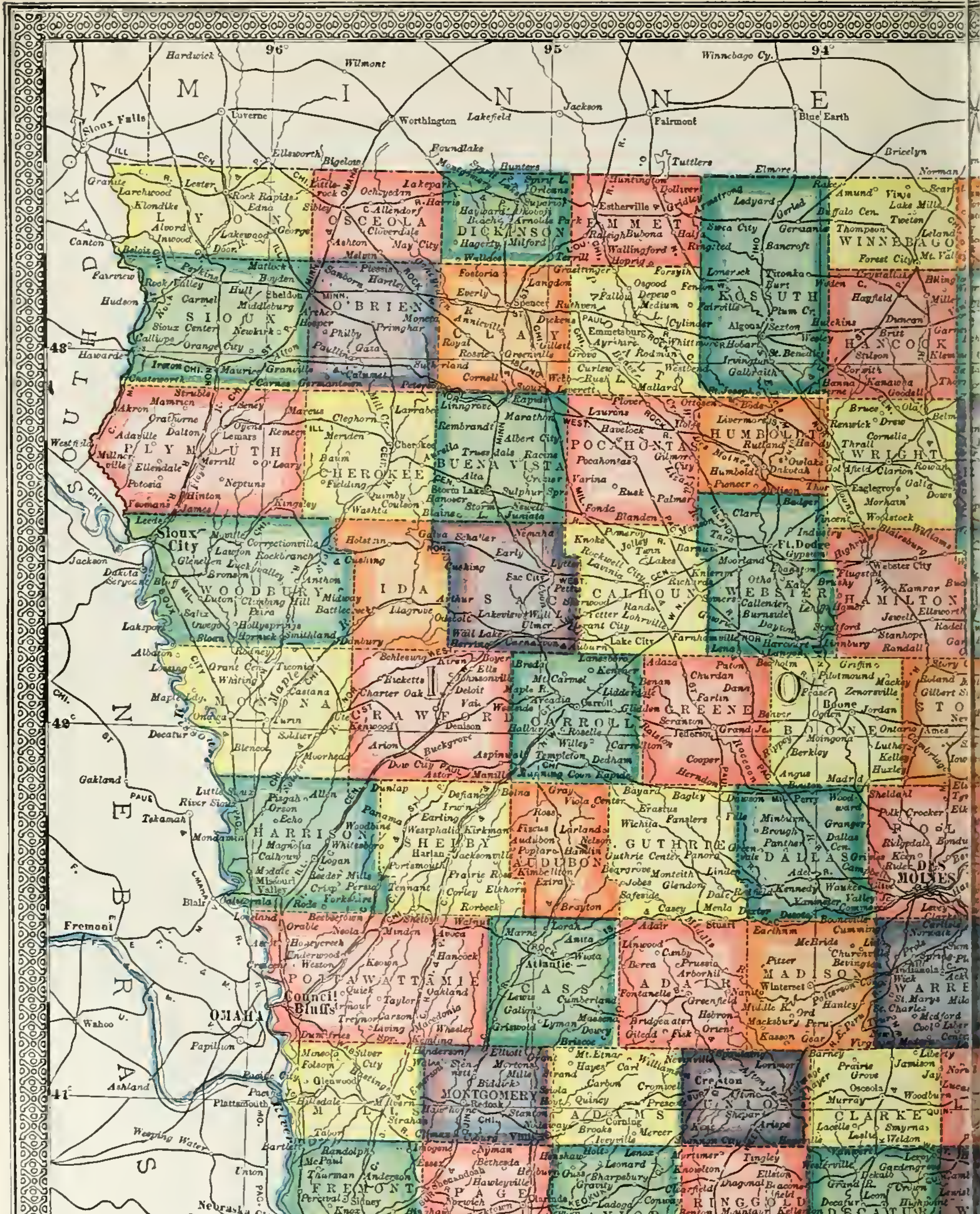
Ioniza'tion. See ELECTROLYSIS; ELECTRON; SOLUTION.

Ios, ī'ŏs, an island in the Ægean Sea, said to have been the birth-place of Homer. According to the ancients his mother was born here, and the poet's grave was likewise located here.

I O U, a written acknowledgment of debt, usually made in this form:—"To A. B. I O U Ten Dollars.—C. D. May 12, 1891." In Great Britain when the name of the creditor is stated such a document is evidence of a debt of the amount stated due to him by the person whose signature it bears. In the absence of the name of the creditor the document is *prima facie* evidence of such a debt being due to the holder of the document. It is not negotiable. The letters I O U are of course used instead of the words "I owe you," on account of the similarity of sound. The I O U is seldom used in the United States.

Iowa, ī'o-a ("the Hawkeye State"), a north-central State extending from the Mississippi River to the Missouri River, and occupying three and one sixth degrees of latitude. It is bounded on the north by Minnesota, on the east by Wisconsin and Illinois, on the south by Missouri, and on the west by Nebraska and South Dakota. Area, 56,025 square miles; 550 water; it is 310 miles east and west, and 210 north and south. Capital, Des Moines. Pop. (1900) 2,231,853. It is the sixteenth State in order of admission to the Union.

Topography.— Iowa is a part of the great central plain, and is chiefly undulating prairie, rising in gentle swells from the Mississippi River to a divide running diagonally, from a height of 1,694 feet in the northwest to a slight elevation in the southeast, with a parallel subdivide in the southwest. There are now no swamps and few natural forests. The only rough spots are the sharp bluffs where the rivers have cut their paths through the glacial drift; the only woods, those along the streams,— altogether about 7,000 square miles of woodland, with oak, elm, hickory, black walnut, maple, cottonwood, linden, ash, box-elder, pine,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95°
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M I N N E
S O U T H D A K O
N E B R A S K A
M I S S
I O
Sioux Falls
Worthington
Jackson
Fairmont
Blue Earth
LYON
OSCEOLA
DICKINSON
EMMET
KOSSUTH
WINNEBAGO
SIOUX
O'BRIEN
CLAY
PALO ALTO
HANCOCK
PLYMOUTH
CHEROKEE
BUENA VISTA
POCAHONTAS
HUMBOLDT
WRIGHT
Sioux City
WOODBURY
IDA
SAC
CALHOUN
WEBSTER
HAMILTON
MONONA
CRAWFORD
CARROLL
GREENE
BOONE
HARRISON
SHELBY
AUDUBON
GUTHRIE
DALLAS
POLK
DES MOINES
POTTAWATTAMIE
CASS
ADAIR
MADISON
WARREN
Council Bluffs
OMAHA
MILLS
MONTGOMERY
ADAMS
UNION
CLARKE
FREMONT
PAGE
TAYLOR
RINGGOLD
DECATUR
Fremont
Nebraska City
Creston
Atlantic
Ft. Dodge
43°
42°
41°
Longitude 94° West
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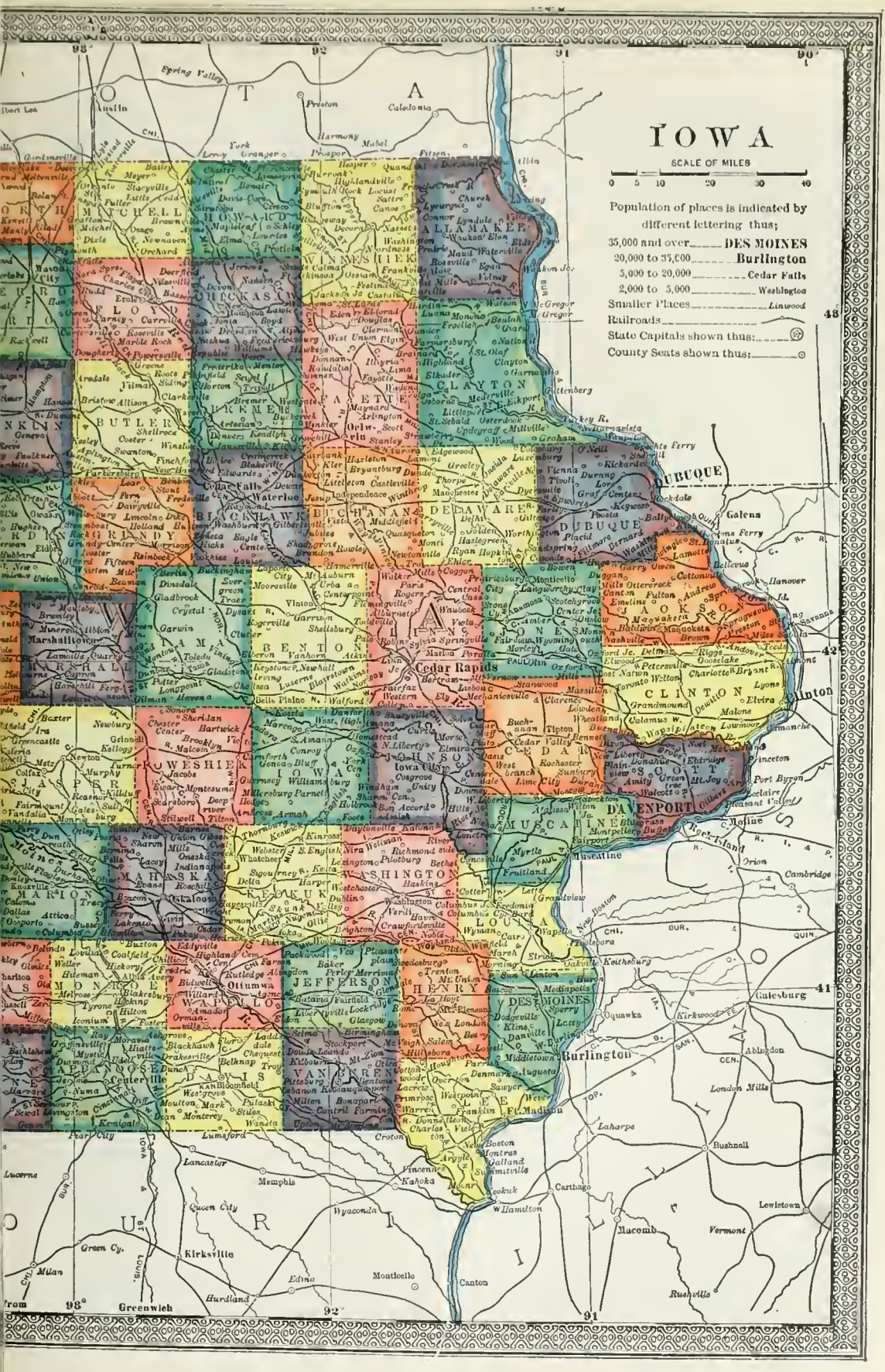
IOWA
SCALE OF MILES
0 5 10 20 30 40
Population of places is indicated by different lettering thus;
35,000 and over DES MOINES
20,000 to 35,000 Burlington
5,000 to 20,000 Cedar Falls
2,000 to 5,000 Westlington
Smaller Places Linwood
Railroads
State Capitals shown thus:
County Seats shown thus:
98°
92
91
90
48
42
41
Dubuque
Galena
Cedar Rapids
Clinton
Davenport
Muscatine
Burlington
Keokuk
Fort Madison
Oskaloosa
Ottumwa
Fairfield
Mt. Pleasant
Des Moines
Marshalltown
Iowa City
Grinnell
Newton
Knoxville
Pella
Sioux City
Council Bluffs
Fort Dodge
Mason City
Waterloo
Cedar Falls
Independence
Decorah
Winneshiek
Allamakee
Clayton
Fayette
Howard
Chickasaw
Floyd
Butler
Bremer
Buchanan
Delaware
Jackson
Clinton
Scott
Cedar
Johnson
Jasper
Poweshiek
Marshall
Hardin
Grundy
Tama
Benton
Linn
Jones
Jasper
Polk
Dallas
Guthrie
Adair
Madison
Warren
Marion
Mahaska
Keokuk
Washington
Louisa
Henry
Des Moines
Lee
Van Buren
Wapello
Jefferson
Monroe
Appanoose
Davis
Wayne
Lucas
Clarke
Union
Adams
Taylor
Ringgold
Decatur
Page
Fremont
Mills
Montgomery
Cass
Shelby
Audubon
Pottawattamie
Harrison
Monona
Crawford
Carroll
Greene
Boone
Story
Hamilton
Webster
Humboldt
Wright
Franklin
Hancock
Winnebago
Worth
Mitchell
Howard
Chickasaw
Floyd
Cerro Gordo
Butler
Bremer
Fayette
Clayton
Allamakee
Winneshiek
Mississippi R.
Missouri R.
Des Moines R.
Iowa R.
Cedar R.
Wapsipinicon R.
Turkey R.
Maquoketa
Dubuque
Delhi
Monticello
Anamosa
Center Jct.
Onslow
Nashville
Fairview
Wyoming
Morley
Oxford Jct.
Delmar
Elwood
Petersville
Lost Nation
Toronto
Welton
Grandmound
Dewitt
Calamus
Wheatland
Low Moor
Wapsipinicon
Tipton
Buchanan
Cedar Valley
Bennett
Rochester
Sunbury
Durant
Wheatland
Lowden
Malone
Elvira
Lyons
Clinton
Princeton
Port Byron
Eldridge
Charlotte
Bryant
Camanche
Le Claire
Pleasant Valley
Moline
Rock Island
Milan
Orion
Cambridge
Galesburg
Oquawka
Kirkwood
Abingdon
London Mills
Laharpe
Bushnell
Lewistown
Macomb
Vermont
Rushville
Carthage
Warsaw
Keokuk
Hamilton
Fort Madison
Montrose
Galland
Summitville
Argyle
Vincennes
Kahoka
Memphis
Lancaster
Lucerne
Pearl City
Lumford
Croton
Edina
Monticello
Canton
Hurdland
Greenwich
Kirksville
Green Cy.
Queen City
Wyaconda
Athens
Mt. Union
Trenton
Pleasant Plain
Mediapolis
Sperry
Danville
Middletown
Augusta
Denmark
Yarmouth
Salem
Hillsboro
Glasgow
Birmingham
Stockport
Douds
Leando
Kilbourn
Utica
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Columbus City
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Bonaparte
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Cantril
Pulaski
Stiles

cedar, etc. The eastern watershed, two thirds of the whole State, is drained to the Mississippi by a series of streams, nearly all of which are parallel and have a southeastward course. The western part is drained to the Missouri by shorter and swifter rivers, flowing first southwest and then south as the Missouri turns eastward. The chief Mississippi affluents are the Upper Iowa, the Turkey, the Maquoketa, the Wapsipinicon, the Iowa, and the Cedar (the "main" stream, the Iowa,—375 miles, its "tributary," the Cedar, 400 miles, the two forming the second largest interior system of the State and joining not far from the mouth of the Iowa), the Skunk, and lastly the Des Moines with its numerous affluents, far the greatest and commercially the most important as well as the finest scenically, rising in Minnesota and running diagonally across the entire State in a course of 550 miles, with a basin of 14,500 square miles. The State is prolonged by a southeastern corner to include the entire channel of the Des Moines. The northern part of the State has a continuation of the many small, clear, pebbly lakes of Minnesota in glacier-scored pits; some of them—the Walled Lakes—surrounded each by a natural wall of loose stones. The largest are Spirit Lake and the two Okoboji lakes in Dickinson County, and Clear Lake in Cerro Gordo County, all popular summer resorts. West Okoboji, of great depth, lies between wooded hills, and is indented by several picturesque "points" or promontories.

Climate.—The winter climate is somewhat severe, owing to the influence of the great uninterrupted plains to the northwest; but like all this region, the severity is tempered by freedom from excessive moisture. The State is one of the healthiest in the Union, several of the streams in the northeast having rocky channels, and none having the miasmatic bottom-lands found farther south. The dry, pure air of its rolling prairies affords a valued sanatorium for consumptives. The extreme temperatures range from 110° above to 40° below zero; but the average range is from 95° above to 20° below. The average rainfall during the years from 1890 to 1903 inclusive was 31.4 inches—two thirds of it between April-October, and more than half during the critical crop months, May, June, July, and August.

Geology.—No less than five separate sheets of drift cover the State, giving a remarkable variety of productive soil, as well as many different clays for industrial purposes. The watershed shows the inclination to the underlying palæozoic rocks, in lines from northwest to southeast. The oldest formation is Sioux quartzite in the northwestern corner. Cretaceous deposits overlie the older formations through the northwest part generally; along the eastern side from north and south are Cambrian, Silurian, Devonian, and Carboniferous in succession. The most valuable mineral beds are the vast fields of bituminous coal, covering more than one third of the entire area of the State, and turning out in the year ending 30 June 1903, 6,185,734 tons, valued at $8,016,274; employing 13,192 persons, of whom 9,169 were miners. It is the leading coal State west of the Mississippi except Colorado, and a great factor in all the northwestern industries. Its limestone, the finest grade of building stone, near Marshalltown, Anamosa and other points, is quarried to the extent of about $800,000 a year. Its gypsum from the rocky hills in the vicinity of Fort Dodge is the basis of a fast increasing manufacture of stucco, hard-wall plaster, and paint, also clays for pottery, fire and building brick, tile, and terra-cotta. Iowa ranks eighth in the value of its clay products. Considerable mineral water is also exported, that from the Colfax springs being in the lead.

Agriculture.—Iowa is unsurpassed in the quality and extent of cultivated land. It presents mainly a friable black loam on the top, from one to five feet deep; is easily worked, is in the main free from stumps and stones, and requires little or no commercial fertilizers. It has three main varieties, the principal being the alluvial mud of the river bottoms, the glacial drift of the prairies, covering most of the State, a sand and clay loam, and the loess, a rich yellow deposit containing much carbonate of lime, found at great depth on the Missouri slope and along the streams in the central and eastern portions. There is now almost no waste land in the State. In 1900 it presented the unparalleled record of 86.5 per cent improved farm land. A large part of the remaining 13.5 per cent yields income as timber and pasture land. With this fertility and a steady and sufficient rainfall, the State has for many years been first in the Union in value of products derived exclusively from the soil. The total value of its farm products in 1900 was $365,411,528, of which over a hundred million was fed to its own live stock. Its great crop is corn; it varies, in bushels, from 129,104,930 in 1894 to 383,453,190 in 1900, with an average value of $100,000,000 to $150,000,000. A fourth of its surface is covered with cornfields. Its second crop is oats (of which it was second in the United States), with a total in 1900 of 168,364,170 bushels; third, barley, 18,059,060; wheat, 22,769,440; rye, 1,170,970; and buckwheat, 151,120. Its cereals altogether occupy nearly half of its area. It also raises considerable flaxseed. Its hay product is surpassed only by New York; in 1902 it was 5,211,232 tons, most of it used for feeding its own stock. The vegetable crops are also of great importance; in potatoes it was second in 1900, producing 2,662,660 bushels, also 224,622 bushels sweet potatoes, altogether realizing $3,870,746; other vegetables, $3,332,039. It has a considerable fruit crop, especially of apples; in 1900 the value of orchard products was $1,849,767, besides $878,446 of small fruits and berries. The average of Iowa's chief products during the 13 years, 1890–1902, in bushels, is: Corn, 261,200,756; wheat, 16,130,339; oats, 117,118,483; rye, 1,907,482; barley, 12,503,051; flax, 2,182,950; potatoes, 12,198,347; hay, tons, 5,517,884. Iowa leads all the other States in the value of the implements on its farms, namely, $57,960,660.

Stock-Raising.—Iowa stands near the top in the value of live stock, $278,830,096 in 1900; and it is significant that while one State, Texas, surpassed it in number of neat cattle,—9,428,196 to 5,367,630—the difference in values was only as $163,228,904 to $142,518,902; the average Iowa animal being worth $26.55 against the Texan's $17.31. In dairy cows New York alone takes precedence, and the value of dairy products in 1900 was $18,819,000. That of poultry and eggs was $19,508,000. Great care is taken to have the best breeds of stock, and

this alone accounts for the difference in value of the Iowa and the Texas cattle. The richness of the milk is due largely to the breed. In the number of horses (1,268,016) and swine (9,723,791) Iowa led all the other States in 1900; and from 1850 to the last census there has been a steady increase in the number of swine, cattle, and horses.

Manufactures.— The State's fast-growing population and prosperity and its abundant and almost inexhaustible supply of bituminous coal have, together, within the last decade given a rapid impetus to manufacturing. Small factories have enlarged and many new factories have sprung up. Not a few of these are assuming large proportions. In 1900 Iowa manufactured 7,800 cultivators, 5,000 equalizers, 7,560 harrows, 34,560 hoes, 13,638 plows, 2,021 seeders, 100 drills, 3,720 harvesters, 3,775 hay-carriers, 10,980 dozen hay-forks, 5,809 horse hay-rakes, 79,296 scythes, 58,003 separators, etc., representing a total value of $1,343,455 — a gain of over $400,000 in a single year. In the same year Iowa's product of metal-working machines was valued at $273,501. There is but one manufactory of typewriters in Iowa (Des Moines), but it is fast becoming one of the foremost in the country, exporting largely to Great Britain, France, and the colonies. The output of carriages and wagons in 1900 was $4,087,400; product of paints was $336,867; chemical industries paid $70,022 in wages. A curious industry has sprung up in and about Muscatine — the manufacture of pearl buttons from mussel shells found in the beds of streams. Almost unknown, it has grown to huge proportions, and now that the manufacturers have united in the protection of the sources of supply, the future of this industry is assured. The value of its products in 1900 was $866,538, more than one fourth of which went for wages. The industry is now chiefly confined to the cutting of blanks for the eastern market. Iowa has 702 flouring and grist mills, two with a capacity of 100,000 barrels annually. The output of its mills in bushels is: wheat, 12,521,953; corn, 6,352,045; rye, 458,763; buckwheat, 277,593; barley, 538,740; other grain, 5,859,842. Cedar Rapids, Fort Dodge, and Muscatine have extensive oatmeal mills; the one at Cedar Rapids is said to be the largest in the world. The grand total of food products in 1900 was $142,000,000. The slaughtering and meat-packing industry represented in 1900 a total product amounting to $25,695,044. Cheese, butter and condensed-milk factory product in 1900 was $15,846,077 — an increase of nearly 50 per cent in 10 years. The fruit and vegetable canning product in 1900 was $1,359,958 — a gain of over $800,000 in 10 years. Iowa ranks third in the canning of corn. The starch product in 1900 was $896,831 — a gain of over $500,000 in 10 years; product of boots and shoes in 1900 was $786,141, a gain of over $200,000 in 10 years; product of gloves and mittens in 1900 was $142,600; product of planing mills in 1900 was $8,684,566. A fact not generally understood is that there is more timber in Iowa to-day than at any other time in its history. The clay products, which were $175,165 in 1890, had increased in 10 years to $2,224,920; to this should be added brick and tile products, which in 1900 aggregated $1,979,322; also pottery, terra-cotta and fire-clay products, $192,702. The paper product in 1900 was $243,776. Dubuque has the only ship-building plant in the interior. Among the larger cities Des Moines leads in brick-making (over 25,000,000 annually), proprietary medicines, book and job printing and binding, typewriters and hosiery; Sioux City, Ottumwa, Cedar Rapids, and Des Moines in meat-packing; Davenport, Dubuque, Burlington, Des Moines, and Ottumwa in foundries and machine works; Dubuque, Council Bluffs, and Grinnell in carriages; Burlington, Davenport, Des Moines, Dubuque, Ottumwa, Keokuk, and Oskaloosa in cigars; Sioux City, Des Moines, Cedar Rapids, Fort Dodge, Mason City, in flour and other food products; Des Moines, Ottumwa, Grinnell, Newton and Fort Madison in farm and other machinery; the principal river cities in malt products. The total value of manufactured products in 1900 was $164,617,877 — an increase of over 31 per cent in 10 years; the capital represented in 14,819 factories was $102,733,103 — an increase of over 32 per cent; the wages paid the 58,553 employes was $23,931,680 — an increase of over 17 per cent. These figures, showing enormous growth in the last decade, are a surprise to those who regard Iowa as distinctively an agricultural State.

Transportation and Commerce.— Several of the interior rivers are navigable for small boats, the Des Moines for 100 miles, the Missouri for fair-sized steamers its whole length, and the Mississippi for large ones. But the first named are not used to any extent; they have been superseded by railroads; the shifting channel, sandbars and snags of the Missouri make its navigation dangerous and slow. Only the Mississippi remains in practical use. The State, lying in the main path of transcontinental commerce, and originating much well-distributed local traffic, is a vast network of railroads, seven of the great trunk lines crossing it. Every one of the 99 counties has at least one railroad. The farthest distance between railroads at any point in the State is 13.79 miles. In 1903 it had 9,855 miles of road, exclusive of electric lines.

Banking and Insurance.— Iowa has the greatest number of banking institutions of any State in the United States. In August 1903, it had 1,482, divided into 258 national banks, 245 State banks, 350 savings banks, and 561 private banks. The State banks had capital of $10,445,800; deposits, $45,268,974.73; surplus, $1,718,832.41. The savings banks had capital $11,565,500; deposits, $87,620,377.34; surplus, $2,173,462.88. Total capital of all banks in the State, $53,435,020; total deposits, $264,803,000. Iowa is rapidly gaining prominence in the insurance world. In life insurance it promises soon to become a formidable competitor with the Eastern States. In 1902 there were 42 life insurance companies having headquarters in the State, and of this number 24 were located in Des Moines, "the Hartford of the West." Of the 42, 10 were "old line" life companies, carrying insurance to the amount of $36,972,257; 8 were assessment companies, carrying $209,955,500; 16 were fraternal benefit associations, carrying $168,418,000. Total of insurance carried by Iowa companies, $415,345,757.

Education.— Iowa stands second in the literacy of its population; 99.63 per cent of those from 10 to 14 years were, in 1900, able to read and write, although there was no compulsory attendance law prior to 1902. In 1902 it ex-

STATE CAPITOL AT DES MOINES.

pended $9,556,890 on its schools, there being 18,513 schoolrooms with 22,708 teachers holding certificates. The enrollment of children in the public schools in that year reached 560,173. There has been a liberal increase in the wages of teachers during the school year of 1902 and 1903. About one third of the schools are located in towns and cities and two thirds in the country. Relatively few of the teachers have had normal training. One State normal school and several private normal schools were in operation in 1900. In 1902 the State normal school had 28 professors and 28 other teachers, with 2,065 students. Under a law passed in 1902, 16 private schools have become accredited for the training of teachers under State supervision. For higher education there are about 200 public high schools and a number of private academies. The courses of study pursued are of high standard and generally uniform. The State University, the head of the public school system, is at Iowa City, the former capital, with law, medical, dental, and other colleges, which in 1902 had 48 professors, 111 other teachers, and 1,512 students. There is also a State College of Agriculture and the Mechanic Arts, located at Ames, which in 1902 had 32 professors, 43 other teachers, and 1,480 students. In 1902 a "Memorial University," at present a military academy, was opened at Mason City by the national order of the Sons of Veterans. Connected with certain of the public secondary schools there are 20 training classes for teachers. Among the private schools of the State there are 16 business colleges and 26 academies. Under the auspices of the Roman Catholic Church there are in the State 25 schools for higher education (academies and colleges), with an attendance of 4,040 pupils, 3 normal schools, 167 parish schools, with an attendance of 22,529 pupils. Iowa was one of the first States to pass a township school law. This law has enabled a number of towns to better their school facilities. In 1895 Buffalo Centre township, for example, was organized into a school township, and within four years all the district schools except two were closed and the pupils were transported to a central graded school. The law makes provision for the transportation, at public expense, of children living remote from the central school. The State report for 1901 shows that consolidation has been tried in 28 counties, transportation in 35, and both in 19. Good results were reported in 27 counties, doubtful in 5 counties. Bad roads are the chief obstacle in the doubtful counties, but a vigorous "Good Roads" movement is minimizing this obstacle. Ninety-five per cent of the county superintendents for 1901 favored the plan.

Libraries.— In 1893 there were 83 public libraries in Iowa, as follows: Supported by the State, 12 (volumes, 118,974); college and academic, 24 (volumes, 95,114); association and subscription, 16 (volumes, 81,234); free public, 15 (volumes, 68,809); miscellaneous, 7 (volumes, 46,176); public school, 5 (volumes, 7,850); total, 418,157 volumes. In 1903 the number of libraries had increased to 248, as follows: Supported by State, 22 (volumes, 236,953); college and academic, 36 (volumes, 179,261); association and subscription, 32 (volumes, 52,080); free public, 70 (volumes, 336,305); miscellaneous, 11 (volumes, 89,159); public school, 77 (volumes, 75,982); total, 969,740 volumes.

Churches.— In the number of church societies in the State the denominations rank as follows: Methodist, Lutheran (three branches), Roman Catholic, Baptist, Christian (Disciples), Presbyterian, Congregationalist, United Brethren, Evangelical Association, Protestant Episcopal, Friends, Reformed, Adventist. There is one Roman Catholic archdiocese, with two dioceses. The non-polygamous Mormons or "Latter-day Saints," and the Amana Colony community of Christian Socialists, have a large and prosperous membership.

Charities and Penal Institutions.— The State charitable institutions are managed by a board of control appointed by the governor with the consent of the senate. There are four insane retreats: at Clarinda, Mt. Pleasant, Independence, and Cherokee; besides four private asylums; a school for the deaf at Council Bluffs; a school for the blind at Vinton; an institution for feeble-minded children at Glenwood; a soldiers' home at Marshalltown; and a home for soldiers' orphans at Davenport. There are State penitentiaries at Anamosa and Fort Madison, both have adopted the graded system; an industrial school for boys at Eldora, and one for girls at Mitchellville. L. S. Coffin has established a home for ex-convicts on his farm near Fort Dodge.

State Government.— The constitution was adopted in 1857. By law, the electors must vote once in 10 years on calling a convention to revise the constitution, which convention the legislature must call if so voted. All amendments must receive a majority vote of both houses at two successive legislatures, and then be passed by popular vote. The Senate has 50 four-year members, the House 100 two-year; legislative sessions are biennial. Bills must have a majority of all members elected to both houses — not merely present. A two-thirds vote overcomes the governor's veto. Executive officials are elected for two years — half in one year and half in the alternates, with the exception of the railway commissioners, who are elected for three; the railroad commission has power to regulate rates, etc. The judiciary consists of a supreme court, with a chief justice who is such by reason of priority of election, and five associate judges, one chosen every year; also 53 district judges in 20 districts, each serving four years. Women may vote only on school questions involving the expenditure of money. All incorporated towns of 2,000 people and over are ranked as cities; all platted but unincorporated towns are villages. In 1902 there was a militia of 2,474 officers and enlisted men. The number of representatives to Congress is 11. In politics the State has been Republican since the organization of the party, except in the years 1890–4, when the advocacy of prohibition drove it into retirement. The prohibitory amendment adopted in 1882 was pronounced unconstitutional by the supreme court of the State, and was succeeded by prohibitory laws which after several years' trial were in turn succeeded by a local option law, under which 54 of the 99 counties were reported in 1903 as wholly free from saloons.

Finances.— The State has no debt except one of $10,936 to its own school fund, which debt by provision of the constitution is a permanent

one. It had a balance in the treasury 1 Jan. 1903, of $926,916.65. Local taxation is limited to 1 per cent of valuation for current expenses, but this may be exceeded for waterworks, sewers, schools, etc. The State as a whole cannot incur a debt greater than $250,000 except for war purposes, and cannot loan its credit to any person or association; counties and towns cannot run in debt to over 5 per cent of their actual valuation. The average income is about $3,000,000 a year.

Population and Divisions.— Iowa ranks tenth among the States in population. The population was 43,112 in 1840; (1850), 192,214; (1860), 674,913; (1870), 1,194,020; (1880), 1,624,615; (1890), 1,911,896; (1900), 2,231,853. The original population was part of the great Free-State movement which peopled the central States except Indiana. Of the entire population (1900), 305,920 were foreign-born. Of these 123,162 were from Germany; 72,611 from Scandinavia, or nearly two thirds from the Teutonic nations; besides several thousands from German Austria and Switzerland. From England and English Canada were 35,195, French Canadians 14,168, Ireland 28,321, Holland 9,388. Colored, 12,693. There were 81,845 more males than females. There are no great centres of population. The capital, Des Moines, on the river of the name, is the largest, with 62,139. On the same river to the north is Fort Dodge, an old frontier fort and settlement (12,162), and below it Ottumwa (18,197) and Keokuk (14,641). The Mississippi River business is chiefly represented, from north to south, by Dubuque (36,297 — the first settled site in the State), Clinton (22,698), Davenport (35,254), Muscatine (14,073), Burlington (23,201), Fort Madison (9,278), and Keokuk, the "Gate City," at the mouth of the Des Moines. Sioux City (33,111), in the extreme west near the mouth of the Big Sioux, and Council Bluffs (25,802), opposite Omaha, the old terminus of the Union Pacific, represent the Missouri River; Cedar Rapids (25,656) and Waterloo (12,580), the valley of the Cedar River; and Marshalltown (11,544), the valley of the Iowa River.

History.— The territory now included in Iowa was originally inhabited by the Ioway and Illinois tribes of Indians, which were driven out by the Sacs and Foxes. In 1761 the "Ioway" or Iowa tribes were on the east side of the Missouri River and near the headwaters of the Des Moines; but in 1805 they were occupying land on the south side of the Des Moines River. Later they left the vicinity of the Des Moines, some going to the reservation of the Foxes and Sacs (now Oklahoma), others to a reservation in Kansas. The missionary, Father Marquette, and Joliet, the fur trader, were the first white men known to have traveled in this section. In 1673 they visited the tribes of Indians along the Mississippi River, and first landed on Iowa soil near the mouth of the river now known by the name Iowa. In 1788 a party of 10 white men under Julien Dubuque established the first white settlement at the place now occupied by the city of Dubuque. They were attracted to this locality because of the lead deposits in the vicinity. They opened mines, but how successful they were may be conjectured from the fact that after the death of Dubuque, in 1810, his associates abandoned the settlement. All that portion of country drained by the Mississippi was claimed by France because of the explorations made by Marquette and some of his companions, and because of settlements made by other Frenchmen. France's claim to this territory was ceded by treaty to Spain in 1763, but the country was returned to France in 1800-1. In 1803 all the territory now known as the "Louisiana Purchase" (q.v.) was bought of France by the United States government. The territory now the State of Iowa was part of the Territories of Louisiana in 1805; of Missouri in 1812; of Michigan in 1834; of Wisconsin in 1836. Iowa became an independent territory in 1838, and was admitted as a State in 1846. The Indian claims to lands within the boundaries of the State were purchased by the United States government before its admission as a State. The last purchase was made in 1843. Remnants of the Sacs and Foxes occupy a reservation, 419 acres, in Tama County, and still receive annuities from the government. In 1832 a settlement was made at Fort Madison, an abandoned government post, and soon after Burlington was founded, and in 1830 a settlement was again made at Dubuque. In 1857 the Indians attacked the settlers living near the Okoboji lakes and Spirit lake, in Dickinson County, and about 30 whites were killed and nearly all the houses burned. This action on the part of the Indians retarded for some years the growth of that section of the State. Iowa City was first selected for the Territorial capital (it became the State capital in 1846), but in 1857 the capital was changed to Des Moines. Iowa had in the Federal army during the Civil War 75,839 men, which was about one tenth of her population. Some of this number were in regiments belonging to other States. Consult: Aldrich, 'Annals of Iowa'; State Historical Society publications; Shambaugh, 'Documentary Material Relating to the History of Iowa'; Monette, 'History and Discovery of the Mississippi Valley'; Iowa Geological Survey publications; Shambaugh, 'History of the Constitutions of Iowa' and 'Messages and Proclamations of the Governors of Iowa'; Gue, 'History of Iowa.'

JOHNSON BRIGHAM,
Librarian, Iowa State Library.

Iowa Central Railway Company.— *History.* — The Eldora Railroad and Coal Company was organized in 1866 to build a railroad from Eldora northward to a junction with the Dubuque and Sioux City Railroad at Ackley, Iowa, a distance of about 17 miles, and to engage in the business of mining and selling coal. The company received about 1,200 acres of coal lands (about 600 acres thereof in fee simple and the rest by ground lease) as a consideration for completing the work within a specified time. The road was opened in July, 1868. It was then decided to extend the line 28 miles southward to a junction with the Chicago and Northwestern Railway at Marshalltown, Iowa. This necessitated a reorganization of the company, which was effected in August, 1868. In the reorganization, the coal interests were turned over to the Eldora Coal Mining Company and the railroad property to the Iowa River Railway Company. The capital stock of the latter was limited to $30,000 per mile and the first mortgage bonds were issued at the rate of $16,000 per mile, about $400,000 of them being

used to retire an issue of bonds of the Eldora Railroad and Coal Company. The extension to Marshalltown was completed in December, 1869, the line being formally opened from Ackley to Marshalltown on 7 Jan. 1870. At about the same time the Saint Louis and Saint Paul Railway Company was organized under the auspices of the Iowa River Railway Company, to build a railroad from Ackley to the Minnesota State Line, and an independent corporation, the Iowa Central Railroad Company, was organized to build a north and south line, starting from the Missouri State Line at a point near the boundary of Appanoosa and Davis Counties and running northerly and northeasterly through Albia, Eddyville, Oskaloosa, Grinnell, Toledo and Cedar Falls to the Minnesota State Line. In 1870, the Iowa River Railway Company, the Saint Louis and Saint Paul Railway Company and the Iowa Central Railroad Company were consolidated under the name of Central Railroad Company of Iowa. The Iowa River Railway Company had in operation at the time 45.92 miles of railroad which was turned over to the consolidated company under an even exchange of $30,000 in stock and $15,000 in first mortgage bonds per mile. The entire issue of bonds of the Iowa River Railway Company was retired and the mortgage cancelled. A contract was made with the Iowa Valley Construction Company to complete and equip the road from Marshalltown to the Missouri State Line and from Ackley to the Minnesota State Line in consideration of receiving $30,000 per mile in stock and $16,000 per mile in first mortgage bonds, together with local aid guaranteed at $2,500 per mile. The entire line from Albia to Mason City, Iowa, a length of 178.72 miles, was completed and opened for traffic on 7 Feb. 1871. On 15 June 1871, the company made final settlement with the construction company for the 132.8 miles of new road, and was released from any obligation to build the rest of the projected line. The extension from Mason City to Northwood, 20.73 miles, was commenced on 1 Aug. 1871, and completed on 10 Oct. 1871. The total length of line in operation on 1 Jan. 1872, was 202.11 miles, the cost of the road being represented by $4,644,630 of capital stock, $3,700,000 of the first mortgage bonds and $609,000 of second mortgage bonds. Default having been made in payment of second mortgage interest due 15 April 1873, and of first mortgage interest due 15 July 1873, the property was placed in the hands of a receiver. The company was reorganized on 4 June 1879, under the Central Iowa Railway Company and took over the property after foreclosure sale on 18 June 1879.

In 1880–1882 the company constructed the following lines: Montezuma branch, 13.61 miles; State Centre branch, 25.64 miles; Story branch, 34.5 miles; Belmond branch, 22.20 miles; Keithsburg branch (Oskaloosa to west bank of Mississippi River), 97.16 miles, and Newton branch, 27.75 miles. The Peoria and Farmington Railroad, extending from Iowa Junction, Ill., to the east bank of the Mississippi River, a distance of 88.65 miles, was purchased in May, 1883, the company at the same time securing the right to run its trains into Peoria, Ill., over the tracks of the Peoria and Pekin Union Railway. First mortgage bonds to the amount of $1,531,000 were issued on the Keithsburg and Newton branches, and to the amount of $1,200,000 on the Montezuma, State Centre, Story and Belmond branches, both issues being dated 1 April 1882, and payable 30 years thereafter, with interest at the rate of 7 per cent. per annum, payable semi-annually. Also, $1,517,000 6 per cent. 45-year bonds dated 1 June 1879, secured by first mortgage on the Illinois division, were assumed from the Peoria and Farmington Railroad Company. Default was made in payment of interest due 1 Oct. 1884, and was followed by defaults under the main line and Illinois mortgages. A receiver was appointed 1 Dec. 1886. In pursuance of a plan of reorganization the road was sold under foreclosure of the several divisional mortgages, the sales taking place in September and November, 1887, and in March, 1888. The present company was organized by the purchasers taking over the property on 15 May 1889.

Lease of Iowa Central and Western Railway.— The company leases for 50 years from 1 July 1901, with rights of purchase at any time during the continuance of the lease, the Iowa Central and Western Railway, from Belmond to Algona, Ia., a distance of 37 miles, upon condition that it shall maintain the property, paying, in addition to all taxes lawfully assessed, 20 per cent. of all gross earnings accruing from the operation of the property. The earnings are to be applied to the payment of interest and principal upon the bonds of the Iowa Central and Western Railway Company as the same may become due and payable, and the Iowa Central Railway Company guarantees to make good any deficiency that may arise.

Traffic Agreement with Chicago, Burlington and Quincy Railroad Company.— Under an agreement effective 16 Jan. 1905, this company's freight business between Oskaloosa and Des Moines, Ia., is handled by the Chicago, Burlington and Quincy Railroad Company at an agreed rate per loaded car.

F. H. Davis,
Vice-President.

Iowa City, Iowa, city and county-seat of Johnson County, on the Iowa River, and the Burlington, C. R. & N., and the Chicago, R. I. & P. R.R.'s; 54 miles west of Davenport. The city is pleasantly built on a succession of plateaus, rising one above another from the river banks, which are here high. The first plateau is laid out as a public promenade, and the third, which is about 30 feet higher than the first, is crowned by a handsome Doric edifice 120 feet long and 60 feet wide, of a beautifully marked stone quarried in the vicinity called "bird's-eye marble." This building was originally intended for the State capitol, but, on the removal of the seat of government to Des Moines, was appropriated to the State University. From 1839 to 1854, this was the seat of the Territorial and State governments. It is the seat of the State University of Iowa, the Iowa State Academy, the State Historical Society and Library, the Homœopathic, Allopathic, and Mercy hospitals. It is the farming trade centre for Johnson, Cedar, and Iowa counties, with an annual trade exceeding $1,000,000; has excellent power provided by the Iowa River; and has

manufactories of flour, iron, woolen goods, perfumery, gloves, jewelry, fencing, and linseed oil. The city has electric light and street railroad plants, waterworks on the Holly system, numerous churches, and an assessed property valuation of about $6,500,000. Besides its manufacturing interests the city has an extensive stock-raising and meat-packing industry. Pop. (1890) 7,016; (1900) 7,987.

Iowa College, a coeducational institution founded in 1847 at Grinnell, Ia.; under the auspices of the Congregational Church. In 1901 it had 33 professors and instructors, 411 students, 27,000 volumes in the library; productive funds, $470,000; grounds and buildings valued at $150,000; and an income of $49,000.

Iowa River, a considerable stream in the State of Iowa rising in Hancock County, near the Minnesota State line and flowing southeast into the Mississippi River, north of Burlington. It is 300 miles in length, and is navigable to Iowa City, 80 miles from its mouth.

Iowa State College of Agriculture and Mechanic Arts, a coeducational institution for technical education at Ames, Iowa. It received a grant of land from Congress under the law of 1862, and was first opened in 1868. Regular courses are offered in agriculture, mechanical engineering, civil engineering, electrical engineering, mining engineering, technology, science as related to industry, and general and domestic science; special shorter courses are given in the fall and winter in dairying, agriculture and mechanics, horticulture and mechanics, and domestic science. The State Agricultural Experiment Station is also allied with the college. The annual income in 1902, including the Federal appropriation, was $120,000; there were 1,220 students in attendance, and 84 professors and instructors.

Iowa, State University of, an educational institution forming an integral part of the public school system of the State, situated at Iowa City. It was first opened in 1847, receiving control of lands given by the Federal government. (See COLLEGES, LAND GRANT.) The university is controlled by a board of regents of 2 *ex-officio* members and 11 elective members. Its work is organized in the following departments: the college of liberal arts (including the summer session), which offers courses leading to the degrees of A.B., B.S., and Ph.B.; the graduate college; the Iowa school of political and social science, with both undergraduate and graduate courses; the college of law; the college of medicine; the college of homœopathic medicine; and the college of dentistry. The library, which lost 25,000 volumes by fire in 1897, now contains nearly 65,000 volumes; the university issues the following publications: 'Natural History Bulletin'; 'The Transit,' an engineering journal; 'The Law Bulletin'; 'The Bulletin of the Homœopathic Medical College'; 'The University of Iowa Studies in Psychology'; 'The State University of Iowa Studies in Sociology, Economics, Politics and History.' The State appropriates over $125,000 annually to the university, and the total income amounts to over $300,000 annually. In 1902 the number of students was 1,512; the number of professors and instructors, 160.

Iowa Wesleyan University, a coeducational institution founded in 1844, at Mount Pleasant, Iowa; under the auspices of the Methodist Episcopal Church. In 1901 it had 20 professors and instructors, and 380 students. There are 5,000 volumes in the library. It has productive funds, $75,000; grounds and buildings valued at $150,000; benefactions, $32,000; and an income of $14,000.

I'owas, a tribe of American Indians of the Algonquin family. In 1800 the Iowas lived in Minnesota and soon after moved southward. They were called Palinchas, or "Dusty Noses," in their own tongue. Lewis and Clark, the explorers, designate them as the Ayanways, and the early French traders called them the Ajowes. In 1836 they moved to the Wolf River region west of the Mississippi, and in 1861 ceded 16,000 acres of land to the United States. The remnants of the tribe, some 1,000 in number, at present live on reservations in Oklahoma and Kansas. See also INDIANS, AMERICAN; IOWA.

Ip'ecac, or **Ipecacuanha,** a South American plant of the order *Rubiaceæ* variously called by botanists *Cephælis ipecacuanha* and *Psychotria ipecacuanha.* The plant, which is found mainly in moist shady forests in Brazil, is a creeping herb or sub-shrub with mostly bare stems, only the extremities producing leaves. The small white blossoms, which are borne in heads with long stalks, are followed by dark purple berries. The rather fleshy more or less divided roots were in medicinal repute among the South American Indians, and gradually found their way into European medicine under the name "ipecacuanha." They have been considered emetic, nauseant, diaphoretic and expectorant, and in large doses are reputed poisonous. They appear in commerce in various grades (gray, brown and red), which are dependent mainly upon the season at which they are gathered, the way they are dried, the age of the plants, etc. The chief supplies are collected during January, February and March by the Indians. Owing to the slow growth of the plant and the low price the roots command, ipecac is not cultivated commercially; it has, however, been successfully grown in various parts of the world. The roots of several other plants are substituted for those of true ipecac, among the best known being those of *Tylophora asthmatica* and *Sarcostemma glaucum* (Venezuelan ipecac), both of the natural order *Asclepiadaceæ.* Other species of *Psychotria* and certain species of *Richardsonia* are similarly but unofficially employed.

Wild or American ipecac (*Gillenia stipulacca*) of the rose family, is a common plant in the southeastern United States and as far north as western New York. It is a perennial herb about three feet tall, bearing paniculate corymbs of white or pale rose colored flowers. It is hardy, of simplest culture and being graceful is frequently planted for ornament in flower borders where the soil is of good quality.

Iphicrates, ī-fik'ra-tēz, Athenian commander: b. and d. in the 4th century B.C. Of humble origin, he raised himself to eminence by his courage and talents. In the war of Corinth (393–2 B.C.) he opposed with success Agesilaus, the warlike king of Sparta. He was sent to the Hellespont to act against Anaxibius, but in spite of his victory was unable to prevent the

conclusion of the shameful Peace of Antalcidas (387 B.C.). In 360 B.C. he was appointed to the command of the troops sent by the Athenians to the assistance of Sparta, on the invasion of Epaminondas, but allowed the Theban general to retreat from the Peloponnesus. In the Social War (357–5) he was one of the commanders of the fleet fitted out by the Athenians for the recovery of Byzantium. Being accused of treachery and neglect of duty in the battle at the Hellespont, by one of his colleagues, Chares, and put on trial, he was acquitted, while his colleague Timotheus was fined 100 talents; but though he lived to a great age, did not again engage in active service. Iphicrates was the author of some improvements in Greek arms and accoutrements. He was accustomed always to fortify his camp in the field even in a friendly country; "Because," he said, "if, contrary to probability, I should be attacked, I may not be obliged to make the disgraceful excuse that I did not expect it."

Iphigenia, ĭf-ĭ-jē-nī′ạ, in Greek legend, a daughter of Agamemnon and Clytemnestra (according to some an illegitimate daughter of Theseus and Helen), who was to have been sacrificed to Artemis (Diana) at the advice of the prophet Calchas, when the goddess, enraged with Agamemnon, detained the Greek fleet in Aulis by a calm. Under pretense that she was to be married to Achilles, Iphigenia was led to the altar. But in the moment when the priest was about to give the death-blow Iphigenia disappeared, and in her stead a beautiful hind was substituted, whose blood gushed out on the altar. Artemis had relented, and conveyed her in a cloud to Tauris, where she became the priestess of the goddess. Conformably with the law of the country, she was obliged to sacrifice every Greek that landed there. While serving as priestess her brother Orestes came to take away the image of Artemis, as he had been advised by an oracle to do, that he might get rid of the madness to which he had been subject since the murder of his mother. Iphigenia having recognized him as her brother, the two contrived a means of escape, and carried off with them the image. The story of Iphigenia was dramatized by Euripides (who composed two plays upon the subject — 'Iphigenia in Aulis' and 'Iphigenia in Tauris'), and Goethe, and it is also the subject of two operas by Gluck, 'Iphigenie en Aulide' (1774); and 'Iphigénie en Tauride' (1779).

Ipomæa, ĭp-ō-mē′ạ, a genus of plants, including several hundred species, of the order *Convolvulaceæ,* consisting mostly of twining prostrate herbs, widely distributed in warm regions. The species of most importance is *I. Purga,* which yields the jalap of commerce. Some are cultivated for the beauty of their flowers, and are known to gardeners as convolvuli. *I. purpurea* is the best known garden species. See JALAP.

Ips′wich, Mass., town in Essex County, on the Ipswich River near its mouth, and on the Boston & Maine railroad, 27 miles northeast of Boston, and 9 miles south of Newburyport. As Agawam, it was settled in 1633 by John Winthrop and 12 others. The name was changed to Ipswich (after Ipswich, England), in the following year, by resolution of the Massachusetts General Court. As early as 1634 it had a meeting-house, while in 1642 the first free school in the town was established. Ipswich was among the foremost towns of Massachusetts in resisting the arbitrary taxation introduced under Gov. Andros in 1687, and a number of its citizens suffered punishment in consequence of this action, which foreshadowed the stand to be taken later, by this town and the colonies generally, against similar policies on the part of the British government. Among the distinguished persons who at some time lived at Ipswich were Anne Bradstreet, Nicholas Easton, William Hubbard, John Norton, and others. The town has various industries, among the articles manufactured being grist-mill products, hosiery and underwear, bricks, lumber and boxes, carriages, cabinet-work, soap, isinglass, heels, etc. The Manning High school, the Ipswich Historical Society, and the excellent public library give the town rank and influence in educational and literary affairs. Pop. (1900) 4,658.

Iquique, ē-kē′kā, Chile, a seaport in the province of Tarapacá, till quite recently merely a small fishing village, but now a town of about 34,000 inhabitants. It owes its prosperity to the export of nitrate of soda and borax, the former of which especially is found in great quantities in the pampa of Tamarugal. The annual export of nitrate amounts to about 350,000 tons, and that of borax to about 1,500 tons. Iodine is also exported. The pampa of Tamarugal still contains, it is estimated, about 60,000,000 tons of soda niter. In 1868, and again in 1877, the town was almost entirely destroyed by an earthquake. In 1879 it was bombarded and captured by Chile from Peru; and in 1891 it was much damaged by insurgents.

Iquitos, ē-kē′tōs, a native tribe in Peru, residing at Loreto, on the left bank of the Marañon, about 75 miles above the mouth of the Rio Napo. The settlement has an active trade, valued at $2,000,000 annually; the imports are exchanged mostly for india rubber. In 1900 they numbered about 12,000.

Irade, ĭ-rä′dĕ, a Turkish decree or command of the Sultan, directed to his grand vizier, whose duty it is to announce it to the public.

Iran, ē-rän′, the name given by the ancient Persians to their native land, in opposition to Aniran (that is, Not Iran), the land of the barbarians, by which term were meant principally the Turco-Tartaric tribes bordering on the north. The Persian rulers of the dynasty of the Sassanidæ call themselves, in inscriptions on monuments and elsewhere, kings of Iran and Aniran. At the present day the name is used in contradistinction to Turan, the name applied to the more depressed regions of Asia inhabited by the Turco-Tartaric tribes, to designate the great table-land of Asia, which has a mean elevation of from 3,500 to 4,000 feet. The central portion of this table-land consists of an extensive salt-desert.

Iranian (ī-rā′nĭ-ạn) **Languages,** a family of the Indo-European languages, closely allied to the Indian group, and called by some philologists Persian, from the best known member of the family. The two oldest known Iranian languages are the Old Persian and Zend. The former — that of the cuneiform inscriptions of the Achæmenian dynasty, and the language of the Persians proper — has only become known

in its chief traits at a comparatively recent date through the deciphering of those inscriptions. The Zend is the language in which the Zend-avesta, the sacred writings of the Parsees, are composed. By the term Middle Iranian languages the Huzvaresh or Pehlevi and the Parsi principally are understood, which are preserved in the commentaries to the Zend-avesta. The latter approaches to the modern Persian. The dialect of the Pehlevi coins, as well as the inscriptions of the time of the Sassanian dynasty, also belong to this section. The most important of the New Iranian languages is the Persian. The Afghan, or Pashtu, and the dialects of the Kurds, form separate branches of the Iranian family. The isolated Ossetes of the Caucasus also speak an Iranian language. The Armenian is a branch of the same stock, and contains many peculiar elements.

Irawadi, ĭr-a-wŏd'ĭ, or **Irrawady,** one of the great rivers of Southern Asia, traversing Burma in a southerly course. One branch of it rises near the eastern extremity of Assam, another branch rises in East Tibet, the two branches uniting about lat. 26°. It has generally a south course, being deflected west, and its total length has been estimated at 1,200 miles. There are three rocky defiles in which its channel is suddenly contracted, the lowest near Mandalay; but from that point downward to its delta it has generally a breadth of from 1 to 4 miles. About 140 miles from the Indian Ocean, which it enters by numerous mouths, the delta commences. The current of the Irawadi is commonly gentle — even in its upper part being no more than at the rate of two miles an hour: except during the inundations, when it flows so rapidly that no sailing vessels could navigate it but for the assistance of the southwest monsoon. It is navigable from the sea upward for steamers of five feet draft to the Chinese frontier, 900 miles from the sea.

Iredell, ĭr'dĕl, **James,** American jurist: b. Lewes, Sussex, England, 5 Oct. 1751; d. Edenton, N. C., 20 Oct. 1799. He was appointed comptroller of customs at Port Roanoke, now Edenton, where he arrived in 1768, retained this office several years, and meanwhile studied law. He was appointed by the attorney-general his deputy in 1774, and in 1777 was placed by the legislature on the bench of the supreme court, then just organized under the State constitution. In 1787 he was designated by the general assembly sole commissioner to collect and revise the acts of previous assemblies, which were to be considered in force in North Carolina. This collection of the laws, now referred to as "Iredell's Revisal," was published in 1791. In February 1790 he became one of the justices of the Supreme Court of the United States, and held that office till his death. The 'Life and Correspondence' of Iredell was published in 1857.

Iredell, James, American lawyer, son of the preceding: b. Edenton, N. C., 2 Nov. 1788; d. Raleigh, N. C., 13 April 1853. He was graduated at Princeton in 1806, and was bred to the bar. He served for 10 years in the house of commons of his native State, and twice as speaker in a house of which the majority were politically opposed to him. In 1827 he was governor of North Carolina, and from 1828 to 1831 a member of the Senate of the United States. He afterward resumed the practice of his profession at Raleigh, where he was also for many years reporter of the decisions of the supreme court of North Carolina. In 1833 he was appointed by Gov. Swain one of three commissioners to collect and revise all the statutes in force in North Carolina. The result was the work known as the 'Revised Statutes.' He afterward published a 'Treatise on the Law of Executors and Administrators.'

Ireland, īr'land, **Alleyne,** American author and lecturer: b. Manchester, England, 19 Jan. 1871. He was educated at the University of Berlin, traveled widely, lectured on tropical colonization at Cornell University in 1899, and in 1900 was appointed lecturer in politics at the University of Chicago, where his subjects were tropical colonization and Chinese foreign relations. Besides contributions to periodicals, he has written: 'Georgetown, Demerara' (1897); 'Tropical Colonization' (1899); 'The Anglo-Boer Conflict' (1900); 'China and the Powers' (1901).

Ireland, John, American Roman Catholic prelate: b. Burnchurch, County Kilkenny, Ireland, 11 Sept. 1838. He came to America in 1849 and attended the Cathedral school at Saint Paul, Minn., and in 1853 went to France and studied theology in the seminary of Meximieux and subsequently in that of Hyeres, remaining there till 1861, when he returned to Saint Paul and was ordained priest on the 21st of December. During the early part of the Civil War Father Ireland tendered his services as chaplain of the 5th Minnesota regiment and later became rector of the cathedral, Saint Paul. An ardent advocate of temperance, he devoted much time and energy to promoting the cause, organized temperance societies and traveled about the country lecturing on the subject. For a time he was secretary to Bishop Grace of Saint Paul, whom he represented at the Vatican Council, Rome, 1870–71, and later became his coadjutor, being consecrated Titular Bishop of Maronea, 21 Dec. 1875. He was likewise very diligent in advancing Roman Catholic colonization in the northwest and not only founded colonies but became a director in the National Colonization Association. Later, in 1887, Bishop Ireland accompanied Bishop Keane to Rome to consult with Pope Leo XIII. upon the necessity of erecting a Catholic university in Washington, D. C., and on returning from Europe in 1888, he was made first archbishop of Saint Paul. He is a distinguished lecturer and pulpit orator, a contributor to the leading magazines, and a member of the American Federation of Labor. At present (1905) his diocese includes about 230,000 Catholics; 258 priests; 252 churches; 1 theological seminary; 90 parochial schools; 3 orphanages; 3 hospitals, and various other religious and educational institutions.

Ireland, Mary E. Haines, American translator and author: b. Calvert, Cecil County, Md., 9 Jan. 1834. In addition to serials and numerous other contributions to the periodical press, she wrote 'What I Told Dorcas' (1895), and 'Grandma Elliot's Farmhouse' (1900).

Ireland, William Henry, English literary forger: b. probably London 1777; d. there 17 April 1835. He imposed spurious Shakespearian

MSS. upon his father, Samuel Ireland, a bookseller and engineer, who was a Shakespeare enthusiast, and also upon other men of letters, and produced two "Shaksperian" plays, 'Vortigern' and 'Henry II.,' the former of which was purchased by Sheridan and acted at Drury Lane, but was a complete failure. The criticisms of Malone led to the exposure of the fraud, which was acknowledged by Ireland in 1796. He wrote various novels, poems, etc., besides his 'Confessions' (1805), containing an account of his forgeries.

Ireland, the most westerly and smaller of the two principal islands of which the United Kingdom of Great Britain and Ireland is composed, extends from lat. 51° 26′ to 55° 21′ N.; its average width is about one fourth its length; area, 32,583 square miles. It is separated from England by Saint George's Channel and the Irish Sea, and from Scotland by a narrow passage, the North Channel. Ireland is on the continental shelf, or sub-marine plain, which borders the continental land mass of Europe, hence it is physically a part of Europe.

Topography.— The coast line is irregular; from Dundalk Bay to Wexford Harbor on the east there are less indentations than on any other part of the coast; Dublin Bay, an arm of the Irish Sea, is the only indentation of any size on this part of the island. Galway, Sligo and Donegal Bays are the largest on the western coast. The Atlantic currents, which beat against the western coast, have worn away the land in many places, thus causing fiords such as exist on the coasts of other countries subject to similar wave-action. Some of the many islands which fringe the coast have been formed by the washing away or the submergence of the land. The capes, promontories, and peninsulas have been formed largely by submergence. Some of the islands, all small, are Aran, Achill, Clare, and Rathlin. The chief ports are Cork, Dublin, Belfast, Waterford, and Londonderry. There are 14 harbors which will accommodate the largest ocean steamers.

The highlands are chiefly along the coast; the greater part of the interior is a plain. The mountains, more rounded hills than mountains, are short ranges with little or no connection except the several ranges in the southwest. Some of the mountains are Mourne, in County Down, the Wicklow Mountains, Knockmealdown and Galty in the south; Caha, Stack and other ranges in Kerry; Slieve Boughta in Galway, a number of short ranges in the counties of Mayo, Leitrim, Donegal, and Londonderry, and the Slieve Bloom between Queens and Kings counties. The majority of the peaks are less than 3,000 feet in height; Carrantuohill (Carrantual), in Kerry, near the Lakes of Killarney, is 3,404 feet, and Galty Mountains, in Limerick, are 3,015 feet. The plain in the interior is about 500 feet above sea-level.

Hydrography.— The rivers of Ireland, like those of England and Scotland, are small streams. The Shannon, the largest river in the British Isles, has its rise in the northeastern part of the province of Connaught, flows east, south, and west, forming quite a curve before entering the Atlantic Ocean, between the counties of Kerry and Clare. It passes through several lakes, the largest of which are Ree, Allen, and Derg. The estuary at the mouth is about 70 miles long; the whole length of the river is about 250 miles, 130 of which are navigable for large steamers. Its importance for transportation has been increased by the canals Royal and Grand, which connect it with Dublin. In the southwest, in County Kerry, is a short mountain stream called Roughly River, with a long, broad estuary called Kenmare River. The Liffey, which flows into the Irish Sea at Dublin, the Lee which flows into Cork Harbor, the Boyne with its tributary, the Blackwater, are all short streams which have been made famous in history and literature. The Foyle, Erne, Lagan, Moy, Slaney, and others reach the ocean through broad estuaries or bays. Lough Neagh in the northwest is the largest lake of the British Isles. A number of the lakes of Ireland occur along the river courses, but are really basins, and not merely expansions of the rivers. Lakes Corrib, Conn, Foyle, Belfast, Strangford, Carlingford, and others on the coast are estuaries or fiords, but the land-locked mouths entitle them to be called lakes, like Maracaibo in South America. The famous Lakes of Killarney are in County Kerry, in the southwestern part of the island. There is scarcely a place in Ireland that is more than 25 miles distance from water communication with the ocean.

Geology.— A limestone stratum belonging to the basal portion of the Carboniferous system underlies a large part of the interior plain. The upper Carboniferous rock has been destroyed by erosion except in a few places. Silurian rock underlies nearly all of the northern part, but the Cretaceous, Triassic, and Permian formations exist and appear at the surface in several places. Some of the cliffs of the north are of basaltic formation. The Giant's Causeway (q.v.) on the north coast of Antrim is basaltic. Its 40,000 or more, perfectly formed polygonal columns constitute remarkable specimens of this formation. Crystalline rocks form the axis of the mountains of the province of Connaught, and the highlands of Leinster. Old red sandstone and carboniferous limestone are found in the southwestern counties. Marble exists in large quantities in the county of Kilkenny and in parts of the adjacent counties coal of an anthracite variety is found, but not in large quantities; iron-ore exists in nearly every county. Copper of an excellent quality is in the western mountains, also gold and silver in small quantities.

Soil.— The erosion of the limestone rock which has been going on for ages has contributed largely to the fertility of the soil of Ireland. The igneous rocks, the red marls, and other mineral formations, have added to the richness of the soil, and all has been distributed, by the gradual removal of the ice-covering, over a large area of the plain. After deducting the area, about one fifth of the whole, which is covered by bog, mountain, and moorland, there is left a vast extent of arable surface covered with a deep friable loam of remarkable richness. In addition to the decomposed trap and the calcareous matter derived from the limestone, there is a large amount of vegetable mold which forms one of the most important ingredients of the soil. The bogs, useless for tillage, furnish peat for fuel. The Bog of Allen is the largest one in Ireland.

Climate.— The warm moist winds from the Atlantic blowing over Ireland affect its climate more than any other cause except its latitude.

The mean temperature is from 20° to 30° F. higher than other places in the same latitude on the eastern coast of America or the interior of Europe, and a few degrees higher than places in the same latitude on the west coast of America. The summer temperature is modified by the surrounding waters, being lower by a few degrees than inland places of the same latitude. The moisture brought by the winds from the ocean causes a heavy annual rainfall, and much fog, mist, and general dampness. The low mountains serve to some extent as condensing agents, so that the greatest rainfall is near the coast. The average rainfall on the west and south coasts was, in 1879, 43.56 inches; in 1896, 36.36. The averages for the interior were in 1879, 34.39 inches; in 1896, 34.07 inches.

Vegetation.—The climate and soil are very favorable for vegetation. Its mild temperature and humid atmosphere enable several delicate plants, which usually in the same latitude can be cultivated only in sheltered gardens, to flourish here with vigor in the open air; and frequently forest trees continue to retain their foliage after similar trees have lost their leaves in the warmest parts of England. The conditions would naturally indicate forests, and it seems that in early times, large tracts of magnificent timber were spread over its surface; but the grossest waste and mismanagement have prevailed, trees have almost disappeared except from the parks of the wealthy land-owners, or the "gentry"; and what ought to be among the best is about the worst wooded country in the middle latitudes of Europe. More attention is now being given to the subject of forestry; in 1901 there were 309,741 acres in Ireland under forest, a portion of which was a new growth. During the year, 1,740 acres were planted with trees, mostly fir, spruce, and larch. Grass grows luxuriantly in nearly all parts of the island.

Animals.—The fauna of Ireland consists now of birds and small rodents. Animals once found here and mentioned in the ancient literature, as the deer, bear, wildcat, wolf, beaver, cattle peculiar to the island, and certain birds (including the garefowl), have all disappeared. There are no snakes nor toads in Ireland. Fish are plentiful in the streams and on the coasts.

Fisheries.—The salmon fisheries are very valuable, and are increasing in value every year. With an increased supply of fish, high prices are maintained owing to the improved means of communication from remote districts with the best markets. In spite of this, however, these fisheries are not cultivated to anything like so high a degree as they might be. Still, the number of men engaged in the salmon fisheries in Ireland is over 13,000, the estimated value of the salmon exported being from $700,000 to $950,000 annually. The principal sea fisheries of Ireland are those of herring and mackerel. The herring fisheries in the Irish waters are prosecuted chiefly on the east coast by Irish boats from Howth, Arklow, and other places on the Irish coast, and by a fleet of vessels from Cornwall, Scotland, and the Isle of Man. The number of boats engaged in this branch of the sea fishery is much smaller than in Scotland, from which considerable quantities of cured herrings are imported. The total number of vessels engaged in the sea fisheries is now about 6,525, the number of men and boys employed being about 26,200. The native fishermen, it is said, are now successfully competing with their rivals, yet the sea fisheries of Ireland on the whole have much declined, as shown by the decrease from 55,630 hands and 13,483 boats employed in 1860, to the figures just given.

Agriculture and Stock-raising.—The chief occupation is agriculture. The richness of the soil, its lightness that makes tillage easy, the large percentage of arable land, the amount of rainfall, the mildness of the climate, all combine to make Ireland an agricultural country. Despite the great extent of moorland-wastes and the large amount of bog-land, few countries raise, in proportion to the area, such a large amount of food products year after year. But with natural advantages above the average, agriculture as a system has not progressed as in many other countries. The wholesale confiscation of estates by the English gave the absentee landlord a large portion of the farm land of Ireland. The new owner usually cared only for his rent and gave little heed to improving the land, and showed no regard for the welfare of the man who tilled the soil. The holders and laborers received no encouragement to improve methods or make progress; on the contrary, they were handicapped in many ways, especially in the 18th century, when the English markets were closed to their products, and Ireland was excluded in a large measure from the commercial advantages given to the British possessions in other parts of the world. The holdings, or farms, originally too small to be occupied by farmers of capital and enterprise, were in many cases subdivided until they were reduced to the smallest patches, on the produce of which a family could barely subsist. One result of this poor policy was that the holders were obliged to raise as much as possible each year, for immediate use, without regard to the ultimate effect of this mode of farming upon the land. Competent authorities say that this over-cropping has had a most deleterious effect upon the land. Yet the soil must have been restored to some extent, by rotation of crops or by the use of fertilizers, for the average produce of the soil per acre, in 1902, was found to have increased over the years 1850 and 1860. In some cases the holdings were enlarged during the last years of the 19th century. Statistics show that a change in the kind of crops has been gradually taking place; a decrease in the acreage under cereals and green crops and an increase in the area under meadow and clover. The following table shows the distribution of the cultivated area, given in acres, the first years of the present century:

Year	Cereals	Green crops	Flax	Clover and hay	Pasture
1900	1,347,189	1,098,377	47,451	1,218,717	11,510,370
1901	1,317,574	1,079,443	55,442	1,233,770	11,522,060
1902	1,306,398	1,070,449	49,746	1,228,498	11,575,592

The number of acres of farm land not under crops, but "resting," was, in 1900, 12,589; in 1901, 10,886; and in 1902, 9,558.

Between 1851 and 1881 the farms of 1 to 15 acres decreased in number by 66,363. The total number of holdings in 1891 was 486,865, or 12,244 less than in 1881. Of these 18,243 (1,364 more than in 1881) did not exceed 1 acre, 55,584 (decrease of 6,197) were from 1 to 5 acres, 139,195 (8,628 decrease) from 5 to 15 acres, 120,472 (2,045 decrease) from 15 to 30 acres, and 139,401 (3,262 increase) above 30 acres. Each province

JOHN IRELAND.

ARCHBISHOP OF ST. PAUL.

shows a decrease in the total number of holdings, but in Munster the number is very small. Between 1841 and 1899 there was a total decrease in holdings "above 1 acre" of 25 per cent.

The Land Act of 1870 greatly improved the conditions of tenure in Ireland. The chief aims of the act were to provide compensation to tenants for arbitrary eviction, and especially for improvements effected by them on their holdings in case of their being disturbed in their possession by the landlords, and to afford facilities to tenants for the purchase of their holdings. The act legalized what is called the Ulster tenant-right custom in all the districts in which it prevailed, and decreed the amount of compensation to be awarded in absence of such custom. In 1881 it was supplemented by a more thorough and comprehensive measure. The benefits conferred on Irish tenants by this act were briefly summarized under the terms "fair rent," "fixity of tenure," and "free sale." By the first of these every tenant who objected to his rent, or the rent the landlord wished to exact, was entitled to have a "fair rent" fixed for him by a court. The rent was to remain unaltered for 15 years, at the end of which period it might be readjusted, and raised or lowered. By the principle of "fixity of tenure" the law recognized that the tenant had a certain right in his holding in virtue of which he was not to be arbitrarily removed from it without compensation, and which enabled him on leaving his farm to obtain the best price he could for yielding up his possession. The "free sale" of this right of tenancy was restricted only in so far as that it must be to one person only (except under agreement with the landlord) that the landlord might object on sufficient grounds to the person purchasing, and that he also had the right of pre-emption. At the expiration of the 15 years the landlord might resume possession of the holding on paying the tenant compensation for improvements effected by him, and also paying him the value of his tenant-right, both being determined by the court should the parties be unable to agree. A tenant who sold his tenant-right on quitting his holding was not to be entitled to compensation for disturbance, or if he had received compensation he was not entitled at that time to sell his tenancy. A tenant holding under the Ulster tenant-right might sell under that or under this system, but not partly under one and partly under the other. The scale of compensation for disturbance of tenancy was fixed as follows: Where the rent was $146.70 or under, a sum not exceeding 7 years' rent; rent from $146.70 to $244.50, not exceeding 5 years' rent; from $244.50 to $489, not exceeding 4 years' rent; from $485 to $1,467, not exceeding 3 years' rent; from $1,467 to $2,445, not exceeding 2 years' rent; above $2,445, not exceeding 1 year's rent. The act also empowered the land commission to advance loans to tenants not exceeding three fourths of the value of their holdings, to enable them to become proprietors, and such loans were repayable by an annual payment of 5 per cent for 35 years. Provision was also made for assisting emigration. A tenant whose holding, or the aggregate of whose holdings, were valued at not less than $733.50, was entitled by writing to contract himself out of any of the provisions of this act, or of the act of 1870. Another act passed in 1887 extended the privileges conferred by the act of 1881, and a third act passed in 1896 went farther in the same direction. The Purchase of Land (Ireland) Act of 1891 supplied the Land Commission with further funds for advances to tenants to enable them to purchase their holdings. But the Land Purchase Act of 14 Aug. 1903, whereby the tenants may buy the farms and become independent of the landlords, is a great beginning toward a readjustment of agricultural conditions. The new law provides that the actual tenants or persons, or persons who have been tenants within 25 years, may purchase all the land they occupy or desire at prices varying according to the condition of the property, to be paid for upon the installment plan, the seller accepting a mortgage for a term of years, the government guaranteeing the payment at the ruling rate of interest. The law is not compulsory; landlord and tenant may arrange matters.

Stock-raising has increased in importance during late years. Statistics show that there are now in Ireland more cattle, in proportion to area, than in any other country of Europe. The following table will show the changes which have taken place since 1900:

Year	Horses	Cattle	Sheep	Pigs
1900.....	491,156	4,608,550	4,386,876	1,268,521
1901.....	491,430	4,673,323	4,378,750	1,219,135
1902.....	509,284	4,785,204	4,215,740	1,372,592

England is the principal market for the cattle raised in Ireland. The breeds of horses vary with the locality; ponies are numerous in Connaught; hunters in the north of Leinster; and draft horses in nearly all the counties on the eastern coast. Much good has been effected by co-operative societies. The number of co-operative organizations in 1901 were as follows: 106 agricultural societies, 187 dairy and agricultural societies with 81 auxiliaries, 29 poultry societies, 103 co-operative banks, 46 miscellaneous societies, and 2 federations. The membership of the whole was 51,000.

Manufactures and Trade.— The linen manufacture early took root in Ireland, and still continues to be its most important staple; and in every article, except lace and cambric, competes successfully with all other countries. It has increased in a remarkable manner within the last 40 or 50 years, and Belfast, its centre, has now become the first city of Ireland in population as well as in manufacturing industry. The linen manufacture, indeed, is of importance; a large number of the factories are in Ulster. The cotton manufacture has had a very different history, the number employed in this industry having declined from 4,000 in 1868 to 800. The woolen manufacture appears at the outset to have outstripped that of linen. It had at least made such progress as to alarm the woolen manufacturers of England, who, in a spirit of petty jealousy, petitioned the English parliament for its discouragement, and succeeded. The Irish were prohibited from sending their woolens abroad, and could not even send them into England without paying an oppressive duty. Had the manufacture been suited to the country it might have surmounted all this absurdity and injustice; and, at all events, when these ceased to operate, would have revived. But the woolens of Ireland continue to be of very secondary importance, and indeed the manufacture seems to have much decreased in recent years. The tweed has retained its popularity. The manufacture of Irish poplins (of woolen and silk, or woolen and flax

or cotton) is very flourishing. The number of textile factories in 1890 was 263, which employed 71,788 persons. There are about 20 mills engaged in paper-making. The brewing of porter and distillation of whiskey form important items in the national production. The making of shirts and other clothing for men is becoming prominent. Ship-building was begun several years ago, and during the last of the 19th century it became quite prominent. The largest ship-building yards are in Belfast, where about 10,000 men and boys are employed. The ships of the White Star line are all built in Belfast. Ship-building is carried on to some extent at Dublin, Londonderry, and Haulbowline. Home work still flourishes; and the Irish hand-made laces and embroideries are still popular.

Commerce.— That of Ireland is not at all proportioned to her natural capabilities, and to the admirable facilities afforded by the excellent harbors situated on her coasts. The laws made by the British government to destroy the commerce of Ireland account in a large measure for the present condition of trade. The most important articles of export find a market in Great Britain. They consist chiefly of grain and flour, live stock, salt and fresh meat, eggs and butter. Manufactured articles, particularly linen, rank next in importance; but as the bulk of such articles is very small in comparison with their value, the trade, or at least the shipping connected with them, holds only a secondary place. The trade with foreign countries is also inconsiderable. The principal imports are colonial produce, woolen and cotton goods, wheat, wool, coal, and salt. Of the shipping employed in this trade only a mere fraction is Irish. Belfast and Dublin are the chief shipping ports. The value of the exports direct from Ireland to foreign ports was about $4,533,090 in 1883, of imports from foreign parts $53,166,620; in 1900 they were $6,560,240 and $50,072,985, respectively. In 1900 the number of vessels entered from the colonies and foreign parts was 1,048 (1,032,109 tons); and cleared 448 (473,758 tons); entered coastwise 31,069 (6,401,172 tons); cleared 31,026 (6,746,328 tons).

Transportation.— The rivers of Ireland form excellent navigable channels. In several of them, however, when the water was low, the navigation became seriously impeded by rocky shoals. In removing these, or in making artificial cuts for the purpose of avoiding them, vast sums have been expended. Improvements of equal importance have been made by the construction of canals; but since the introduction of railroads, canals have in Ireland, as elsewhere, sunk to a position of secondary importance. The principal canals are the Grand Canal, 165¾ miles in length; the Royal Canal, 96¼ miles; the Barrow Navigation, 42¼ miles; the Newry Navigation, 35 miles; the Lagan Navigation, 26¼ miles. With the exception of the Barrow Navigation, the Grand Canal, and the Lagan Navigation, the dividends paid by the Irish canals in the possession of public companies are almost nominal. The Royal Canal yields a profitable return, but it is merged in the Midland Great Western Railway. The Grand and Royal canals connect the important systems of the Shannon Navigation, in all 158 miles in length, with Dublin. The railroad system of Ireland has attained a considerable development. The roads are all constructed on a gauge of 5 feet 3 inches, which is compulsory. The average cost of construction, including carrying stock, is about $80,000 per mile. The principal railroads are the Belfast and Northern Counties Railway, with a total length of 180 miles; the Dublin, Wicklow, and Wexford Railway, 135 miles in length; the Great Southern and Western, 478 miles; the Midland Great Western Railway, 425 miles (including the Dublin and Meath, Great Northern and Western, etc.); the Great Northern of Ireland, 503 miles (including the Dublin and Belfast Junction, 63 miles, and the Ulster Railway, 140 miles); and the Waterford and Limerick Railway, 141¼ miles, or including the lines of other companies worked by it, 269 miles in length. Few of the Irish railroads pay any dividend at all; but those that do pay represent a large proportion of the capital invested in railroads in Ireland, and some of them are very remunerative concerns. The most profitable of them are a short one connecting Dublin with Kingstown, the Belfast and Northern Counties, and the Ulster Railway. The total length of railroads completed and open for traffic 1 Jan. 1902 was 3,208 miles. The total number of passengers for that year was about 28,000,000, the total amount of minerals and general merchandise carried, about 5,300,000 tons; the total receipts from the carriage of passengers and goods amounted to nearly $20,000,000.

Public Works.— Large sums have been advanced in loan by the sanction of the imperial parliament under various acts for public works and improvements in Ireland. The Irish board of public works has charge of such grants and their expenditure; the objects to which they are applied include landed improvements and drainage, fishery piers and harbors, roads, bridges, and public buildings, tramways, light railways, and certain lines of inland navigation, and the preservation of ancient monuments. The commissioners have authority to lend for the purpose of any work for which county or borough councils are authorized to borrow. Of $121,141,190 of loans advanced for purposes that have not yet been fully carried out ("current services"), $67,655,395 have been repaid, besides interest amounting to $35,707,115, while the sum of $7,985,250 has been remitted. The largest item of this expenditure, namely, $26,196,100, has been spent on the improvement of lands; river drainage and navigation have absorbed some $14,837,500, while on lunatic asylum buildings there has been spent $13,101,925; in schemes for the improvement of public health, $13,451,390; under the Laborers' Acts, $9,150,940 (to provide employment, etc.); on railways, $6,000,635; in advances to occupants for improvement of holdings, $5,355,530; roads and bridges, $5,041,220. Other sums have been spent on harbors and docks, reclamation of lands, dwellings for the poorer classes, teachers' residences, dispensaries, and in advance to tenants for the purchase of their farms. The recent Land Purchase Bill has made available a large sum of money to be used in aiding tenants in purchase of holdings (1903).

Money, Weights, Measures.— The standard of value is gold. Silver is legal tender up to 40 shillings; bronze up to 12 pence; and farthings only to 6 pence. Bank of England notes are legal tender. The names of the coins used are sovereign, half-sovereign, crown, half-crown, florin, shilling, sixpence, threepence, penny, half-


BELFAST
and Vicinity.
SCALE OF MILES
BELFAST LOUGH
NORTH CHANNEL
SCOTLAND
IRISH SEA
OCEAN
LONDONDERRY
TYRONE
BELFAST
Lough Neagh
Lough Foyle
DONEGAL BAY
Sligo Bay
Blacksod Bay
Clew Bay
Dundalk Bay
Dundrum Bay
Drogheda Bay


IRELAND
SCALE OF MILES
0 5 10 20 30 40 50
Population of places is indicated by different lettering, thus :
100,000 and over..........DUBLIN
50,000 to 100,000..........Cork
10,000 to 50,000..........Kilkenny
1,000 to 10,000..........Mallow
Smaller Places..........Milford
Railroads..........
Canals..........
Longitude West from Greenwich
10° 9° 8° 7° 6°
53° 52°
GALWAY BAY
North Sound
Aran Islands
Mal Bay
River Shannon
Tralee Bay
Brandon Bay
DINGLE BAY
Kenmare River
Bantry Bay
Clonakilty Bay
Courtmacsherry Bay
Old Head of Kinsale
Youghal Bay
Waterford Haven
Wexford Harbor
Limerick
Cork
Kilkenny
Clonmel
Waterford
Wexford
Killarney
Tralee
QUEENS CO.
WICKLOW
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penny, and farthing. The standard units are: of weight, the pound, 7,000 grains; of length, the yard; of capacity, the gallon, containing 10 pounds avoirdupois of distilled water at 62° F., the barometer at 30 inches. On these units all other legal weights and measures are based.

The sovereign weighs 123.274 grains, and contains 113.001 grains of fine gold. The shilling weighs 87.27 grains, and contains 80.727 grains of fine silver. Bronze coins consist of a mixture of copper, tin, and zinc. The penny weighs 145.83 grains.

Banks.— The institution known as the Bank of Ireland has a royal charter and unconditional liability. This bank manages, free of charge, all the public debt of Ireland, and, like the Bank of Scotland, it loans money to the British government, for which, since 1865, 3 per cent is paid. In 1902 there were in Ireland nine joint-stock banks with 625 branches, all of which had adopted limited liability. Six of the nine banks were note-issuing.

There are two kinds of savings banks in Ireland: one the trustee savings bank, which has been in existence since the first years of the 19th century; the other, the postal savings bank, which was begun in 1861. The annual amounts which may be deposited by each person are regulated by the Savings Bank Act. According to the act for 1893 the amount which may be deposited in one year by one person is £50, or $244.50, and not £30, or $146.70, as was the law under a former act. The amount of stock which may be purchased was raised from £100, or $489, to £200, or $978, and the increase in the stock-holding limit was changed from £300, or $1,467, to £500, or $2,445. The post-office savings banks are considered more secure than the trustee savings banks, and the deposits in the former are some larger than in the trustee savings banks. The trustee savings banks received in 1897 about $23,044,180, and in 1902 about $23,547,910. The postal savings banks received in 1897 about $10,869,735, and in 1901 about $12,298,705.

Charities.— The Poor Law, which regulates the system of public charities, is about the same for Ireland as for England and Scotland. It provides for relieving the needy in their own homes or for placing them in charitable institutions. The law is administered by the local government board through boards of guardians elected for the purpose. The number of indoor poor who received assistance for the year 1902 was 43,531; the number of outdoor poor for the same year was 57,813; and those in asylums, 1,427. A large amount of aid is dispersed through private means; but a strong effort is being made to remove the causes, which are about the same in all countries, and which usually result in poverty. Efforts have been made to improve the methods of work, and to foster habits of economy.

Government.— Ireland, by the Act of Union, became an integral part of the United Kingdom, and shares in its legislation by means of 28 representative peers in the House of Lords, and 103 representatives in the House of Commons. The representative peers are elected for life by the whole body of Irish peers. The Lord-Lieutenant, who represents the sovereign, holds his court in the castle of Dublin. Since 1898 great changes have been made in the manner of administering the local government. Previous to that date the chief authority in the county was the grand jury, and all local affairs pertaining to the government and local laws were attended to by the grand juries and presentment sessions. The act of 1898 provides for a council, elected by the people, for a term of three years. The government of the boroughs, rural and urban districts, is also vested in an elective council. The unincorporated boroughs are governed by commissioners.

The government of the incorporated boroughs is vested in a mayor, aldermen, and council. The large cities are now county boroughs. The chief secretary, the under-secretary, and four commissioners, who are appointed by the Lord-Lieutenant, constitute the local government board, which has supervisory authority over the local council. This board approves or rejects nominations made by the local authority, decides upon salaries, and has the whole local government in charge to a certain extent.

The judiciary of Ireland is similar in many respects to that of England. The highest tribunal is the Supreme Court of Judicature, composed of the High Court of Justice and the Court of Appeal. Other courts are the Court of Bankruptcy, the Land Commissioner's Court, and the High Court of Admiralty. The English municipal law is administered by the courts of Ireland.

Finances.— In addition to local indebtedness Ireland assists in the liquidation of the national debt of the kingdom. The amount which has been apportioned to Ireland, it is claimed, is larger, in proportion to the wealth of the island, than the amount apportioned to England and Wales. The imperial revenue collected in Ireland for the fiscal year ending 31 March 1902 was about as follows: Customs, $15,500,000; excise, $15,850,000; estate and duties, $317,300; stamps, $15,740,000; income tax, $5,822,000; post-office, $3,697,000; telegraphs, $876,200; crown lands, $163,400; miscellaneous, $574,200; making a total, together with the non-tax revenue, of $46,792,000. The local taxation revenue for the same year was about as follows: Customs, $74,850; excise, $635,000; estate and duties, $995,000. The expenditures for the same year were about as follows: Against exchequer, for the civil government, $22,200,000; for collection of taxes, $1,215,000; post-office, $5,435,000. For local taxation accounts paid the same year, $5,275,000. The whole makes a grand total of about, for imperial revenue, $284,125,000; for local revenue, $1,945,000. The total amount raised for local expenditure was distributed about as follows: For water, gas, electric lights, $12,270,820; tolls, dues, $1,913,560; rents, interest $1,229,225; government contributions, $7,810,780; loans, $2,365,800; miscellaneous, $2,103,685. The chief local expenditures were about as follows: Town and municipal authorities (police, sanitary works, etc.), $8,025,450; unions, poor relief, $5,592,420; county, rural sanitary, and road authorities, $9,591,165; harbor authorities, $2,422,620.

Population.— Since the census of 1841, when the inhabitants of Ireland numbered fully 8,000,000, the population has almost steadily decreased. In 1846–7 a frightful famine, occasioned by the potato disease, broke out, and was followed by a visitation of fever and cholera. The population was in consequence greatly reduced, and since then emigration has taken the place of

famine and disease in reducing it further. The extent of this emigration will be gathered from the following statement of the numbers that left the country between 1851 and 1899:

Provinces	Number of Emigrants between May 1, 1851, and Dec. 31, 1898.		
	Males	Females	Total
Leinster	355,104	320,706	675,810
Munster	673,106	640,092	1,313,198
Ulster	590,314	475,761	1,066,075
Connaught	282,532	306,616	589,148
Not specified	61,766	48,902	110,668
Total	1,962,822	1,792,077	3,754,899

From the causes just referred to the total population of Ireland, which might by natural increase have amounted to at least 10,000,000, had dwindled away to 4,425,597 in 1902.

The population by provinces in 1901 was as follows: Leinster, 1,152,829 (150.1 per square mile); Munster, 1,076,188 (112.3 per square mile); Ulster, 1,582,826 (183.8 per square mile); Connaught, 646,932 (94.5 per square mile). In that year the average population per square mile for Ireland was 136.7. In 1901 there were six county boroughs with populations as follows: Dublin, 290,638; Belfast, 349,180; Cork, 76,122; Limerick, 38,151; Londonderry, 39,892; Waterford, 26,769.

Education.— The present difficulties in establishing a public system of education in Ireland had their origin in the times following the efforts to make the people abandon the Roman Catholic Church. As a consequence, the parents refused to patronize the government schools. The laws of the time of William III. and Queen Anne made it a crime for Catholics to teach or to have their children taught by Catholics, or to send them abroad where they would be educated in Catholic schools. The rigid enforcement of these laws resulted in a large proportion of illiteracy among the Roman Catholics, although they had established schools abroad which were attended by those with wealth sufficient to live in a foreign country. (Consult, 'History of Irish Schools and Scholars of the Middle Ages.') The principal educational institutions in Ireland are Dublin University and the three Queen's Colleges. The Queen's Colleges were formerly connected with an examining and degree-conferring body, Queen's University, for which the Royal University of Ireland was substituted in 1882, in pursuance of the University Education (Ireland) Act, 1879; $100,000 being yearly granted from the surplus funds of the Irish Church (q.v.). The Queen's Colleges, however, are not directly affected by this act. The Royal College of Science for Ireland was established under the authority of the Science and Art Department, London, in August 1867. Its object is to supply a complete course of instruction in science applicable to the industrial arts, and to aid in the instruction of teachers for the local schools of science. There are professors of physics, chemistry, botany, zoology, agriculture, mining, geology, applied mathematics, etc. The course of instruction extends over three years. There are also the General Assembly's Theological College, Belfast; the Magee College, Londonderry, a Presbyterian college opened in 1865, and embracing in its curriculum literature, science, and theology; the College of St. Columba, near Dublin, founded for the purpose of establishing a system of instruction preparatory to the university.

The Catholic University of Ireland, established in 1854, grants degrees in theology and philosophy, and since 1882 sends its students to the Royal University for examinations for degrees in arts, medicine, law, and engineering. Affiliated with the Catholic University, and now a part of it, are the following colleges: St. Patrick's, Maynooth; University College, Dublin; University College, Blackrock; St. Patrick's, Carlow; Holy Cross, Clonliffe; and School of Medicine, Dublin. There are additional, in different cities and towns, about 40 Roman Catholic colleges and seminaries for men, and a large number of academies or secondary schools for women. There are numerous non-sectarian schools, some of them of royal and private foundation and endowed, but the most prominent are those established since 1831 under the superintendence of the commissioners of national education. These schools are open to the children of parents of all denominations. The pupils are not required to attend any religious exercises or religious instruction of which their parents or guardians disapprove, and opportunity is given to pupils of each religious persuasion to receive separately at appointed times such religious instruction as their parents or guardians may approve of. Of these schools there were 8,670 in operation in 1899, with 785,139 pupils on the rolls. The average daily attendance was small, being only 513,852. In 1892 an act was passed by which a beginning was made of free education, and a modified system of compulsion. In 1878 an act was passed for the promotion of the intermediate secular education of boys and girls in Ireland. By this act about $5,000,000 from the Irish Church surplus fund was set apart, being invested in commissioners who are to apply the revenue arising from it to the purposes of the act, these being (1) the carrying on of a system of public examinations; (2) the awarding of exhibitions, prizes, and certificates to students; and (3) the payment of results fees to the managers of schools fulfilling certain prescribed conditions. The schools referred to in the act are of a grade superior to the national schools. The subjects of examination are Latin and Greek, modern languages, Celtic, natural science, mathematics, etc. The system of apportion according to results is no longer in use; instead the amounts awarded are based on average attendance.

Considerable attention is given to technical instruction. In all the convent schools the young girls have regular courses in domestic science, and in several trades are taught. The Department of Agriculture and Technical Instruction has an advisory board of technical instruction. In 1901–2 the course of experimental science had been adopted in 152 schools with 6,412 science pupils. The central institutions belonging to this department are the Royal College of Science, Dublin, and the Metropolitan School of Art. Throughout the provinces the work is being organized by the councils of county boroughs, urban districts, and counties. The annual grant for the technical instruction is $25,895,000. Provisions are made for the

1. Albert Memorial, Belfast.

2. St. Stephen's Green Park, Dublin.

special training of teachers for the different departments of work.

Language and Literature.— The predominant in the Irish literature is the heroic, pathetic, love of nature, romance, virtue, and through all runs the traditional. Although the Ogham, a system of writing, was introduced into Ireland about 13 centuries before Christ, yet the literary productions were transmitted orally. Hyde says, "The love of literature of a traditional type, in song, in poem, in saga, was more nearly universal in Ireland than in any other country of western Europe."

The modern literature of Ireland, or the literature produced by Irish writers of the last centuries, has been included under English literature because the language used is English. See CELTIC LANGUAGES.

Music.— See IRISH MUSIC.

Art and Architecture.— Many of the ancient types of architecture extinct in other lands may still be found in Ireland. Their buildings and home life remained practically undisturbed for centuries; no ancient Roman architecture is found on the island. When Christianity was introduced, the change in form of the Druid temple was for several centuries in accordance with the natural development of the people, except the addition of the small cross, the windows facing the east, and the altar. When the building became too small a new one was erected beside it. Some of the existing ancient specimens are a group of stone buildings on Skellig Michael, a rock rising precipitously out of the sea to the height of 700 feet, and about eight miles due west of the nearest headland in the County Kerry. The approach is by a flight of stone steps. Dry rubble masonry forms the walls, and in this group, as in others, the absence of the arch shows its ancient origin. It is oval outside, bee-hive in form, but rectangular within. The door has a horizontal lintel, above which is a small cross worked into the stone wall. The six cells in the interior, the common room for prayer (choir), the chapel, all show it was occupied by monks. The doors, with inclined jambs and horizontal lintels, antedate the arch. A wider lintel above, or the double lintel, indicates progression in architecture, a method of relieving the pressure of the roofs. The roofs of the ancient buildings were of stone. There are many of these ancient ruins, some in a good state of preservation. Off the coast of Sligo, at Inishmurray, on the Isles of Aran, on islands off the coast of Kerry, and in many places are found buildings of dry rubble masonry. The change shows itself when cement is used and the walls become perpendicular, as at Gallarus, in Kerry, and a further advance is shown in St. Declan's oratory in Ardmore, with square perpendicular towers, or, more properly, supports at the corners. Some of these were erected in the 6th, 7th, and 8th centuries. St. Colum-Cille's monastery at Kells was built about 807 A.D. In the 'Annals of the Four Masters' mention is made of the church St. Kevin founded in about 1108, and which is still in existence, at Glendalough. The Romanesque style makes its appearance in the 11th century; the earliest example is in St. Flannan's, at Killaloe. Brian Boroimhe is said to have built churches at Killaloe, in County Clare. A church built about this time, at Freshford, the ancient Achadh-ur, eight miles northwest of Kilkenny, is still in use. At Clonfert Cathedral, in County Galway, there is a fine example of an Irish Romanesque doorway. This church is said to have been founded by St. Brendan, "the navigator." The interlaced patterns on the piers, the ornamented column, are all most beautiful. "There is not," says Mr. Brash, "a square inch of any portion of this beautiful doorway without the mark of the sculptor's tool, every bit of the work being finished with the greatest accuracy." The Cathedral at Ardmore, County Waterford, shows another advance in its decoration; here may be seen The Judgment of Solomon, Adam and Eve, The Magi bringing their gifts, the stable indicated by a cow, etc. Many of the modern cathedrals are most beautiful.

The "Round Towers" of Ireland have been for years subjects of study and discussion. There exist in Ireland in whole or part about 100 of those towers; 18 are in a perfect condition. Many claim that the Round Towers are of pre-Christian origin, and cite the similar towers, two in Scotland, seven on islands off the coast, one on the Isle of Man, and a few on the Continent, as examples of pagan architecture. Their average size is 100 feet in height, circumference at base, 50 feet, walls at door lintel, 3½ feet. The interior is divided into from four to eight stories. Petrie, who has studied the subject with care, claims that the towers are of Christian origin and were used both as bell towers and as safes or places in which to deposit the Church treasures. The Irish name for the towers, *Cloigtheach*, which means "house of a bell," supports the theory of Petrie and others. Petrie advances other and strong arguments in support of his theory. The 'Annals of the Four Masters' mentions the bells in some of the towers. One of the finest examples of a Romanesque doorway in a Round Tower is at Kildare. Some of the ancient pottery shows skill and artistic merit. In designing and coloring the ornamentation of the old Celtic manuscripts show great artistic power. The initial letters are most beautiful, especially in the 'Book of Kells,' a copy of the four Gospels in Latin, and in 'Annals of the Four Masters.' The symbolism used by other early nations is not found in the works of the ancient Irish. The designs are geometrical patterns, interlaced ribbon work, diagonal and spiral lines, strange animals, peculiar birds, and the key pattern. The ancient metal work shows unique and beautiful designs; the bell shrines, the brooch of Tara, and many pieces of old metal work may be seen in museums. The laces of Ireland, revived the last of the 19th century, show most intricate and charming patterns. Sculpture and oil painting are modern arts in Ireland, and in both many of Irish birth have excelled.

Religion.— The first authentic account of the introduction of Christianity into Ireland was in the 5th century, when Pope Celestine sent Germanus, bishop of Auxerre, and later, in 431, Palladius as bishop. Both Germanus and Palladius found on the island believers in Christianity, but no organized body of Christians. However, the chief work of conversion and organization was accomplished by St. Patrick, who, good authorities state, was sent to Ireland by the same pope. Killpatrick, a town of Scotland, is said to have been Patrick's birthplace, but some authorities claim that he was a native of France. He had been consecrated bishop

before coming to Ireland as a missionary, and he selected Armagh as his see. A large number of converts were made, so many that even before Patrick died he had other bishops and a number of priests to assist him. The Roman Catholic Church in Ireland has four archdioceses and 25 dioceses. The archdioceses are Armagh, Dublin, Cashel, and Tuam. The Roman Catholic clergy and churches are all supported by voluntary contributions. The college at Maynooth, for the education of those studying to become priests, was founded in 1795. There are several other Roman Catholic ecclesiastical seminaries and colleges.

The Reformation never made much progress in Ireland, and though a Protestant Episcopal church was established by law, it was only the church of a small minority. In 1869 it was disestablished. Previous to this time the clergy were supported by a tithe rent-charge, the proceeds of the Church lands, etc., the total annual income of the Church, including the value of houses and lands in occupation, being about $3,068,920. By the above act, taking effect from 1 Jan. 1871, the position of the Church and clergy was entirely changed, though those holding benefices at the time of its passing have not suffered loss. The property and tithes formerly belonging to the Church are now vested in commissioners, who pay to all deprived of income by the act, so long as they continue to discharge the duties of their offices, such an annual sum of money as they would otherwise have received, deduction being made of curates' salaries, and other outgoings to which the parties would have been liable, and regard being paid to the prospective increase of incomes by the falling in or cessation of such charges; or instead of an annual sum, an equivalent single payment has been paid to such as have commuted their claims in that manner. The Irish Church accordingly is no longer a state Church, and none of its bishops have now a seat in Parliament. It is still a vigorous and flourishing institution, however, and possesses funds amounting to over $40,640,000. Of this, upward of $20,000,000 have been voluntarily contributed by friends of the Church since it was disestablished. While disestablishing the Irish Church, the act at the same time declared the cessation of the Maynooth grant and the *Regium Donum.* The affairs of the Irish Church are now managed by the diocesan synods and by the general synod in conjunction with the representative body. The supreme legislative powers reside in the general synod, which meets in Dublin, and is composed of the archbishops of Armagh and Dublin and the 11 bishops, and of lay and clerical representatives from the different dioceses; the lay representatives being more than twice as numerous as the clerical. The representative body incorporated in 1870 consists of the archbishops and bishops *ex officio,* 39 lay and clerical elected members (three for each diocese), and 13 co-opted members elected by the other two classes conjointly. This body is empowered by its charter to hold Church property, subject to the regulations of the general synod. The Church uses the Book of Common Prayer, as revised in accordance with statutes passed by the general synod, and furnished with a preface containing an exposition of its formularies in the sense in which they are understood by the Church.

The Presbyterian Church of Ireland is chiefly confined to the province of Ulster, where it may be said, more especially in the counties of Down and Antrim, to be the leading religious denomination. Its ministers are supported by voluntary contributions, seat-rents, and church funds. They were formerly aided by an annual grant from government, called the *Regium Donum,* the amount of which, paid in 1869, was $202,735. This annual grant, however, was abolished, as already mentioned, by the Irish Church Act of 1869, and was commuted to a single sum of $3,506,860 paid to the Church. According to the census of 1901 there were in Ireland 3,310,028 Roman Catholics, 579,385 Protestant Episcopalians, 443,494 Presbyterians, 61,255 Methodists, and 56,703 members of other persuasions, besides 3,769 Jews.

History.—The beginning of the history of Ireland is, like that of all European nations, enveloped in fable. Among the ancients it was known at least as early as the time of Aristotle, who calls it *Ierne.* In Diodorus Siculus it is called *Iris;* in Strabo, *Ierne;* in Pomponius Mela, *Iverna;* in Pliny, *Hybernia.* Plutarch calls the island *Ogygian,* meaning very ancient, and says: "They drew their history from remote antiquity, so that of other nations is new compared with them." Yet the information to be found about Ireland in the works of the ancient geographers and historians is altogether very scanty. The bardic historians of the country speak of Greek and Phœnician colonies, and lists of kings, for which there is no authentic, but some probable, foundation. The vernacular language of the Irish proves that they are a part of the great Celtic race which was once spread all over Western Europe. The first probable records of the Irish people show that for the times they were advanced in civilization. The ancient bards were called *Fileas* or *Feardanos,* which means philosophers. Cæsar mentions in his 'Gallic Wars' their advancement. Pliny, Cæsar, and other authors say that the Druids who inhabited Ireland were learned; they knew philosophy and the sciences. In the Irish chronicles we find that in the reign of Eochy the First, more than a thousand years before the birth of Christ, "society was classified into seven grades, each marked by the number of colors in its dress, and that in this classification men of learning, that is, eminent scholars, were by law ranked next to royalty." Another proof of the existence of an ancient civilization, marvelous for its time, was the institution of Feis Tara or the Triennial Parliament of Tara. The monarch, Ollav Feola, who reigned as Ard-Ri, or monarch, of Erinn, about 1,000 years before Christ, established this parliament. The subordinate royal princes or chieftains, constituted one branch; the Ollavs or law-givers, and bards, judges, scholars, and historians, another branch; and the third consisted of the military commanders. Under the Ard-Ri, or monarch, were the kings of the provinces, and under each king were the clans who were governed locally by a chief, each clan selecting its own. Wars were frequent, as fighting and bloodshed were common pastimes throughout the then known world. The battle was the final court of appeal, and in most instances the first court of trial. A cause of dissension in Ireland, as in Great Britain and other countries, was the antagonism

1. Blarney Castle.

2. Innisfallen, Lake Killarney.

existing among people of different races. The Milesians, the Tuatha de Danaans, and the Firbolgs (q.v.) were distinct races centuries after the Milesians landed in Ireland. The differences among themselves seem not to have seriously affected their union when attacked by a common foe; as at the birth of Christ, when Rome was mistress of nearly all of Europe, she had never gained possession of Ireland. The introduction of Christianity into Ireland was not attended with bloodshed as in many other countries; indeed, afterward the nation seems to have enjoyed a season of repose from strife, although southern Europe was being overrun with the Germanic hordes. This repose favored the growth and expansion of Christianity and the progress of learning. The schools and monasteries founded by Saint Patrick and his bishops in the 5th century became the centres from which went forth many scholars; and even as early as the 6th century, Ireland became the seat of western learning; and its monasteries were the schools from whence missionaries who disseminated the Christian faith throughout continental Europe proceeded. In the 8th and 9th centuries the scholars of Ireland were among the most distinguished at the courts of the kings, especially at that of Charlemagne, but when the Northmen commenced their descents some of the schools were destroyed and the monks dispersed. The ravages of the Danes at this period had results different from the attacks of the Romans. The continued attacks for nearly two centuries fostered internal dissensions, when in the beginning of the 11th century Brian Boroimhe (Brian of the Tribute) united the greater part of the island under his sceptre, restored public tranquillity, and subdued the northern invaders. After a contest of about 20 years he conquered Malachy, the brave warrior who "wore the collar of gold" won from the Danish invader, and became Ard-Ri of all Erinn. After the death of Brian, the island became a place of dissension; frequent wars rendered them weak against a foreign foe. This condition was largely the result of the divisions, made by Brian, of the island among his three sons. At this time Henry II. of England, professing love for Ireland and a great desire to restore peace, sought to gain possession of the island. This was the beginning of the Anglo-Norman invasion of Ireland. Henry II. claimed to have received from Pope Adrian IV. a bull authorizing him to take possession of Ireland. (The authenticity of this bull is very doubtful.) After some delays occasioned by internal troubles in England, Henry attempted to gain possession of Ireland. For many years after, the history of Ireland was a record of persecution, confiscation of lands, and attempts to wrest from the people inalienable and hereditary rights. So great was the resistance that in the 14th century, at the time of Richard II., the authority of England extended practically over only a small portion of country on the eastern coast, called "The Pale" (q.v.). This was governed by various nobles subject to a viceroy. The subjection was, however, sometimes little more than nominal. The nobles quarreled among themselves, and were very often at open feud. The beginning of the reign of Edward III. (1327) was marked in Ireland by the outbreak of civil strife in every part of the English "Pale," advantage of which was taken by the Irish for a general rising, which threatened the safety of the English colonists, and which the government found itself unable to subdue, until it yielded to the demands of the barons in Ireland, by granting them complete civil and military jurisdiction in their own districts. During the wars with France some Irish troops served in the English armies, and the common sympathies induced by that circumstance seemed likely to promote a better state of feeling between the two races, when the breach was made wider than ever by the celebrated statute of Kilkenny (1367), framed under the viceroyalty of Lionel, duke of Clarence, son of Edward III., forbidding, under severe penalties, intermarriages between English and Irish, the assumption of Irish names by persons of English blood, the use of the Irish language, the native (Brehon) law, etc. In consequence of this the disturbances between the Irish and English inhabitants of Ireland increased so greatly that the English viceroy found it necessary to protect The Pale by payments of money to the Irish chiefs, and this state of matters continued during the reigns of Richard II., Henry IV., and Henry V., until, in that of Henry VI., when Richard, duke of York, was appointed governor of the island, who succeeded by his politic measures in restoring peace. In the reign of Henry VII. (1495) was passed Poyning's Act (so called from Sir Edward Poyning, lord-deputy of Ireland), which provided that all former laws passed in England should be in force in Ireland, and that no Irish Parliament should be held without previously stating the reasons on account of which it was to be summoned, and the laws which it was intended to enact. The power of the English government in Ireland was thus strengthened, but nothing was done to improve the condition of the Irish, whom the oppressive severity of the English yoke embittered without subduing. At the beginning of the 16th century the greater part of the island still remained unconquered by the English. The Irish still lived according to their old constitution under their own chiefs. In 1541 Henry VIII. received from the Irish Parliament the title of King of Ireland; but he did nothing to extend the English sway, or to improve the social circumstances of the people. The Reformation which took place in England during this reign took but a slight hold upon Ireland even in the English districts; but the monasteries were suppressed, and the tribute to the Papal see abolished. Elizabeth's reign was marked by a series of risings, which finally terminated in a general war against England, usually called the Rebellion. Hugh O'Neil, who had been raised by the queen to the dignity of Earl of Tyrone, was the leader in this war, which, though successfully begun, ended with the complete defeat of the insurgents, and the reduction of the whole island by the English (1603). More than 600,000 acres of land were taken from the Irish chiefs, and for the most part distributed among English colonists. The reign of James (1603–25) was somewhat favorable to Ireland; the arbitrary power of some of the chieftains was restrained, and the administration of justice improved, etc.; but the means which he took to effect some of these improvements were tyrannical. He demanded from every Irish chief the document upon which he rested his claim to his property, and if it were

not to be found, or contained even any formal error, his lands were forfeited to the crown. Of 800,000 acres of land which in this way came into the hands of the king in the north of the island, a large share was entirely withdrawn from the Irish, and divided among Scotch or English settlers. In addition to this, the Catholics, on account of the oath of supremacy by which all public officers were required to acknowledge the king as head of the church, remained excluded from all official appointments. The Roman Catholic hierarchy established in the 5th century was still in existence. Various circumstances, led, in 1641, to an attempt to shake off the English yoke. Dr. Lingard says of this insurrection that it has been usual, for writers to paint the atrocities of the natives, and to omit those of their opponents, but that revolting barbarities are still recorded of both, and that if among the one there were monsters who thirsted for blood, there were among the other those who had long been accustomed to deem the life of a mere Irishman beneath their notice. After the death of Charles I., Cromwell was appointed (15 Aug. 1649) lieutenant of Ireland. With great cruelty, he reduced the whole country within nine months. All the possessions of the Catholics were confiscated, about 20,000 Irish were sold as slaves in America, and 40,000 entered into foreign service, to escape the severity of the conqueror. (See Drogheda.) Charles II. restored a portion of the lands, but fully two-thirds remained in possession of the English or of Irish who had become Protestants. Under James II. some changes were made; under his viceroy, Earl of Tyrconnell, Catholics were given a fair representation in Parliament. In the English Revolution of 1688, the Catholics of Ireland sided with James, and the Protestants with William III. For a time the army favoring James were fairly successful; but the landing of William in Ireland changed matters. The battle, 1 July 1690, at Boyne, won by William, proved a turning point, as it encouraged the English and in a great measure discouraged the Irish. Sarsfield's gallant defense of Limerick, the last place in Ireland that held out for James, saved that city from capture by William's troops; but on 3 Oct. 1690, the city capitulated, a treaty being concluded with Gen. Ginkell on behalf of the English, according to which the Irish were to be allowed the free exercise of their religion, as had been granted by Charles II. More than 12,000 Irish that had fought on the side of James went into voluntary exile. The Treaty of Limerick was not kept by the English, a fact which is commemorated by the name which the Irish still give to the place at which it was concluded, "The City of the Violated Treaty." By a decree of the English Parliament upward of 1,000,000 acres of land were now confiscated and divided among Protestants. In order to keep down every movement of the Catholic population, cruel penal laws were passed against those who adhered to that form of religion. By these laws the higher Roman Catholic ecclesiastical dignitaries were banished from the island; the priests were not allowed to leave their counties; no Roman Catholic could hold a public office, acquire landed property, enter into a marriage with a Protestant, etc. Such suppression and persecution naturally led to the formation of secret organizations whose object would be an overthrow of those in power, in order to secure freedom and justice. "Whiteboys," "Levellers," and a number of kindred organizations were formed, whose methods were not always fair; but who were brought into existence by force of circumstances. All this, however, did not ameliorate the general condition of the country, and it was not till the American War of Independence taught the English government the folly of attempting to govern a people by coercion, that the severity of the laws relating to Ireland was mitigated. In 1778 the penal laws against the Catholics, although not repealed, were made much more lenient. Catholics were henceforth permitted to acquire landed property, to erect schools, and to observe their own religion under fewer restrictions. In 1783, Poyning's Act was repealed.

The outbreak of the French Revolution had naturally a great effect on the minds of the Irish people. Out of a corps of volunteers which had been formed in 1779, but which had been dissolved a few years later, a society was formed calling itself the Society of United Irishmen, which included in it many Protestants, and which sought to make Ireland an independent nation. The Catholics at the same time took advantage of the embarrassment of the British government to demand equal rights with the Protestants, and the government gave in to this demand so far as to remove the hindrances which had been placed by the law in the way of Irish trade and industry, and to repeal nearly all that remained of the penal laws against the Catholics, who now received the right of acting as counsel before the court, and of entering into marriages with Protestants. When further demands were refused, the Society of United Irishmen allowed its revolutionary aims to become more apparent, and the government then determined to quell the movement by force. The Habeas Corpus Act, which had been introduced into the country in 1782, was repealed; the towns were strongly garrisoned, and the society dissolved and disarmed. But the conspirators, trusting to expected aid from France, were not discouraged. At the close of 1796 a considerable French fleet did actually appear off the Irish coast bearing 25,000 land troops, under the command of Gen. Hoche; but owing to adverse winds, and the incompetence of the commanders, it was obliged to return without having accomplished anything. The only effect of this expedition was to induce the government to take still stronger measures in Ireland, the whole of which was placed under military law. The United Irishmen were thus prevented from taking any open steps for renewing the society, but they continued to pursue their ends in secret, and devised for themselves a very skilful military organization. At its head was a directory of five men, whose names were known only to those at the head of the provincial committees. In January 1798 the society already numbered more than 500,000 members, when a treacherous member gave information regarding the society to the government, and several of the leaders were seized. In consequence of this the conspirators, not knowing the extent of the revelations that had been made, resolved to anticipate any further preventive measures on the part of the government, and rushed into premature action. In May 1798, simultaneous

risings took place at different parts of the island; but the government was fully prepared, and the main body of the insurgents, who made a brave fight, suffered a decisive defeat at Vinegar Hill on 21 June. Flying columns traversed the island, and checked by the most violent measures any further outbreaks. In August a French squadron appeared in Killala Bay with 1,500 men on board, under Gen. Humbert; but the British troops prevented a junction with the insurgents, so that they were soon compelled to surrender. Another French expedition which approached the Irish coast in September was overtaken and attacked by Admiral Warren, and nearly all the ships composing it were captured. Several subsequent attempts of the French were similarly frustrated.

The events of this insurrection brought the British government to form the resolution of uniting the Irish and English Parliaments, since in the state of feeling which that movement too plainly manifested as prevailing among the people, it was seen that the independence of legislation enjoyed by the country fostered the desire of political independence, and it was feared that new revolutionary efforts might thence derive a legal sanction. The first proposal to this effect which was made in the Irish Parliament was rejected with indignation. The government then resorted to bribery to secure its purpose, and $8,000,000 was spent in buying up the rotten boroughs which had the majority of seats in the Irish House of Commons. The Irish landlords were from the first favorable to the project. By these means an act providing for the legislative union of the two countries passed the Irish Parliament on 26 May 1800, and the British Parliament on 2 July in the same year, in virtue of which the union was effected on 1 Jan. 1801. But although this measure bound the destinies of Ireland still more closely to those of England, yet it was far from putting an end to the religious and political troubles which had so long divided the two countries. In order to gain the masses the enlightened Pitt had promised a complete political emancipation of the Catholics; but the bigoted George III. could not be induced to make this concession. Enraged at this great breach of faith the Catholics in 1802 formed a Catholic Association, having for its object the accomplishment of this end; but it was not till the period of O'Connell's agitation, favored by a change of public opinion in England, that the government was induced to bring in an Emancipation Bill, which after passing both houses of Parliament, received the assent of George IV. on 13 April 1829. A new oath, which could be taken by Catholics as well as Protestants, was substituted for the one previously required from members of Parliament, and the Catholics were thus enabled to take a seat in the house. They were also allowed to fill all public offices except that of lord-chancellor.

This victory was greeted by the Irish Catholics with great joy; but they wanted more than emancipation which meant permission to hold certain offices, they wanted independence. The efforts of the national party were now directed to the repeal of the Union, for which purpose O'Connell founded the Repeal Association, which caused the Grey ministry in 1833 to bring before Parliament the Irish Coercion Bill (q.v.). When this bill became law the Lord-Lieutenant of Ireland was empowered to forbid all assemblies of the people, and to proclaim military law throughout the island; and in order to give force to the act an army of 36,000 men, besides 6,000 armed police, was sent over. The Coercion Act was indeed soon repealed, and from 1835, under the viceroyalty of Lord Mulgrave, a better feeling seemed to be growing up between the people and the government. But when the Tories came again into power in August 1841, O'Connell began anew the repeal agitation, and with such boldness that in 1843 the authorities caused him to be apprehended on a charge of conspiracy and sedition, on which he was convicted and condemned to pay a fine and suffer imprisonment for a year. These proceedings were, however, declared illegal by the House of Lords, and O'Connell was released. Soon after the terrible famine which visited Ireland in the autumn of 1845, and still more severely in the summer of 1846, cast all other interests into the background. The spirit of the people seemed broken, and many of them sadly left their native land and by hundreds of thousands emigrated to America. In the midst of this crisis O'Connell died, and the place of the party which he led was taken by one still more advanced, which received the name of Young Ireland. In these circumstances of political excitement the French revolution, which took place in February 1848, had a great effect upon Ireland. The leaders of the Young Ireland party, Smith O'Brien, Mitchel, Duffy, Meagher, and others, entered into relations with the provisional government at Paris, and the people generally began openly to provide themselves with arms, and to exercise themselves in the use of them. But the measures of the government fustrated the designs of the conspirators. The Habeas Corpus Act was suspended, the insurrectionary newspapers suppressed, and Smith O'Brien, who had been hailed by the people as King of Munster, and a number of his associates were arrested and condemned to death. This punishment was afterward commuted to transportation. In a short time peace was restored; but the material distress remained undiminished. Famine and disease decimated the population. The agricultural holdings were deserted, whole districts remained uncultivated, and a constant and overflowing stream of emigration directed itself toward the United States.

After a time agriculture revived, and the manufacturing industries of the island began to compete with those of England. In 1849 were chartered the Queen's Colleges, offering the same advantages to Catholics as to Protestants; but these institutions have been taken comparatively little advantage of by the former. The history of those institutions made the Catholics fear they were meant as a menace to their faith. In 1852 telegraphic communication was opened with Great Britain. In 1853 an industrial exhibition was held at Dublin, resembling that held two years before in London; another exhibition was held in 1865. The latter year witnessed the discovery of a new conspiracy designed to effect a separation between England and Ireland. This had its origin in America at the time of the Civil War in the United States, when the numerous Irish in that country saw an opportunity in England's attitude toward the seceding States. This conspiracy, originating among the

members of a secret society calling themselves Fenians (see FENIANS), soon spread to Ireland; but before the Fenians could take any overt action in that island their design was stifled by the proceedings of the British government (1865–6). The attention of English statesmen was now strongly drawn to the necessity of doing all that could be done to render the Irish people loyal and contented; and with this view an act to disestablish the Irish Protestant Episcopal Church was passed in 1869, and another to improve the tenure of land, in 1870. Since 1871 an agitation for what is called Home Rule has made itself prominent. In 1880 Ireland became the scene of an agitation carried on mainly by a body calling themselves the Land League. Various severe laws were passed to "coerce," but further concessions were made, and to redress Irish grievances a land act was also passed in August 1881. Under this act substantial reductions on rents were made. The Land League was suppressed, but a new body called the National League was soon organized in its place. Another act for the relief of tenants in arrear with their rents was passed, 1885. In 1885, 86 Nationalist members, headed by C. S. Parnell, were returned to Parliament, and their pressure on the government led to the production of a scheme by Mr. Gladstone, in 1886, by which Ireland was to receive a parliament of her own and the Irish members to be withdrawn from the Imperial Parliament. This scheme and the accompanying land purchase scheme were rejected by Parliament and the constituencies; and a fresh act against crime in Ireland was passed in 1887, although statistics showed the island was in a most peaceable condition, and no remarkable acts of lawlessness were being committed. In 1898 a very important Local Government (Ireland) Act was passed. It established county councils, urban district councils, rural district councils, and boards of guardians in Ireland, and transferred to them the administrative functions formerly discharged by the grand juries and presentment sessions. The first elections under the act took place early in 1899. The results showed that the voters of Ireland realized they were gaining ground. They never lost an opportunity to proclaim their discontent with the existing land laws, and their desire for "Home Rule." The Irish members of the British Parliament kept the cause of Ireland before the people; and in 1903 a further concession was gained. On 1 Nov. 1903 a new "Land Act" went into effect whereby the tenants, sub-tenants, or the people, may purchase the land and hold it as their own. Arrangements were made to assist the tenant in making the purchase.

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B. E. BURKE,
Editorial Staff 'Encyclopedia Americana.'

Ireland, Church of. See IRELAND.

Ireland, Language of. See CELTIC LANGUAGE.

Irenæus, ī-rē-nē'ŭs, **Saint,** one of the Greek Church Fathers: b. Asia Minor: d. Lyons, France, about 202. He was a learned and zealous man, a pupil of Polycarp and Papias. He actively opposed the Gnostics, and especially the Valentinians. His works are lost, except his 'Libri V. adversus Hæreses,' of which there are fragments in the original Greek, and a Latin version, made, it is supposed, toward the end of the 4th century. He suffered martyrdom at Lyons, of which he was bishop, in the persecution under Septimius Severus.

Irene, ī-rē'nē, empress of Constantinople: b. Athens about 752 A.D.; d. Lesbos 15 Aug. 803. In 769 she married Leo IV., after whose death, caused, as is generally believed, by poison administered by her, she raised herself (780) and her son Constantine VI., then but nine years old, to the imperial throne. When Constantine came of age he refused to permit her to participate in the government, and seven years later was arrested at the order of his mother, blinded and at last murdered. Irene was the first woman who reigned over the Eastern Empire. Her triumphal entrance into Constantinople, her liberality, the freedom bestowed on all prisoners, and other artifices employed by her, were not sufficient to secure her from the consequences of her criminal accession. She had ordered many nobles into banishment, when Nicephorus, her treasurer, who had secretly been made emperor, exiled her in 802 to the Isle of Lesbos. Her zeal for image-worship has caused her to be regarded as a saint by the Greek Church.

Ireton, īr'tŏn, **Henry,** English general and statesman: b. Attenton, Nottinghamshire, 1611; d. Limerick, Ireland, 26 Nov. 1651. He was graduated at Trinity College, Oxford, and brought up to the law: but when the civil contests commenced joined the parliamentary arm-

and by the interest of Cromwell, whose daughter Bridget he married in 1646, became commissary-general. At the battle of Naseby he commanded the left wing, which was defeated by the furious onset of Prince Rupert, and was himself wounded and made prisoner. He soon recovered his liberty, and took a prominent part in all the transactions which threw the Parliament into the power of the army. He had also a principal hand in framing the ordinance for the king's trial, and was one of the judges. Ireton accompanied Cromwell to Ireland in 1649, and was left by him in that island as lord-deputy. He reduced the natives to obedience with great vigor, but not without cruelty. He was buried in Westminster Abbey, and after the Restoration his body was taken up, suspended from the gallows with that of Cromwell, and buried in the same pit.

Irid'ium, a metallic element resembling platinum in its general properties, and occurring in nature in the metallic form, alloyed, usually, with platinum and osmium. The commercial supply comes chiefly from the Ural district, from Brazil, and from Borneo. Small amounts have also been obtained from California. The existence of iridium was first recognized, in 1802, by Tennant, who observed that an insoluble residue remained behind after dissolving platinum ore in aqua regia. In 1804 he showed that this residue contains two new metals, to which he gave the respective names "iridium" and "osmium." The separation of iridium from the other metals of the platinum group is a matter of some difficulty; and for details of the processes employed the more extended treatises on metallurgy and the chemistry of the metals must be consulted. Iridium is frequently obtained in the form of a spongy gray mass, or a gray powder; but by heating either of these to whiteness, and subjecting them to compression, the metal may be brought into the form of a compact, lustrous mass resembling steel. In this form it is harder than iron, and somewhat malleable when hot, though brittle when cold. At ordinary temperatures it has a specific gravity of about 22.4, being, with the exception of osmium, the heaviest substance known. Its specific heat is about 0.0323 at ordinary temperatures, and its coefficient of linear expansion (Fahrenheit) is about 0.0000039. Its melting point is very high, the estimates given by various authorities ranging from 3,600° F. to 4,500° F. Compact iridium, after being strongly heated, is insoluble in all acids, and is not affected by air or moisture. The metal has the symbol Ir, and an atomic weight of 193 if O = 16, or 191.5 if H = 1. It forms numerous salts, but these are of no practical importance. The name "iridium" (from Greek, "rainbow,") refers to the varied colors exhibited by the salts of this element, as they pass from one state of oxidation to another. Metallic iridium, either alone or alloyed with other metals of the platinum group, is used in the arts to a limited extent, where a hard, noncorrosible metal is needed. In particular, it is used for the tips of gold and stylographic pens, for the construction of standards of length, and for standard electrical resistance coils.

Iridosmine, ĭr-ĭ-dŏs'mĭn, or **Osmiridium,** a natural alloy of iridium and osmium in varying proportions, is a hard slightly malleable mineral, crystallizing in hexagonal prisms. It occurs as irregularly flattened grains, and contains some platinum, rhodium and other metals of the platinum group. It is found associated with platinum in the Ural Mountains, in South America, and elsewhere. It is also found in the black sands on the ocean beaches of northern California, and a small amount is recovered yearly by placer miners in the Sierra Nevada. Iridosmine is used to a small extent for pointing gold pens.

Iriga, ē-rē'gä, Philippines, pueblo of the province of Ambos Camarines (Sur), Luzón, on the Buhi River, 23 miles southeast of Nueva Cáceres. It is on the main road, is a military and telegraph station, and one of the most important towns in the province. Pop. 17,100.

Iris, ī'rĭs, in Greek mythology, daughter of Thaumas and Electra, sister of the Harpies, the fleet golden-winged messenger and servant of the Olympian gods, especially of Zeus and Hera. Iris was originally the personification of the rainbow, though she does not appear in the Homeric poems as the goddess of the rainbow. She is sometimes represented as a beautiful virgin with wings and a variegated dress, with a rainbow above her, or a cloud on her head exhibiting all the colors of the rainbow.

Iris Family, a natural order of monocotyledonous herbs, mostly perennials with tubers, corms or rhizomes, and usually with an acrid flavor. About 800 species belonging to more than 50 genera have been described from temperate and tropical climates, mostly from South Africa and tropical America. They are characterized by two rows of leaves, the outer of which fit over and protect the inner (equitant); regular or irregular perfect flowers which are frequently handsome; perianth six parted, the other floral organs in threes; and many-seeded, three-celled fruits (capsules). Some species have been used as food in countries where they are native; others furnish rootstocks which are used for making perfumes, especially orris; some few have been employed to a limited extent in medicine; but the species most widely popular are cultivated for ornamental purposes. Of these last the most important genera are *Iris* (fleurs-de-lis), *Gladiolus, Freesia, Crocus, Tigridia, Tritonia, Sisyrinchium, Ixia* and *Belemcando,* elsewhere described.

The plants of the genus *Iris* constitute one of the chief ornaments of the northern regions of the globe, and usually grow in wet places, bearing flowers of various colors, but the prevailing tint is blue. The common wild iris or flag (*I. pseudacorus*), common in Europe and also found in the eastern United States, has yellow flowers of large size and long sword-like leaves. The gladdon or stinking iris (*I. fœtidissima*) is a British species, with bluish flowers. Among favorite garden species are the English iris (*I. xiphioides*), the Persian iris (*I. persica*), the common iris (*I. germanica*), the snake's-head iris (*I. tuberosa*), and the Chalcedonian iris (*I. susiana*). Orris root consists of the rootstocks of the white-flowered *I. florentina* and some other species. Among other species found in the United States are the larger blue flag (*I. versi-color*), common from the Atlantic coast to the Mississippi, the slender blue flag (*I. virginica*), and several dwarf species.

Irish Academy, Royal, a literary and archæological association founded in Dublin, Ire-

land, in 1786. Its object is to promote the study of literature, antiquities, and science. The library founded and owned by the association contains a large number of Irish manuscripts and documents of public interest. It has a fine collection of antiquities which have been loaned to the National Museum, Dublin. The association is governed by a council consisting of 21 members. This council meets regularly several times a year. The work is divided among the members, who are subdivided into committees. The committees are three in number; committee of literature, committee of science, committee of antiquities. Students making historical research in Ireland have found this association of great assistance.

Irish Catholic Benevolent Union, a fraternal organization founded in the United States in 1869. It has 149 subordinate societies and 14,000 members. The benefits disbursed since organization have amounted to over $2,500,000, and during the year 1902 amounted to $45,371. The membership in the union is confined to persons of Irish extraction who are communicants in the Roman Catholic Church.

Irish Deer, or Elk. See ELK.

Irish Language, Society for the Preservation of, an organization established in 1873, in Boston, Mass. The object is to foster the study of the Gaelic language so that it may again be one of the spoken languages of the Irish people. At first the society was called the Philo-Celtic Society. The headquarters are now in Dublin, where the organization was established in 1877. It has a number of branches in different parts of the United States.

Irish Land Laws. Under the Brehon laws, when the people of Ireland were divided into tribes, the land was usually the property of one of the four or five tribes which were the strongest in Erin. A large portion was given to the king or chief of the tribe, then divided among the clans that made up the tribe. Here again a large portion was given to the chief of the clan and then divided among the septs. The chief of the septs received the largest portion of the amount set apart for the sept. The free tribesmen, after the chief, received the greater part of the sept lands.

Some of the tribesmen, the Ceil, owned cattle, some, the Daer and Saer, were loaned cattle by the chief. The Fuidhir were the tenants who performed the manual labor.

When a chief died, the tribesmen distributed his land among his descendants, and when a tribesman died, the chief distributed his property. After England took possession of Ireland, the land tenure in a large part of the island continued to be administered under the Brehon laws; but within "The Pale" the English feudal system prevailed; there the king alone owned the land and the tenants derived ownership from him. Gradually England forced her land laws upon Ireland. This was done by driving the "rebellious Irish" out of certain counties. Kings and Queens, then all Ulster, when the Ulster plantation was established, in 1607. Other confiscations and dispossessions took place until all Ireland came under the English law. Cromwell took forcibly the best lands of Munster and Leinster and a large part of Ulster, and divided the whole among his soldiers. Although some of the lands were restored later, it was retaken, by act of Parliamen, under William III. Naturally the chiefs and leaders among the people of Ireland were deprived of their lands and the friends of the king of England or the English government, were given Irish possessions as a reward. The penal laws later made it a crime for a Catholic to acquire or hold land. Thus the Irish land question virtually began with the entrance of Henry II. into Ireland. With the Irish owners deprived of their lands there was instituted the system of "landlordism" which has been a hindrance to Ireland's progress. The majority of those who owned the land did not live upon it, and usually the money received for rent was spent in a foreign country. The landlord owned only the land, the houses had to be built and all improvements had to be made by the tenant and at his own expense. The more a holding was improved, the more rent was demanded. The "middle men" who held lands under the owner, and sublet to tenants were the means of increasing the burdens of the peasantry. The commission under Lord Devon, in 1843, to investigate conditions in Ireland, revealed an alarming state of affairs and the famine of 1846–8 brought the Irish Land question to the notice of the whole civilized world, even many of the English statesmen who had censured Irish shiftlessness were astonished when they learned the nature of the land laws which gave power of eviction without any remuneration for improvements; and the wonder was that so much thrift and industry existed. In 1847 Lord Russel endeavored to have Parliament pass an act to protect the tenant against loss by eviction. This measure failed, and others accepted by Parliament later proved ineffectual. Two years after the terrible devastation by famine, the Tenant Right League was organized in Dublin, and its members began a systematic campaign to elect to Parliament members pledged to support measures for the relief of the tenants. The Land Acts of 1860, under the Palmerston ministry, may be said to have resulted from the agitation kept up by the Tenant Right League. Various other organizations for the betterment of the people of Ireland were established, and among them were "physical force" societies. In 1870, under the Gladstone ministry, three new laws were enacted; that a tenant could not be evicted if his rent were paid; that this non-payment must be for at least three years; and that if the tenant choose, he might sell his improvements. This purchase of improvement clause was a great advance in favor of tenants' rights. The Land League in various parts of the world, especially the United States, continued the agitation and brought the question of the wrongs of the Irish tenants before the whole world. The Ashbourne Act of 1885 provided for the purchase of the lands by the tenants and nearly $25,000,000 was set aside for that purpose. Later a like amount was added. In 1891 the Balfour Law Purchase bill was passed and nearly $150,000,000 was provided for its enactment. In 1896 this law was improved; but for various reasons all the laws enacted by Parliament proved ineffective only in so far as the bringing of the matter to the notice of fair-minded statesmen. (See LAND LEAGUE.) The most radical and satisfactory "Land Purchase Bill" was enacted 14 Aug. 1903, whereby the tenant

may purchase and own land and the government will, under certain and fair conditions, be responsible for the payment. To George Wyndham, who as chief secretary for Ireland, prepared the bill, the credit is largely due for the passage of the act. (See WYNDHAM, GEORGE.) Consult: Reports on the "Land Purchase" acts for relief of Ireland; Hansard's 'Parliamentary Debates'; Guinell, 'The Brehon Laws'; Maine, 'Lectures on the Early History of Institutions'; Fisher, 'History of Landholding in Ireland'; Richey, 'The Irish Land Law'; Godkin, 'The Land War in Ireland'; Richey, 'The Irish Landlord.'

Irish Literary Society, an organization established in 1892, in London. Its object is to promote the study of Irish literature, music, art, and history. Some of the leading Irish literary men and women of England and Ireland are active or honorary members, and strive in many ways to promote the work of the society. The society provides lecture courses on topics pertaining to literary Ireland, and it has a large library which may be used by any of its members. Some of the members are Justin McCarthy, W. B. Yeats, Rev. Stopford Brooke, Barry O'Brien, and several of the well known writers among the Irish women. There were (in 1903) about 625 members.

Irish (Gaelic) Literature. See CELTIC LITERATURE.

Irish Moss, an edible dulse or seaweed. See CARRAGEEN.

Irish Music has been celebrated from almost prehistoric times, Irish teachers of the art as early as the 7th century holding high rank as specialists in the faculties of continental and English colleges. While the bagpipe was the popular instrument of the common people, the harp was in great favor among the noble and educated classes, and their professional harpists were noted for their skill. The Irish scale originally consisting of five notes, gradually developed with the addition of a sixth and a seventh, until the Irish harp had a finely graduated scale of tones and semitones either in the key of C or G, extending through a compass of four octaves. A harp in the museum of Trinity College, Dublin, said to be that of Brian Boru, has 30 strings, and the Dallway harp, made in 1621, has 52 strings. The national temperament was so musically imbued that there were special songs and airs for different crafts and for almost every conceivable occasion. War marches were played by the pipers at the head of the clansmen marching to battle; spinning, weaving, smithy, plowing, boating, and sporting songs were in daily use, and there were even milking songs, slow and plaintive airs which had the effect of soothing the cows and induced them to submit gently to the milking operation. In Irish literature, native music is frequently classed under three different styles, known as mirth, sorrow, and sleep music, comprising (1) lively, spirited pieces, as jigs, reels, hornpipes and other dance music; (2) solemn and slow pieces, as laments or dirges, commonly called *caiones* or *keens*, and sung on the occasion of a death; (3) plaintive and soothing airs, such as nurse tunes, cradle songs, lullabies, etc. In the numerous collections of these airs, about 2,000 different melodies are preserved, some of the most popular being 'Savourneen Dheelish,' 'Eileen Aroon' (popularly known by the Scotch appropriation 'Robin Adair'), 'The Coolin,' 'Garryowen,' 'Langolee,' 'Molly Asthore' and 'Patrick's Day.' With the universal spread of music after the 17th century, Irish music as a national feature became merged in the general history of the art. Turlogh Carolan, Carroll O'Daly, Reilly and the Conallons were among the chief of Ireland's ancient harpists and musicians. In modern times Ireland's musical productivity is represented by Michael William Balfe, William Vincent Wallace, Sir Charles Villiers Stanford, and others. Consult: Graves and Stanford, 'Songs of Old Ireland and Irish Songs and Ballads' (1882–92); id., 'Songs of Erin'; Graves and Wood, 'Irish Folk Song'; Graves, 'Songs of Irish Wit and Humor'; and collections of Bunting, Joyce, Moore and Petrie.

Irish Presbyterian Church, formerly called the Synod of Ulster. Its members are mostly descended from the Scotch Presbyterians, who migrated to Ireland by invitation of James I., between 1609 and 1612, to colonize Ulster.

Irish Sea, the body of water between England and Ireland. It is connected with the Atlantic Ocean on the north by the North Channel, and on the south by Saint George's Channel. The north shore of Wales and the southwest shore of Scotland are washed by this sea. It is almost circular in form, about 140 miles north and south, and the same east and west. The largest arms of the sea are on the west shore. The Morecambe Bay on the coast of England, and several large fiords. Dublin and Dundalk bays are the most important on the west coast. The only large islands are the Isle of Man in the north, about midway between England and Ireland, and Anglesey off the northwest coast and a part of Wales.

Irish Terrier, a rough-coated, strongly built terrier, resembling the Welsh and Scotch terriers. See DOG.

Irish Texts Society, an organization established in London. Its object is to promote the study of Irish literature,—that is, of literature in the Irish text. They foster societies and issue publications to aid the work. In 1900 they published their third volume, which contained the poems of Egan O'Rahilly. In 1901 their annual volume contained Keating's 'History of Ireland,' edited by David Comyn. The volume of 1903 contains an 'Irish-English Dictionary.'

Iritis, ī-rī'tĭs, inflammation of the iris, the colored curtain that shows the pupil in its centre. This disease follows several types, depending on the kind and virulence of the causative agent. In the serous form there is an exudation of blood-serum into the space in front of the iris, and more or less fibrinous matter that tends to glue the parts together. Pain shoots through the whole eyeball, and vision is dimmed by the turbid fluid. Persistent adhesions to the lens are formed, causing a permanent distortion of the shape of the pupil. Another form is the plastic, in which the pupil is actually occluded by the fibrinous deposits. Rheumatism and syphilis are the two most frequent causes of the malady, but many constitutional diseases —as gout, diabetes, anæmias, and menstrual disorders—may be factors in causing the disturbance, and it may also be secondary to diseases

in other parts of the eye, or even in the other eye, as in sympathetic ophthalmia. The treatment consists of dilating the pupil by dropping solutions of some drug, as atropine, into the conjunctival sac, treating the constitutional disease at the seat of the malady, and in relieving the pain by hot fomentations, blood letting, and the administration of drugs that are sedative. Syphilitic iritis is a lesion of the third stage of syphilis (q.v.), where tiny spots called gummata grow in the substance of the iris.

Irkutsk, ĭr'kootsk, a provincial government of Russia, in eastern Siberia, separated from China by the Sayan Mountains. It has an area of 287,061 square miles. The country is generally mountainous, but produces rye, barley, oats and vegetables. The most important rivers are the Angara, Lena and its tributary the Vitim. Gold, iron, and salt figure foremost among the mineral products. Agriculture, cattle-breeding, and the transport of goods to and from China are the chief occupations of the people. Pop. 501,237 (one third exiles and forced colonists). The capital city, Irkutsk, on the Angara, is the residence of the governor-general of eastern Siberia and the seat of a bishop.

Iron, a common and exceedingly useful metallic element, which has been known and used in the arts for many centuries. It occurs in nature in the metallic form, both in meteorites and in certain lavas and volcanic rocks; but the commercial supply is obtained by the reduction of the oxids (or other ores) of the metal, by strongly heating them in a blast furnace with carbon. Iron is grayish in color, with a marked lustre. It crystallizes in the isometric system, usually in the form of cubes or octahedra. The melting point of iron varies to a considerable extent, according to the impurities with which the metal is associated, and also, apparently, according to the physical condition of the iron itself. Pictet gives it as about 2900° F. for iron that is sensibly pure. The specific gravity of the metal also varies to a considerable extent, the determinations ranging from 6.95 to 8.2. The specific gravity of pure iron, at 60° F., may be taken to be 7.85. The specific heat of the metal is about 0.112 at ordinary temperatures, and its coefficient of expansion (on the Fahrenheit scale) is about 0.0000068. Taking the electrical conductivity of mercury (at 32° F.) as unity, the conductivity of iron is about 9.68 at 32° F., and 6.19 at 212° F. Iron is the most magnetic substance known. Soft, pure iron is capable of being magnetized very highly when surrounded by a solenoid of wire that is conveying an electrical current; but its magnetization persists only while the electric current is flowing, falling off, upon the cessation of the current, to a value that is practically negligeable. It is upon this property of temporary magnetization that the action of the telephone, the telegraph, and many other useful electrical inventions depends. (See MAGNETISM; and for a full discussion of the phenomena of magnetization, consult Ewing, 'Magnetic Induction in Iron and Other Metals.') Hardened steel, when magnetized by the action of the electric current (or otherwise), retains a large proportion of its magnetism permanently. Iron becomes non-magnetic at a red heat, but regains its magnetic properties upon cooling again. Wrought iron, when pure, is malleable to a certain extent at all temperatures; but it yields to the hammer with special readiness when heated to whiteness, and it may then be forged and welded without difficulty. The presence of any considerable proportion of sulphur or phosphorus makes the metal "short," or brittle. When phosphorus is present in too great a proportion, the iron is brittle in the cold (that is, "cold-short"); while if sulphur is present in excess it is brittle when hot (that is, it is "hot-short").

Chemically, iron is a dyad. It has the symbol Fe (from "ferrum," the Latin name for the metal), and an atomic weight of 56 if O = 16, or 55.6 if H = 1. It forms two basic oxids, (1) ferrous oxid, FeO, which gives rise to a series of salts known as "ferrous" salts, and (2) ferric oxid (or ferric sesquioxid), Fe_2O_3, which gives rise to a corresponding series of "ferric" salts. A third oxid, having the formula Fe_3O_4, is also known, which is magnetic, and occurs in nature, either amorphous or crystallized in octahedra, as the mineral "lodestone." This oxid is black in color, and is known as the black oxid, magnetic oxid, or ferroso-ferric oxid. It may be prepared, artificially, by oxidizing iron at a high temperature, either in air or in steam, or by heating carbonate of iron to 650° F., in a current of carbon dioxid. It is not readily attacked by acids or other chemical agents, and for this reason a coating of it is often formed on articles of iron to protect them from further oxidation. The Russian iron that is used for stove-pipes is coated in this way, by a secret process. When in mass, iron does not readily decompose water at ordinary temperatures, though it does so at high temperatures. Finely divided iron decomposes water at 212° F., and at lower temperatures according to some authorities. When in a sufficiently fine state of subdivision, iron will burn in the air or in oxygen, with the formation of a mixture of Fe_2O_3 and Fe_3O_4. Iron forms alloys with many metals, and combines directly with chlorine, bromine, iodine, fluorine, sulphur, carbon, boron, silicon, phosphorus, and arsenic. Melted iron dissolves carbon to some extent, and when the molten mass is cooled the carbon is largely deposited in the graphitic form, although a part of it remains in the iron, combined with it in the form of a carbide; and it is believed that the presence of varying quantities of such carbides has much to do with the physical qualities of iron and steel. When melted iron that is saturated with carbon is allowed to cool under great pressure, the carbon is partly deposited in the form of minute crystals of diamond (q.v.); but the manufacture of the diamond by this method has not yet been made commercially practicable.

Ferrous Compounds.— Ferrous oxid, FeO, has not yet been prepared in a state of absolute purity, but it may be obtained approximately pure by reducing ferric oxid, Fe_2O_3, by heating it to 600° F. in a stream of pure hydrogen. It is black in color, and absorbs oxygen with great readiness, passing into the higher oxids. Ferrous sulphate, otherwise known as protosulphate of iron, green vitriol, or copperas, is prepared by dissolving metallic iron in sulphuric acid, and crystallizing by evaporation. It has the formula $FeSO_4 + 7H_2O$, and is greenish in color. It is soluble in water, but the solution oxidizes readily, the salt becoming converted into ferric sulphate, $Fe_2(SO_4)_3$. Ferrous sulphate is largely used in the manufacture of certain black dyes,

in the preparation of writing ink, and, to a certain extent, in photography. The ferrous oxalate developer, made by mixing a solution of ferrous sulphate with one of oxalate of potassium, was formerly in great favor, but has now fallen into comparative disuse, owing to the discovery of other developers that are more active and more convenient to handle. Ferrous chloride, $FeCl_2$, may be prepared by heating excess of iron wire or iron filings in chlorine, or by passing dry hydrochloric acid gas over hot metallic iron. It crystallizes in white, lustrous, six-sided forms, and is volatile at a yellow heat. In air it oxidizes readily to a mixture of ferric oxide and ferric chloride. Ferrous carbonate, $FeCO_3$, is an insoluble compound, occurring in nature as "spathose iron ore," and constituting a valuable ore of iron. Ferrous sulphide, FeS, is a black or grayish-black body, which may be prepared by melting sulphur and iron together in the proportion of 56 parts (by weight) of iron to 32 of sulphur. It is insoluble in water, but dissolves readily in dilute acids, with copious liberation of sulphuretted hydrogen gas. It is therefore greatly used in chemical laboratories, where this gas is extensively used for the separation of the metals. See CHEMICAL ANALYSIS.

Ferric Compounds.— Ferric oxid, Fe_2O_3, occurs native as hematite (q.v.), and it may be prepared artificially by heating ferrous sulphate to redness. Ferric hydrate, $Fe(OH)_3$ is precipitated as a brownish-red powder when ammonia or caustic potash is added to the solution of a ferric salt. Ferric sulphate and ferric chloride are prepared by dissolving this hydrate in sulphuric and hydrochloric acids, respectively. In general, a ferrous salt, when in solution, is converted into the corresponding ferric salt by the action of oxidizing agents; and the ferric salts, conversely, are reduced to ferrous salts by the action of certain reducing agents. Ferrous salts give a white precipitate with caustic alkalies, and, with potassium ferrocyanide, a light-blue precipitate which quickly turns black. Ferric salts give a reddish-brown precipitate with caustic alkalies, and a deep blue precipitate with potassium ferrocyanide. Iron is sometimes called "ferrosum" when it is present in a ferrous salt, and "ferricum" when present in a ferric salt. See IRON AND STEEL INDUSTRY IN AMERICA.

Iron Age, (1) in mythology, the last of the four great ages of the world, supposed to be characterized by abounding oppression, vice, and misery. (2) In archæology, an age, the third in succession, in which weapons and many other implements began to be made of iron, stone having been used for these purposes in the first, and bronze in the second.

Iron, Manufacture of. The metallic products extracted from iron ores for use in the arts are generally divided into three classes: (1) pig or cast iron, (2) wrought iron, and (3) steel. For a description of the distinctions between these products and for their properties, see IRON AND STEEL INDUSTRY; STEEL INDUSTRY; STEEL; STEEL, HEAT TREATMENT OF.

In the present article the methods employed for the manufacture of cast iron and of wrought iron will be shortly outlined. For the methods used in the production of steel, see STEEL, MANUFACTURE OF.

Although the minerals in which iron occurs are very numerous, the only ones from which the metal can be extracted under economical conditions — that is, the only ores of iron — are those in which the iron is present as an oxide, as in magnetites, hematites, and limonites, or as a carbonate, as in siderites. (See IRON ORES.) When carbonate of iron, moreover, is heated to a sufficiently high temperature either at an early stage of the process of manufacture or in a preliminary operation (the calcining of the ore), the carbonic acid which it contains is expelled as a gas and the iron is reduced to the condition of an oxide, hence the operation of extracting metallic iron from its ores always consists in the deoxidation or reduction of iron oxide.

In order to reduce oxide of iron two conditions are essential: (1) contact with a reducing or deoxidizing substance, and (2) a high temperature. By heating iron oxide in contact with some carbonaceous fuel these two necessary conditions are realized, the carbon acting both as the needed fuel and as the needed reducing body, for at a sufficiently high temperature it has a stronger affinity for oxygen than iron and therefore deprives the latter of that element.

Iron ore, however, never consists of pure oxide of iron: in the richest varieties the iron oxide is associated with at least a small amount of other minerals, generally of an earthy character, such as quartz, clay, or limestone, and which are called the *gangue* or *vein stuff*. In the majority of cases the gangue is silicious, that is, made up chiefly of silica or quartz. Silica is *per se* a very infusible compound, but when brought in contact with iron oxide at a high temperature it combines readily with it to form a silicate of iron, a readily fusible substance or slag.

Besides the earthy matters which constitute the gangue, iron ores generally contain other minerals in which are present such elements as phosphorus, sulphur, manganese, etc., and under the strongly reducing conditions prevailing during the operation some of these elements, as well as some of the silica of the gangue, are partially reduced to the metallic state, in which condition they combine with the reduced iron. The influence of these impurities upon the quality of the iron is generally harmful, especially so in the case of phosphorus and sulphur, and their elimination constitutes one of the most delicate problems of the iron metallurgist. Metallurgical fuels also generally contain such impurities as sulphur and phosphorus, and if the fuels be used in contact with the reduced iron, these elements will in part be absorbed by the metal.

Finally, if metallic iron be kept in contact with incandescent carbon for a sufficient length of time, a considerable amount of that element will be absorbed by the metal. The conditions are then said to be carburizing. This affinity of iron for carbon plays a most important part in its metallurgy, chiefly because of the marked influence of carbon upon the melting point of the metal. Pure or rather carbonless iron requires a very high temperature to be melted (about 2,900° F.), necessitating the use of special furnaces and implements capable of producing intense heat. By the introduction of some carbon in the iron, however, its melting point is greatly lowered, from which the im-

portant conclusion is to be drawn that if the metallic product of the metallurgical operation be highly carburized it will be produced and maintained in a liquid state much more readily than if it were freer from carbon. If the iron contains but a small amount of carbon and if we lack the means of producing an intense heat, the product of the operation will be pasty and not molten.

The Primitive or Direct Methods.— The simple operation outlined in the preceding paragraphs which consists in heating iron ore in contact with carbonaceous fuel, was the one conducted in the direct or primitive methods which for ages were the only ones used for the production of iron and steel. Charcoal was the fuel employed and the simple furnace required, called a forge or bloomery, resembled a smith's forge.

So simple is the operation required for extracting a small mass of malleable iron from some rich ore that it seems highly probable that man became acquainted with the use of iron at a very early period of his existence. A fire accidentally lighted by a primeval man upon the ground where iron ore occurred near the surface would have resulted, under suitable conditions, in the production of some metallic iron. Indeed, the first iron furnaces of which we have any record consisted in a single excavation dug preferably on the side of a hill, facing the prevailing wind, and with suitable openings at the bottom for the necessary draft. Artificial blast was later introduced and the construction of the furnace improved. It will suffice to mention here two representative types of this class of furnaces: (1) the old catalan furnace or forge, and (2) the American bloomery, a modern adaptation of this primitive forge.

The catalan forge takes its name from the province of Catalonia, in Spain, where at one time it supplied a large proportion of the world's production of iron, and where, indeed, it is still in operation, as well as in other localities adjacent to the Pyrenees. In its more modern form it consists of a shallow hearth made up of thick iron plates, with the exception of the back, which generally consists of masonry lined with fire clay, while the bottom is frequently made of a movable block of granite. The blast was undoubtedly at first supplied by crude bellows, but was later produced by a water blower or "trompe." The furnace is kept filled with charcoal and small lumps of rich iron ore until a pasty mass of metallic iron is obtained weighing some 350 pounds, called a "bloom," and which contains much slag. It is then removed from the furnace and much of the slag expelled by hammering or squeezing.

For many years a direct process known as the American bloomery process was extensively used in those localities of the United States where suitable ore and an abundant supply of charcoal were available. This process does not differ in any essential feature from the catalan method, which has just been described, but in details of furnace construction and in manipulations there are many points of difference between the two methods.

The hearth of the bloomery is kept full with burning charcoal and coarsely pulverized ores until a bloom of iron weighing some 300 or 400 pounds has been produced and which generally requires three hours. The loss of iron in the operation is said to be about 20 per cent and the fuel consumption some 2½ tons of charcoal per ton of iron produced.

These methods are called direct because they yield iron by the direct treatment of the ore in a single operation, in contradistinction to the modern methods in which at least two distinct treatments are required for the production of iron and steel, the first operation yielding, as will be seen presently, an impure product called cast iron, which must be refined or purified in order to convert it into iron or steel.

While these methods are now obsolete, having been replaced by the more modern indirect processes, they are still in use in some countries, although only to a very limited extent.

According to James M. Swank, in 1902 and 1903 there were no forges in operation in the United States for the manufacture of blooms and billets from the ore. In 1901 the blooms and billets so made amounted to 2,310 gross tons, against 4,292 tons in 1900, 3,142 tons in 1899, 1,767 tons in 1898, 1,455 tons in 1897, 1,346 tons in 1896, 40 tons in 1895, 40 tons in 1894, 864 tons in 1893, and 2,182 tons in 1892. All the ore blooms produced since 1897 were made by the Chateaugay Ore and Iron Company, of Plattsburgh, N. Y., at its Standish Works, which, however, have been idle since 1892.

The Blast Furnace.— In order to prevent the great waste of iron previously alluded to and resulting from the combination of the gangue of the ore with some of the metallic iron, it is necessary to provide a substance with which the silica of the gangue will readily unite, forming with it a fusible slag, and as silica is an acid it is necessary to provide a base to that effect.

Limestone (a carbonate of lime) is the most readily obtainable and cheapest substance for such purpose. It is either burned or calcined in a preliminary operation by which it is converted into lime, the carbonic acid escaping as a gas, or if used raw, it is likewise changed to lime at an early stage of the metallurgical operation by the heat to which it is exposed.

The substances which are thus added for the purpose of forming a fusible compound with the gangue of the ore or with other impurities are called fluxes.

The use of fluxes constitutes one of the most important improvements ever introduced in the manufacture of iron, for it made it possible to extract the metal, under economical conditions, from the enormous amount of relatively lean ores which occur in nature, and to do so at a relatively very low cost. Previously to the use of fluxes it was unprofitable to treat ore containing less than some 60 or 70 per cent of metallic iron, while with their assistance iron ores with as little as some 25 per cent of iron may be profitably smelted.

With the addition of lime, however, it is no longer possible to carry on the operation in the very simple furnace or forge previously used, because the resulting slag or silicate of lime is a much more infusible substance than the silicate of iron produced without the addition of lime and a sufficiently high temperature to fuse this lime slag could not be produced in the forge furnace.

The very high temperature required to fuse the lime slag necessitates the use of a very different type of apparatus (a high, chimney-like

furnace), together with the necessary appliances for the production of the needed heat; in other words, the reduction of the ore must be carried on in the modern blast furnace. The blast furnace was gradually evolved from the primitive forge or bloomery by a mere increase in height, such furnaces as the "Osmund," the "Stückofen," and the "Blauofen" forming as many steps in this evolution. The exact date of the origin of the blast furnace, that is, of an apparatus in which cast iron alone could be produced — and it might be added with addition of flux — is not positively known but it is generally believed that it originated in the Rhine provinces about the beginning of the 14th century.

The operation conducted in early blast furnaces consisted chiefly in smelting iron ore with the necessary amount of charcoal for fuel and of limestone to flux the gangue of the ore. The waste gases which contained a large amount of carbon monoxide were allowed to escape and to burn freely at the top of the furnace. The molten cast iron was allowed to collect at the bottom of the furnace until a sufficient quantity had accumulated, when it was withdrawn by opening a tap hole at the bottom and in the front part of the furnace. The slag was permitted to escape as soon as formed by flowing through an opening and over a stone on one side of the furnace known as the dam-stone. The blast was at first created by rude bellows, later by blowing cylinders, and finally by steam-blowing engines, while no attempt was made at preheating it.

The following improvements introduced in blast furnace practice, outside of mere improvements in construction, marked the most important steps which have led to the modern blast furnace operations. They are mentioned in a chronological order: (1) Use of coke instead of charcoal introduced by Abraham Darby in 1735; (2) the heating of the blast first proposed by James Beaumont Neilson in 1828; (3) the closing of the top of the furnace and utilization of the waste gases by P. Taylor in 1840; (4) the heating of the hot blast stoves by the waste gases of the furnace successfully accomplished between 1833 and 1845 by Faber du Faur and James Palmer Budd; (5) the cup and cone arrangement for closing the top of the furnace invented by G. Parry in 1850; (6) the waste gases used for generating steam by James Palmer Budd in about 1855; (7) regenerative stoves for heating the blast introduced by E. H. Cowper in 1860.

The important and numerous improvements in construction cover every part of the furnace as well as every appliance connected with iron making. To attempt even to mention them would occupy an amount of space which is not here available.

Modern American blast furnaces generally measure from 90 to 100 feet in height and from 20 to 30 feet in diameter at the widest part, while the hearth diameter frequently measures 13 or 14 feet, giving a capacity of from 20,000 to 30,000 cubic feet. The bosh walls which extend from the hearth to the widest part of the furnace are cooled by hollow rings of cast iron or bronze built in sections and inserted into the brick work, and through which water is constantly flowing. The water required for cooling purposes often exceeds 3,000,000 United States gallons in 24 hours. Two down-comers conduct the blast from the top of the furnace to the dust-catchers, from which it is led to the stoves and the boilers by means of a gas main. Another main leads the blast from the stoves to the furnace. Before connecting with the bustle pipe surrounding the furnace the hot blast main frequently divides in order to better equalize the pressure around the complete circle. Explosion doors are provided at the furnace top, and whenever possible in all pipes and chambers carrying gas.

Blast at the rate of 40,000 to 60,000 cubic feet per minute is forced into the furnace through pipes or "tuyeres," varying between 12 and 20 in number, under a pressure of 10 to 15 pounds per square inch and preheated by its passage through the stoves to a temperature of 1,000 to 1,500° F. The output of these furnaces frequently averages 600 tons of pig iron in 24 hours and is occasionally considerably greater, the furnace being tapped six times a day and some 100 tons of iron being obtained at each cast. The tapping hole is frequently opened by means of compressed air drills and closed by means of a tapping hole gun which forces clay into the hole. The fuel consumption varies between 1,500 and 2,000 pounds of coke per ton of pig iron, according to conditions.

The raw materials are conveyed to the top of the furnace by an inclined plane and skip cars, which discharge the raw materials automatically into a receiving hopper provided with a bell and placed over the main hopper. The use of an upper bell acting as a seal while the material is introduced into the furnace, prevents the escape and waste of the gases during this operation, resulting in further economy.

Modern blowing engines supplying the blast to the furnace are constructed both horizontal and vertical and are generally compound and condensing. They frequently have a capacity of some 30,000 cubic feet of air per minute which they can deliver under a pressure of 25 pounds or more per square inch if needed. Two such engines are generally employed for each furnace. A recent improvement in blowing engine construction consists in the use of gas or internal combustion engines for creating the blast. The first successful engine of this type was built at the Cockerill Steel Works at Seraing in Belgium and the results were so encouraging that many other similar engines have since been constructed, especially in Germany, Belgium, and France. It has been found by careful tests that gas blowing engines consume only from one sixth to one fourth of the gas which would be required to raise the steam for use in an ordinary engine of the same capacity. In spite of its evident superiority over steam engines, however, its introduction into American plants is proceeding very slowly.

The modern stoves employed for heating the blast before it enters the blast furnace consist, roughly stated, in high cylindrical chambers filled with bricks placed some distance apart. The waste gases from the furnace are admitted at one end of these chambers together with sufficient air to burn them, and the hot products of the combustion on their way to the chimney heat the brick work to a very high temperature. After the stove has thus been properly heated, the supply of gas and air is shut off and the cold blast from the engine is admitted. The heat

which has been stored up in the brick work is now imparted to the blast, which in this way is highly preheated. After the stove has cooled down to a certain temperature the blast is shut off and the stove is again heated by the waste gases. Modern furnaces are generally provided with four of these stoves, the blast passing in succession through each stove for one hour, while the three others are being heated. With such regenerative system of heating the temperature can readily be maintained at 1,450° F., which results in a considerable economy of fuel in the furnace.

Until quite recently it was the universal practice, after opening the tap hole, to allow the iron to run into sand molds, prepared for that purpose on the floor in front of the furnace, and this method is still widely used. The metallic mass filling each mold is called a pig, while the metal filling the channels connecting a number of molds is called a sow. The pigs are, of course, fastened to the sow, and, after solidification, must be broken loose, generally with sledge-hammers. When the cast iron is to be used for conversion into steel by the Bessemer process the metal as it flows from the furnace is frequently received in large tanks or "ladles" mounted on wheels, which are afterward taken to the steel mill, where the metal is converted into steel without being allowed to solidify, thus saving the cost of remelting the pig iron. In later years casting machines have been introduced to save the heavy labor connected with the handling of the pigs, and to otherwise expedite the casting operation. Nearly all these devices consist in an endless chain, the links of which are made of small iron molds, which are filled in succession by passing under the stream of molten metal. The chain then carries the partially solidified pigs or "chills" under water to promote their cooling and discharge them automatically on cars, the empty molds returning to the ladle again to be filled, and so on.

In the modern furnace the slag tap hole or "cinder notch" is kept closed as well as the iron tap hole, being opened only at stated intervals, generally a short time before the casting of the iron. In the latest American practice the slag is generally received in ladles which carry it away to the dumping place, or it is handled by means of a device known as "slag conveyor," and which is not unlike the casting machines just described, consisting in an endless chain of shallow pans which are successively filled as they pass under the stream of molten slag. After being immersed under water the pans are automatically emptied on cars.

The Products of the Blast Furnace.—Owing to the extremely high temperature at which the operation must be conducted and to prolonged contact between the reduced iron and the incandescent carbonaceous fuel, the conditions in a blast furnace are strongly carburizing, the metal absorbing a large amount of carbon, (generally between 3 and 4 per cent). Moreover, owing to the fact that highly carburized iron is much more fusible (melting generally between 2,100° and 2,400° F.) than iron containing little carbon, and to the intense heat of the furnace, the extracted metal, instead of being obtained in a semi-fused, pasty condition, will be perfectly liquid, and on account of its high specific gravity will settle at the bottom of the furnace. The slag also will be melted, and being lighter than the iron, will float as a separate layer above the metallic bath. The molten slag and the molten iron are withdrawn separately from the furnace, thus effecting their complete separation.

This highly carburized iron produced in the blast furnace is called pig iron, or cast iron. Owing principally to the large amount of carbon which it contains, the properties of cast iron are very different from those of wrought iron and steel.

Owing to the intensely reducing conditions prevailing in a blast furnace, to the high temperature and to the presence of metallic iron, many impurities, such as phosphorus, sulphur, manganese, and silicon, which are always present in greater or less amount in the ore, flux, and fuel, are partially or wholly reduced to the metallic state, and in this condition are retained, in part at least, by the molten cast iron. Cast iron, therefore, is not simply an association of iron and carbon, but contains also varying amounts of the impurities just mentioned.

The following table illustrates the rapid increase in the world's production of cast iron since the beginning of the last century.

YEARS	Production tons.	YEARS	Production tons.
1800	825,000	1880	17,950,000
1830	1,825,000	1890	27,157,000
1850	4,750,000	1900	40,400,000
1870	11,900,000	1903	46,420,000

The following table shows the wonderful growth of the manufacture of cast iron in the United States:

YEARS	Production tons.	YEARS	Production tons.
1810	53,908	1901	15,878,354
1850	563,755	1902	17,821,307
1875	2,023,733	1903	18,009,252
1900	13,789,242	1904	16,497,033

The Refining of Cast Iron or the Indirect Methods for the Production of Wrought Iron and Steel.— Cast iron is not malleable — it cannot be forged; that is, it cannot be shaped into finished implements by mechanical pressure such as that exerted by hammering, rolling, etc. Cast iron, therefore, can only be used as such for casting purposes, which means that cast iron implements can only be obtained by pouring the molten metal into molds having exactly or very nearly the external shape of the objects we desire to manufacture. Cast iron, moreover, is brittle and lacks both strength and toughness, which further greatly limits its useful application. To produce a metal which is forgeable, which possesses more strength and toughness and other valuable properties absent in cast iron, and, therefore, a much more useful metal, it is necessary to subject cast iron to a refining operation by which it is converted either into steel or into wrought iron.

This indirect method of producing iron and steel is the prevailing modern method, for, in spite of strenuous efforts made to improve the older or direct method, it remains by far the cheaper of the two.

The refining of cast iron or its conversion into wrought iron or steel consists essentially in eliminating a large proportion of the impurities which it contains, especially carbon and silicon. In order to expel these impurities

we must bring the cast iron in contact with a substance, either solid or gaseous, possessing more affinity for them than the iron itself, and here again heat is required for such reaction to take place. Oxygen has a very great affinity both for carbon and silicon, and in general for the other impurities present in cast iron, and it is upon this element that we shall depend for the elimination of the impurities. We may for that purpose use either atmospheric oxygen or the oxygen of some oxidizing substances. The oxidizing agents generally used besides atmospheric oxygen are rich iron ore or rich slag from some previous operation, or the slag produced in the refining operation itself. These substances are composed essentially of oxide of iron, which is an oxidizing compound, for it readily parts with some of its oxygen which is taken up by the carbon of the cast iron.

When cast iron in order to be purified is exposed at a sufficiently high temperature to the action of atmospheric oxygen or of some other oxidizing substance, the silicon which it contains combines with some oxygen, being converted to silica. Some of the iron itself will be oxidized and the resulting oxide of iron will in turn enter into combination with the silica to form a fusible silicate of iron or slag.

The carbon present in the cast iron also combines with some atmospheric oxygen, or more frequently with some of the oxygen held by the slag or by some iron ore purposely added, and is converted into carbonic oxide or carbonic acid gas, in which condition it escapes from the furnace. By being deprived of its oxygen the iron ore added in some of these refining operations is reduced to the metallic state and incorporated into the refined metal.

The Products of the Refining of Cast Iron.— As was the case in the treatment of the ore, the nature of the metal resulting from the refining of cast iron will likewise greatly depend upon the temperature at which the operation is conducted. If the temperature be low the refined metal will be obtained in a semi-fused or pasty condition, and will on that account include a relatively large amount of slag, while it will generally be quite free from carbon. In other words, the product of the refining operation conducted under these conditions will be wrought iron, or, if the conditions be made slightly more carburizing, steely iron. These are the conditions prevailing in the old forge refining of cast iron or "finery method," as well as in the more modern puddling process for the manufacture of wrought iron, which methods will be outlined briefly.

The Finery Methods for the Production of Wrought Iron.— When the ironmaster of the 13th or 14th century, through the gradual development in height of its catalan or other forge so increased the carburizing conditions that he finally obtained a small amount of molten cast iron, he was confronted with the necessity of refining this brittle, unforgeable metal in order to convert it into malleable iron, and he quite naturally endeavored to conduct this refining operation in furnaces similar to the low hearths or forges which for so many centuries had been the only apparatus used for the direct extraction of iron from its ores. In these forges, known as "fineries," the pig iron was melted in contact with charcoal and under the oxidizing influence of a blast issuing from a single tuyere. While the details of the finery operation and of the furnace differed much in various countries, and even in different sections of the same country, their essential features were identical. Four of these processes attained especial prominence and have not been entirely driven out of existence by the puddling process nor later by the Bessemer process; they are the Walloon process as still conducted in Sweden, the Franche Comté process, the Lancashire process still used in England, the United States, and some other countries, and the South Wales process which was for many years extensively used in South Wales for the production of iron plates for tinning. In recent years, however, soft Bessemer and open hearth steel have taken the place of wrought iron for such purpose and this once flourishing industry is now quite, if not altogether, extinct.

These charcoal hearths or fineries are frequently used for the remelting of iron and steel scrap resulting in the production of wrought iron of high quality. The operation consists in filling the hearth with charcoal, upon which the scrap is placed and covered with additional charcoal and the charge melted. The slag produced in this operation is very basic and therefore promotes the removal of the phosphorus and sulphur which are eliminated to a notable extent.

The iron manufactured or remelted in these hearths is mainly used for the manufacture of plates, sheets, skelp rods, etc., which are used in the manufacture of boiler tubes, boilers, screws, rivets, wire, etc.

According to J. M. Swank, the iron blooms produced in forges from pig iron and scrap in 1903, in the United States, and which were for sale and not for the consumption of the makers, amounted to 9,940 tons, against 12,002 tons in 1902, 8,237 tons in 1901, 8,655 tons in 1900, 9,932 tons in 1899, 6,345 tons in 1898, 7,159 tons in 1897, and 6,494 tons in 1896. All the pig and scrap blooms made in forges from 1895 to 1903, and for sale, were made in New York, Pennsylvania, and Maryland.

The Puddling Process.— The finery methods described in the preceding paragraphs were the only ones available for the conversion of cast iron into wrought iron until an Englishman by the name of Henry Cort invented the puddling process in the year 1784, a date which marks a very important epoch in the metallurgy of iron. It has been seen that in the finery processes the pig iron is heated in contact with solid fuel, and this necessitates the use of charcoal, because this fuel alone is sufficiently pure to yield wrought iron of good quality. If the attempt were made to use inferior fuels, such as coal or coke, it would be found that the iron absorbed so much impurity from the coal, notably sulphur, as to be of inferior quality. The necessity of using such an expensive fuel as charcoal, and a large amount of it, is a serious limitation of the finery processes, greatly increasing the price of the iron. To make the use of more impure but cheaper fuel possible, Cort proposed to conduct the refining of the pig iron in the hearth of a reverberatory furnace, that is, out of contact with the fuel itself, thereby preventing the contamination of the iron by the impurities of the fuel. In a reverberatory furnace the fuel is burnt in a separate fireplace, the substance to be treated coming in

contact only with the flames and gases resulting from the combustion of the fuel. In the puddling furnace, moreover, the labor required per ton of iron was greatly reduced and it was possible to treat in one operation a considerably greater amount of pig iron.

The puddling operation as originally conducted by Cort and others is now known as the "dry puddling process," while the more modern method of conducting the operation which involves some important alteration of the original method, is known as the "wet" or "pig boiling" puddling process. Only the latter will here be described.

The Wet or Pig Boiling Puddling Process.— In the original or dry puddling process, while the oxidation of the carbon, silicon, and other impurities was brought about to a certain extent by the oxide of iron formed during the operation, we depended mostly for their elimination upon the oxygen of the air, and this necessitates for reasons which cannot here be explained the use of white or refined pig iron. The modification about to be described was introduced into the puddling process for the purpose of making it possible to treat grey cast iron at once in the reverberatory furnace doing away with the preliminary refining operation and otherwise hastening the process. It is said to have been first used by Joseph Hall, of the firm of Barrows and Hall, of Tipton, England, about the year 1830.

The modern puddling furnace employed for the conduct of the pig boiling process resembles in its general lines the earlier puddling furnaces, the essential difference being in the nature of the lining of the hearth. The bottom of the hearth and the sides are made of iron plates which are protected by a thick layer of oxide of iron, called the "fettling" of the furnace. The substances used for fettling purposes consist of pure hematites (ferric oxide) crushed or ground to the desired size and of slags or scales obtained in the production or working of iron, and which are very rich in oxide of iron, such as roasted tap cinder or "bull-dog." This oxide lining, as previously stated, plays an important part in the operation by giving up a part of its oxygen to the carbon and other impurities present in the pig iron, thus greatly hastening their removal. From 300 to 500 pounds of grey pig iron are generally treated in these furnaces, frequently with the addition of some hammer scale, which consists of magnetic oxide of iron and which therefore help in oxidizing the impurities. The pig iron is now melted and becomes liquid without assuming the pasty condition characteristic of white pig iron. During the melting down period a large proportion of the silicon is oxidized and some of the carbon chiefly by the oxygen of the air. Some iron also is oxidized and slag formed, while owing to the removal of silicon the remaining carbon passes to the combined condition.

The bath is constantly stirred or "rabbled" so as to promote contact of all portions with the oxidizing lining and with the iron oxide of the slag, thus hastening the oxidation of the silicon and carbon. As the carbon is expelled the mass becomes pasty, the metal having now "come to nature." The spongy mass of wrought iron is then divided into balls weighing some 60 pounds, which are withdrawn from the furnace and worked in the usual way.

The whole operation lasts usually about 1½ hour, but may be longer or shorter, according to the purity of the metal treated. The loss varies from 7 to 20 per cent, being chiefly dependent upon the amount of impurity in the pig iron. According to Turner, the consumption of coal in the puddling furnace per ton of puddled bars amounts generally to about 2,600 pounds. The following interesting comments are from Prof. H. M. Howe:

"While the yearly production of wrought iron in the United States more than doubled between 1870 and 1890, yet since the latter year it has shrunk very much, probably nearly to that of 1870; and between 1870 and 1900 the proportion which the production of wrought iron bears to that of steel diminished very greatly. Of the combined annual production of wrought iron and steel in the United States that of wrought iron formed 95 per cent in 1870, 63 per cent in 1880, 37 per cent in 1890, and probably not far from 15 per cent in 1899. The corresponding numbers for Great Britain are 34 per cent for 1890 and 19 per cent for 1899, and 16 per cent for 1901. In the year 1899 the average number of British puddling furnaces in operation is reported as 1,149 out of a total of 1,320 in existence. Thus in 19 years the position of wrought iron changed from that of the chief product to one of secondary importance."

ALBERT SAUVEUR,
Assistant Professor of Metallurgy, Harvard University, and Editor of 'The Iron and Steel Magazine.'

Iron and Steel Industry in America. The iron of commerce is classified under three groups. These are "wrought iron," "steel," and "cast" or "pig iron."

In the colonial period the British government systematically discouraged all efforts of the colonists to produce iron, in order to avoid competition with home industries. There were forges or bloomeries in nearly all the colonies from the times of earliest settlement, and as unlimited supplies of fuel were always at hand in the vast forests it was only necessary to find ore and obtain persons who could construct forges. The iron required for structural purposes, such as bars, straps, nails, sheets, etc., was obtained in the early days either by hammering the bloom from the forge or by shaping with rolls propelled by water-power. In fact, before the invention of the puddling process in England by Cort, in 1784, a large proportion of all forms of wrought iron were derived in this manner. The old so-called "Walloon" process of refining pig iron into the malleable or wrought form or into a crude mild steel was introduced into the colonies at an early date in their history. By the puddling process malleable iron is not directly produced from the ore, as in the older methods of manufacture, but indirectly from pig iron. The introduction of the puddling process was second in importance to no other invention in the history of the iron industry of this country.

After the Revolution the iron industry developed steadily but slowly, probably owing to the fact that, as in colonial days, much, if not most, of the iron used along the seaboard was imported. No statistics of the production of iron were collected before the year 1810. The produc-

tion of pig and cast iron in that year was 53,908 tons; wrought and malleable iron of all kinds, 27,105 tons; having a total value of $6,081,374, of which amount Pennsylvania produced $2,473,748. The product of the steel furnaces of Massachusetts, Rhode Island, New Jersey, Pennsylvania, Virginia and South Carolina in 1810 was 917 tons, valued at $144,736; of the whole number of steel furnaces Pennsylvania contained five, producing 531 tons, valued at $81,147. An analysis of these figures gives us some idea of the state of the industry at the beginning of the century. The product of the blast-furnaces — pig, or, as it was at that time termed, cast iron — was run directly into small castings then in demand for commercial purposes; the malleable iron was probably all derived directly from the ore in forges or bloomeries, whence it was taken to the rolling or slitting mills to be made into rods, bars, plates, nails, etc. The steel made at this period in the United States was probably all produced by the cementation or blister process, and was all of the grade now known as high-carbon or tool steel. Although Huntsman's improvement of this process, by which the steel bars thus made were fused in crucibles and subsequently cast into ingots, had been in operation in Sheffield, England, a number of years prior to 1810, it is doubtful if his invention had been adopted in the United States at this early date. In the census of 1820 the quantities of iron made are not given; their value, however, is stated as follows: Pig or cast iron, $2,230,275; wrought iron, $4,640,669; total, $6,870,944. The 1830 census gave: Pig iron and castings, $4,757,403; wrought iron, $16,737,251; total, $21,494,654. The production of iron steadily increased upon much the same lines as before and in 1840, 804 blast-furnaces produced only 286,903 tons of iron, and 795 bloomeries, forges, and rolling-mills only 197,233 tons of malleable or bar iron. For the first time in the history of the industry the production of cast or pig iron exceeded that from the bloomeries and forges. No figures are published for the value of the product in 1840, but if we assume the ton of pig iron to have cost $30, and the ton of hammered bar iron $90, we obtain $8,607,090, or nearly double the value of pig and cast iron produced in 1830. The total value of the bar iron at this estimate would be $17,750,970.

The high cost of manufacturing charcoal, and its enormous consumption in the furnace per ton of iron produced, were serious obstacles to the growth of the industry, even where a good supply of ore was well assured. As early as 1835 the adaptation of anthracite to the manufacture of iron began to attract attention, and Franklin Institute offered a gold medal "to the person who shall manufacture in the United States the greatest quantity of iron from ore during the year, using no other fuel than anthracite coal, the quantity to be not less than 20 tons." The medal was never awarded, but there is abundant evidence that from 1830 to 1840 a number of attempts to use mineral fuel in smelting iron ores were made. The first practically successful attempt to produce pig iron by the use of anthracite was made by David Thomas at Catasauqua, Pa. The furnace which he erected there for this purpose was blown in on 3 July 1840. It was equipped with a "hot blast" operated by water-power, and thus inaugurated in the United States, two of the greatest innovations in blast-furnace practice. This furnace, producing from the start 50 tons of iron per week, continued in profitable operation until the year 1879, when it was dismantled. The early forms of hot-blast apparatus consisted of nests of iron pipes heated externally by separate fires, the object being to pass the air from the blowing- or blast-engine through these pipes, thereby greatly augmenting its temperature, and to decrease the consumption of fuel per ton of ore smelted. The hot blast was patented in 1828 by James B. Neilson of Glasgow, and its use is perhaps the most important improvement ever made in blast-furnace practice, for without it the present large and cheap production of pig-iron would have been impossible. Notwithstanding that the success in smelting iron in blast-furnaces with anthracite had been practically demonstrated in 1840, the general use of this fuel appears to have grown slowly; it was 10 or more years before the use of coal (either anthracite, coke, or a mixture of the two) became general. In 1846 the first furnace constructed with the intention of using raw bituminous coal as fuel was successfully placed in operation at Lowell, Mahoning County, Ohio. Although coke had been in general use in England for a number of years, it was not until 1837 that it was successfully used in the United States in the blast-furnace at Lonaconing, Alleghany County, Md. The manufacture of Connellsville coke was commenced in 1841, but, according to Weeks, it was not until a number of years later, when railroad transportation had become more fully developed, that its value as a furnace fuel became thoroughly demonstrated. The period between the years 1840 and 1850 was a most eventful one in the history of the American iron industry. The introduction of the improvements in smelting already indicated, together with the use of steam-power for propelling the blast and in performing other varieties of work about the furnaces, its replacement of water-power in operating rolling-mills and hammers, in mining coal and ore, and the rapid growth of the railroads, produced a stimulating effect probably never before experienced in a similar degree by any American industry. The railroads contributed largely to the development of the iron industry in two ways: directly, by rendering transportation comparatively cheap, thereby enlarging the iron market and increasing the demand; and indirectly, by creating in their construction a new and unprecedentedly large consumption of iron. As the production of iron increased in later years, the older iron-ore deposits became exhausted, or were proved inferior to the newly discovered ore-beds of the Lake Superior region. The problem of suitably locating a modern blast-furnace producing from 9,000 to 10,000 tons of pig iron per month became a serious one, and its solution has had the effect of moving the geographical centre of the iron industry west of the Alleghany Mountains, nearer a new and larger ore supply, yet handy to the coke of Connellsville. In 1850 there were produced in the United States 563,755 tons of pig iron by 377 establishments, and wrought iron to the value of $22,629,271 in 552 establishments.

The evolution of iron and steel plate making, particularly boiler-plates, forms an interesting chapter in the growth of our great industry.

About 1815, when steam began to be used, Dr. Charles Lukens remodeled his mill to produce thicker plate. The bloom was reheated at the forge and hammered thin, usually about one and a half inches. It then went to the rolling-mill, where it was laid on a bed of coal in what was called a grate-furnace. After heating, it was rolled into plates one quarter and three sixteenths of an inch thick and sent to the boiler maker. But soon the mill began shearing into regular commercial sizes: 48 and 49 by 26 by one quarter or three sixteenths; or, if large enough, it was sheared into plates 68 and 69 by 26, and the scrap was cut into nails. But when the reverberatory furnace was introduced, the scrap was arranged into piles of such size as was necessary to produce the required plate, heated to a welding heat, and rolled in the mill. This state of things continued until the introduction of the puddling furnace. The most important advances made in the years between 1850 and 1860 were the invention of the "three-high" roll-train; the introduction of mills for rolling beams, by Cooper & Hewitt, at Trenton, N. J.; and the invention in 1848 of the "universal mill," by Daelin, a German engineer, which found its way to America 12 years later. In the manufacture of the finer qualities of steel, no progress was made up to 1860. According to the census of 1860, 97 establishments in the United States produced 51,290 tons of blooms, valued at $2,623,178; 286 establishments produced 987,559 tons of pig iron, worth $20,870,120; 256 establishments produced 513,213 tons of rolled iron, worth $31,888,705; 13 establishments produced 11,838 tons of steel (probably of cheap grades), worth $1,778,240.

During the Civil War the resources of the iron industry in the Northern States were taxed to their utmost. The industry in the South, strained at an early day beyond its feeble capacity, soon broke down, and most of the requirements of the Confederate armies were supplied from abroad. In the train of dire disaster wrought by the Civil War some good to the iron industry may be found; for not only did iron ships make their appearance in the navy, but the use of iron plates had its inception. As early as 1859 the French had built the frigate Gloire, armored with iron plates five inches in thickness, and in 1861 the British constructed the frigate Warrior, which was protected by solid iron plates four and a half inches thick. As regards armor, either of these vessels was much better protected than any of our monitors constructed during the Civil War, for the first monitor was protected by six to eight thicknesses of one-inch iron plates bolted one on the other with overlapping joints, and later vessels were probably protected in much the same way by armor made up of a greater number of similar one-inch plates.

In 1855 and 1856, Henry Bessemer, of London, had obtained patents for a process of converting molten pig iron into steel by forcing small jets of cold air through the molten iron; but his invention was not successful until modified by Robert F. Mushet, who added to the molten steel, after the blast had been stopped, a sufficient quantity of spiegeleisen (an alloy of iron and manganese) to neutralize the oxide of iron caused by blowing and to give the steel the proper degree of hardness and fluidity. Neither Bessemer nor his American rival, William Kelly, of Pittsburg, who secured a patent but did not utilize it, accomplished anything in America until 1866, when their interests were combined with Mushet's and the first plant to produce the steel as a commercial article was put in successful operation by the Pennsylvania Steel Company at Steelton, near Harrisburg, Pa., June 1867. The first steel rails rolled in the United States in the way of regular business were rolled by the Cambria Iron Company, Johnstown, Pa., August 1867, from ingots made by the Pennsylvania Steel Company. The production of Bessemer steel in the year 1867 was 3,000 tons, the industry continuing to grow with rapid strides. In 1890, 4,131,535 tons were produced, in 1900 7,532,028 tons, and in 1902 9,138,363 tons. Of these amounts 2,550 tons were made into rails in 1867, 1,853,862 in 1890, 2,250,457 in 1900, and 2,935,392 tons in 1902. The importance of the invention of the Bessemer process to the world in general and the United States in particular cannot be overestimated, since it has reached a development with us greater than in any other country in the world. In 1901 the total amount of all varieties of steel made in the United States was 44 per cent of the entire world's product. The rapid and enormous development of the Bessemer-steel industry in the United States is attributable chiefly to the great extension of our railroads. Bessemer steel is also used for steel bars, merchant steel and for tin plates. The basic Bessemer or Thomas process though used in Germany to produce 4,888,054 tons in 1902, has not gained a foothold in this country.

The open-hearth steel process was first used in 1856, when the Siemens Brothers of London perfected what is now generally known as the Siemens regenerative gas-furace, without which no open-hearth steel can be made. In 1864, Messrs. Emile and Pierre Martin, of the Sireuil works in France, erected, with the assistance of Dr. Siemens, one of the regenerative gas-furnaces to convert steel in an open-hearth or reverberatory furnace of their own construction. This scheme was a success from the start, and by a subsequent consolidation of the Siemens and Martin inventions a steel-making apparatus was devised, known as the Siemens-Martin or open-hearth process. This process was introduced into America in 1868 by F. J. Slade for Cooper, Hewitt & Company, at the works of the New Jersey Steel and Iron Company, at Trenton, N. J. In 1870 the production of open-hearth steel in the United States was 1,500 tons, and in 1890 574,820 tons, the industry showing a rapid development during the intervening 20 years. Great Britain was long the largest producer of open-hearth steel in the world, and in this branch of the iron industry the United States was somewhat behind its great rival, until 1900. In 1890 Great Britain produced 1,564,200 tons, as against 574,820 tons in the United States; in 1899 Great Britain produced 3,030,251 tons and the United States a little more than 2,900,000 tons; but in 1900 the figures are 3,398,135 tons for the United States (following James M. Swank, 'Iron and Steel at the Close of the 19th Century,' 1901; the census figures, always incomplete, are 3,044,356) and 3,156,050 for Great Britain. This growth is all the more striking when it is known that in 1895 the writer of this article hopefully

prophesied that the production might reach in that year 1,000,000 tons. Five years later it had passed the 3,000,000-ton mark. The so-called "basic" open-hearth process, although in successful operation in Europe for a number of years, was not introduced into the United States until 1888, when a number of such furnaces were constructed at the works of Carnegie, Phipps & Company, at Homestead, near Pittsburg, Pa. Without going into technicalities, the basic open-hearth process may be briefly defined as an ordinary open-hearth plant whose furnace lining is made of a basic material, such as dolomitic limestone or the mineral magnesite. When pig iron containing a sufficiently great quantity of phosphorus to render it unfit for conversion into steel by any other method is melted in such a furnace, the basic lining, together with a basic flux which is added, removes the objectionable phosphorus and renders (other conditions being normal), the resulting steel equal to that prepared in the open-hearth furnace in the old and usual manner. The purposes for which open-hearth steel is ordinarily adapted are quite different from those for which the Bessemer steel is most suitable; but the converse of this fact, however, is not true, since open-hearth steel may be and frequently is used to an equal, if not greater, advantage wherever Bessemer steel is employed. In this country, at least, all high-grade structural material, such as boiler and ship plate, bridge and building members, high-grade castings, etc., is almost invariably of open-hearth steel, which is generally considered, and doubtless is, more uniform in quality than soft steel made by the Bessemer method.

One of the most curious phases in the history of the American iron industry is the fact that although the United States at one time consumed nearly 60 per cent of the world's entire production of tinned plates, with the exception of a few sporadic attempts in 1873 and 1875, no tin or terne plates were made in the United States until 1891. Great Britain furnished virtually all the tin-plate used in the United States during the 20 years ending 1890. No better evidence of the success of our domestic tin-plate industry could be afforded than the fact that our imports have steadily decreased since 1889, those for 1890 being 29,435 tons, for 1894 215,068 tons, and for 1900 only 60,386 tons. The American production amounted to 999 tons in six months of 1891; to 6,092 tons in 1892; 44,563 tons in 1893; over 100,000 tons in 1895, and in 1900 to 302,665 tons. The census of 1900 reports 57 establishments manufacturing tin and terneplate; gives their capital as $6,650,047, its wage-earners as averaging 3,671, and their wages as $1,889,917; and estimates the cost of materials at $26,728,150, and the value of the product as $31,892,011. In 1890 the industry was practically non-existent and was not reported in the census of that year.

If the history of the development of the American blast-furnace practice were written it would form a large book of itself. In 1870 most of the blast-furnaces in operation were still very primitive, and although no statistics for that year are given, it is probable that the best of them did not produce as an average over 50 tons of pig iron per day, whereas in 1902 the production of 300 tons per day was a common occurrence, and some furnaces regularly produced over 500 tons daily. The table at the bottom of the page taken from the United States census reports, exhibits the production of pig iron from 1870 to 1900.

These figures show the rapid fall in the number of establishments, resulting from the movement of concentration nowhere so strikingly shown as in the steel and iron industry. The capital invested has increased 150 per cent approximately in 30 years, the production nearly 700 per cent and the value of the product almost 200 per cent. During the 20 years between 1870 and 1890 production in the Middle States had nearly quadrupled, in the Western States increased nearly 5 times, and in the Southern States nearly 10 times. In 1890 the American product passed the record figures of the British furnaces, made in 1882. Between 1890 and 1895 the American trade suffered considerably and fell below the British in its total product; then it again advanced and is now 100 per cent greater than that of Great Britain.

The wonderful growth of the world's iron industry within 50 years is shown by the following tables, in metric tons (2,204 pounds).

Country	1854	Per cent	1902	Per cent
United States	750,000	12.5	18,003,448	40.7
Great Britain	3,000,000	50.0	8,653,976	19.5
Germany	400,000	6.6	8,402,660	19.0
France	750,000	12.5	2,427,427	5.5
Russia	200,000	3.3	2,566,000	5.8
Austria-Hungary ..	250,000	4.3	1,335,000	3.0
Other countries ..	650,000	10.8	2,869,480	6.5
Totals.....	6,000,000	100.0	44,257,991	100.0

Even more striking is the increase in steel output in the last 35 years, as shown below:

Country	1867	Per cent	1902	Per cent
United States	19,963	4.1	15,186,406	44.0
Great Britain	235,000	47.8	5,102,420	14.8
Germany	122,591	26.0	7,780,682	22.5
France	47,597	9.7	1,635,300	4.8
Russia	6,271	1.3	1,730,250	5.0
Austria-Hungary...	15,000	3.1	1,143,900	3.3
Other countries ...	35,000	7.1	1,900,825	5.6
Totals.....	491,422	100.0	34,479,783	100.0

PRODUCTION OF PIG IRON.

	1870	1880	1890	1900
Number of establishments.....	386	341	304	224
Capital	$56,145,326	$89,531,362	$134,608,543	$148,226,113
Wage earners.....	27,554	41,695	33,415	39,358
Total wages.....	$12,475,250	$12,665,428	$14,614,458	$18,500,462
Tons produced.....	1,832,876	3,375,912	8,845,185	14,452,234
Cost of materials.....	$45,498,017	$58,619,742	$110,098,615	$131,536,424
Value of product.....	$69,640,498	$89,315,569	$145,643,153	$206,823,202

The total iron and steel exports and imports of the United States for the years 1890, 1900, and 1902 are shown below, the totals being long tons (2240 pounds).

Year	Exports	Imports	Excess
1890.....	45,687	603,749	Imp. 558,062
1900.....	1,154,284	209,955	Exp. 944,329
1902.....	370,805	1,212,839	Imp. 842,034

A sketch of the American iron industry would be incomplete without some reference to the introduction of the manufacture of armor-plate into the United States. This class of material not only has a peculiar and limited demand, but its manufacture requires the highest degree of metallurgical and mechanical skill, together with an exceptionally expensive plant. When the reconstruction of the United States navy was begun, some 20 years ago, we had absolutely no facilities for making the simplest kind of armor-plate, although we had some of the largest steel-works in the world. One of the first of the new armored vessels completed (the monitor Miantonomoh) was protected by "compound" plates imported from England. All the large forgings for the guns and shafts of the earlier ships were likewise imported. Owing to the policy of Congress, the Bethlehem Iron Company, and Carnegie, Phipps & Company, of Pittsburg, were induced to erect expensive plants necessary for making not only the heavy gun-forgings required, but also for all the different grades and thicknesses of armor-plate. In 1891 these firms began to supply armor for the ships in course of construction, although at first their output of finished armor was extremely slow. The delays have now been slowly overcome, and at the present time there is little doubt that these great steel-works will be able to supply the armor as fast as new ships are constructed. How successful these works have been in furnishing our government with the best grades of armor-plate could have no better illustration than the fact that the Bethlehem Iron Company soon began supplying foreign governments with armor for their ships. The only two important iron and steel commodities which the iron industry of the United States did not supply in 1890 (tin-plate and armor-plate) are at present being made in large quantities, and the census for 1900 reports during the year 1900 15,302 tons of armor plate all produced in Pennsylvania, and valued at $7,526,479. Vast improvement has been made in the machinery necessary to manipulate iron and steel. The Bethlehem Iron Company has a hammer of 125 tons' capacity, built by John Fritz and put into successful operation in 1891. But armor-plate is no longer rolled nor forged by hammers, but manufactured with huge hydraulic presses, some with an energy of 15,000 tons. George Fritz is the inventor of what is known as the "automatic tables," which with John Fritz's roll train enables the manufacturer to successfully handle almost any weight of ingot. I well remember when a 500-pound mass of iron was thought to be so heavy that the whole neighborhood gathered in to see it rolled. The necessity of handling such very heavy weights as could be made from ingots cast in large masses brought into play the invention of hydraulic machinery, so that we now have pumps to produce any required pressure in a series of pipes which deliver the water to the hydraulic engines in any part of the works. By simply turning a valve now a boy will pick up a heavy ingot (say of 10,000-pound weight) with his hydraulic crane and deliver it anywhere within reach of the crane. If on a car, it may then be taken by a small locomotive to the rolling-mill, where another crane picks it up and puts it into the furnace, and, after heating to the required degree, takes it out and delivers it to the machinery at the rolls; then the automatic tables push it back and forth through the rolls until it is reduced to the required dimensions. The same tables now take it to the shears, which are also operated by hydraulic power, and the plate, sometimes two inches thick, is sheared ready for shipment. All this is done with more ease than was possible a few years ago. Within the last few years electricity has been brought into play to do some of the heavy work.

Revised by S. Sanford,
'Engineering and Mining Journal,' New York.

Iron City, a name given to Pittsburg, Pa., owing to its extensive iron industries. "Smoky City" is another name frequently applied to Pittsburg because of the large number of rolling-mills, furnaces, and foundries in which bituminous coal is used.

Iron Cross, a Prussian order, instituted by Frederick William III. in 1813, and conferred for distinguished services in war. The decoration consists of a Maltese cross of iron, edged with silver. The order was revived by William I. in 1870, on the eve of the great war with France. The grand cross, of double size, is presented exclusively for the gaining of a decisive battle.

Iron in Medicine. Iron was in use in medicine by the Chinese as early as 2700 B.C., and was employed in the treatment of anæmia much as it is administered to-day. In its native form, as iron, it is devoid of action, but when reduced to a salt, or oxide, capable of dissociation, it becomes active. Iron differs from many of the other heavy metals in that it is an active ingredient of the tissues, and is probably essential to the life of many if not all forms of living things. In the human blood it is an absolutely essential constituent, and its importance is great for all of the tissues of the body. In a number of the animals that lack red blood-corpuscles iron is not found abundantly in the blood, but is nevertheless present in large amounts in all parts of the body, and is perhaps just as essential for the chemical processes of nutrition as in higher vertebrates. It is well known that the presence of iron is necessary for the active processes of photosynthesis in plants, and that in its absence the higher plants are unable to develop chlorophyll, although chlorophyll itself does not contain iron in the form of hæmoglobin. It is of interest, however, to note that Nencki, a Russian biologist, has shown that reduction compounds of hæmoglobin and of chlorophyll are very closely allied, and he propounds the interesting speculation that probably the same iron compound was present in the living matter before a differentiation of animal and plant was made, and that as plants and animals developed along divergent lines of struc-

ture the iron compounds became somewhat separated in their chemical character.

Iron combinations in medicine are usually divided into two classes, inorganic and organic. In the former the iron is dissociated in solution, and is usually acted upon by the hydrochloric acid of the gastric juice and converted into soluble chlorides, in which form it probably enters into the tissues. In the organic iron it is probable that the same conversion takes place, although there is much controversy regarding the method of its absorption; but this is true of all iron. The iron is usually taken up in the stomach and intestines, the larger part of it being rejected, and it enters into the blood in the form of an albuminate which passes into the duodenum, some being absorbed by the epithelium, and more or less of it carried directly to the spleen and probably to the liver. In the spleen it seems to undergo some changes, and is taken up by the blood and thereafter deposited more particularly in the liver and in the bone-marrow. When there is deficiency of iron in the blood or other organs, the liver gives up its store and it is absorbed by the tissue that is most in need of it. While in the blood, iron is the great organ of oxidation. By means of the hæmoglobin the oxygen of the air is taken up and distributed to the different parts of the body. This permits of the active chemical oxidative changes that take place throughout the entire body, which changes are of such vital importance in general metabolism, and without which the body suffers, degenerates and dies.

Iron is used particularly for diseases in which the blood is poor in that metal. This is particularly the case in anæmias of primary and secondary character. In primary anæmia or chlorosis (q.v.), iron is a distinct help, often curing the condition. In primary pernicious anæmia, which is a grave blood-disease, it is of secondary value. In all of the secondary anæmias, those that follow hemorrhage, the acute infectious diseases, such as scarlet fever, malaria, whooping-cough, measles, typhoid, pneumonia, etc., iron is of great service. It is particularly valuable following childbirth or any condition in which there has been a great loss of blood. It is also useful in conditions of scanty menstruation, in tuberculosis, and is one of the best general tonics in the realm of medicine. The effects of inorganic and iron solutions on the teeth should be borne in mind, although they are much exaggerated. Iron is apt to cause a certain amount of constipation, but this, by proper laxatives regularly taken, should be overcome.

Iron Mask, The Man with the, a famous personage who was kept a prisoner in two or three French prisons in the time of Louis XIV., and who excited a curiosity corresponding to the care with which his identity was concealed. His first prison was the castle of Pignerol, of which Saint-Mars was governor. In 1686 he was carried by Saint-Mars to the isles of St. Marguerite; and the same precautions were observed as upon his first journey. Saint-Mars having been appointed governor of the Bastile in 1698, carried the prisoner with him there, but still masked. An apartment had been prepared for him more convenient, and furnished with more care than those of the other unfortunate beings who inhabited this sad abode. He was not permitted to take off his mask even before his physician. In other respects the greatest attention was shown him, and nothing which he requested was refused him. His education appeared to have been carefully attended to; and he amused his leisure by reading, and playing upon the guitar. This unknown person died 19 Nov. 1703, at 10 o'clock in the evening, without having undergone any severe sickness. He was buried the next day in the afternoon in the cemetery of the church of St. Paul. He was, it was said, about 60 years of age, although the register of burials for the church of St. Paul, in which he is mentioned under the name of Marchiali, makes him only about 45. It is said that orders were given to burn everything which had been employed in his service; that the walls of the chamber which he had occupied were rubbed down and whitewashed; and that the precautions were carried so far, that the tiles of his room were removed, in the fear that he might have displaced some of them to conceal a letter behind them. Conjecture exhausted itself to discover who this mysterious personage might be.

At the time of the destruction of the Bastile, in July 1789, there were not wanting curious persons, who sought, in the archives of this fortress, to discover some notices which might throw light upon this historical problem. But to no purpose. A widely-accepted conjecture was first thrown out in a letter written in 1770 by Baron D'Heiss to the 'Journal Encyclopédique.' According to this view the Man with the Iron Mask was Count Girolamo Magni, or Mattioli, first minister of the Duke of Mantua, who had betrayed the interests of Louis XIV. by failing to secure for him, as he had pledged himself to do, in consideration of a large bribe, possession from his master of the fortress of Casale. For this offense he was lured to the French frontier, secretly arrested, and imprisoned in the fortress of Pignerol in 1679. The secret was preserved so carefully, on the supposition that Mattioli was the prisoner, because his seizure and detention were flagrant violations of international law. In a more recent investigation by M. Jung, 'La Vérité sur le Masque de Fer' (1873), an attempt is made to identify the Mask with a gentleman of Lorraine, who was connected with an association for the assassination of Louis. Funck-Brentano in 1894 revived the view that Mattioli was the mysterious prisoner, and many now consider the controversy settled and this view established. Consult: Hopkins, 'The Man in the Iron Mask.'

Iron Mountain, Mich., city, county-seat of Dickinson County; on the Chicago, M. & St. P. and the Chicago N. W. R.R.'s; about 47 miles southwest of Marquette and 57 miles west by north of Escanaba. It was settled in 1879 and chartered in 1888. It is the commercial centre for a large mining section in Michigan and for a farming section in Wisconsin. The city government consists of a mayor and council, elected annually. Its trade is principally in iron-ore and farm products. Pop. (1900) 9,242.

Iron Mountain, the southern spur of the St. Francois Mountains, a low range in the eastern part of Missouri. This mountain, which is really a hill or knob, is in St. Francois County, about 60 miles southwest from St. Genevieve, the nearest point on the Mississippi River. It is about 300 feet above the surrounding land and

about 2,000 feet above the sea. It covers an area of 500 acres. It is famous for its remarkable mineral deposits, specular or hematite iron-ore, the purest iron ore in the United States. The average elevation above the land around is 550 feet, and the area it covers is about 500 acres. Large oak trees flourish on its slope, their roots embedded in soil composed largely of fragments of peroxide of iron. Excavations were begun in 1845. An artesian well has been sunk to the depth of 152 feet, with the result that the beds passed through from the surface were as follows: Iron ore mixed with clay, 16 feet; sandstone, 34 feet; magnesian limestone, 7½ inches; gray sandstone, 7½ inches; hard blue rock, 37 feet; pure iron ore 5 feet; porphyritic rock, 7 feet; iron ore 50 feet to the bottom. It would seem that nearly the whole mountain was a mass of magnetic iron ore. The adjacent valleys are underlaid with magnesian limestone in horizontal strata. Pilot Knob (q.v.), about six miles south of Iron Mountain, also contains an extensive deposit of iron ore; Shepherd Mountain, a short distance southwest of Pilot Knob, is the largest of the iron mountains in that immediate vicinity.

Iron Ores. Although iron is the most abundant of the useful metals, forming 5 per cent of the earth's crust, it is rarely found native — one famous native occurrence of it, however, being at Ovifak on the west coast of Greenland. The iron ores of chief commercial importance are hematite, magnetite, limonite, siderite and pyrite. Pure hematite contains 70 per cent iron; magnetite 72.4 per cent; limonite 59.89 per cent; siderite 48.27 per cent; pyrite 46.6 per cent. Iron ores, however, are practically never mined pure, but are mined in quantity averaging 10 per cent and over less iron than above stated, the principal impurities being silica, alumina, and lime.

Hematite, ferric oxide (Fe_2O_3), by far the most important iron ore, varies greatly in physical characteristics. Specular hematite is black, with a brilliant metallic lustre. Martite is a variety of hematite. Magnetite, a ferro-ferric oxide ($FeO.Fe_2O_3$), is black magnetic, and crystallizes in octahedra, but as mined it is usually massive or granular. Ilmenite, an oxide of iron and titanium, is not yet an ore of commercial importance. Franklinite, an oxide of iron, manganese, and zinc, found at Franklin, N. J., is used in making spiegeleisen, an alloy of iron and manganese after the zinc has been removed by roasting. Limonite or brown hematite, hydrated ferric oxide ($2Fe_2O_3.3H_2O$), is brown or yellow in color and occurs in massive, earthy, or in botryoidal forms. Bog-ore is a variety of limonite. Goethite, differing from limonite in crystalline form and containing less water, is found in large quantities in Minnesota. Siderite, or spathic iron, ferrous carbonate ($FeCO_3$), is white to gray when pure, and crystallizes in rhombohedra. As mined, it varies much in appearance, owing to oxidation. Clay iron stone is siderite mingled with clay. Blackband ore is siderite mixed with more or less bituminous matter. Pyrites, ferric disulphide (FeS_2), often called "fool's gold," is used in great quantities to make sulphuric acid. The residue, known as "blue-billy," or pyrites clinker, is in some countries smelted in the blast-furnace as an iron ore.

In smelting an ore the silica, lime, and alumina are removed as slag. Ores high in silica require more limestone in the furnace-charge for fluxing, that is, for combining with the silica. Some ores contain silica and lime in such proportions as to be self-fluxing. The higher the iron content of an ore, generally speaking, the greater the yield per ton of material put through the furnace, and the lower the cost per ton of the iron made.

A very hard ore must be broken into small lumps to give best results in the furnace. Hematites often smelt easier than magnetites. A fine granular ore makes trouble in smelting, and a certain proportion may be lost as dust, which clogs furnace-flues. The really injurious impurities most often found in iron ores are sulphur, phosphorus, and titanium. Sulphur can be largely removed by roasting the ore before smelting; phosphorus cannot, and all the phosphorus in the ore goes into the iron. For making steel by the Bessemer process an ore should contain less than 1–1,000 of its amount of iron; thus, to be classified as Bessemer, an ore containing 61 per cent iron should contain less than .061 per cent phosphorus. For making steel by the basic process, high phosphorus ores are used.

The present development of the world's iron mines is the outcome of many factors. Generally speaking, it is cheaper to bring the ore to the fuel than the fuel to the ore, hence, countries or districts that have great supplies of iron ore may be insignificant producers of pig-iron. Low-priced fuel has been the chief factor in determining the location of iron and steel industries, while the chief factors in the development of iron mines are the quality of the ore and the cost at which it can be put down at the furnace.

Iron-Ore Supplies of the World.— The iron industry in Asia is several thousand years old, but the annual output of iron ore is small. China has vast but little-developed deposits of limonite and hematite. Japan is very poor in iron ores. The iron industry of Australia is not of importance. The only ores exported from Africa are mined in Algeria, where the annual production has fallen to about 150,000 tons. Europe has famous ore fields. The ores of Elba and those of Styria were worked by the Romans. Certain Swedish mines have been worked almost continuously since 1300. The German output now comes chiefly from so-called minette beds of Lorraine and Luxemburg. The ore, a low-grade limonite high in phosphorus, is used in making steel by the basic process, and the present annual output is over 7,000,000 tons annually. The total ore supply left in the field is estimated at nearly 2,000,000,000 tons. The iron fields of Great Britain have passed their greatest productiveness. The principal districts are Cleveland in North Yorkshire, yielding clay ironstone containing about 30 per cent iron; Cumberland and Lancashire, yielding red hematite containing 50 to 60 per cent iron; and Lincolnshire, Leicestershire, and Northampton, yielding cheaply-mined low-grade hematite. The blackband ores of Scotland are of much less importance than formerly. The principal Spanish mines are in the Bilbao district in the province of Biscay, the productive field being 15 miles long and 2½ wide. The ores are red and purple hematite, limonite, and carbonate, the iron content in the crude ores running from 45 to 56 per cent. The district has produced to date about 95,000,000 tons. The greater part of the

Russian ore supply comes from the Ural Mountains, the ores on the east side of the range being magnetite, and on the west side limonite and carbonate. Near Krivoi Rog, in the Caucasus, are mines of hematite and magnetite. Fully 80 per cent of the iron ore of France is obtained from the minette beds of the Moselle that extend into Lorraine and Luxemburg. Most of the French ores are limonites. The principal Austrian iron mines are in Styria, the Styrian Erzberg having one of the largest deposits of siderite in Europe, yielding yearly about 1,000,000 tons of carbonate ore, containing 40 per cent of iron. In Bohemia are mines of magnetite, limonite, and siderite. Sweden has immense deposits of iron ore, chiefly magnetite with some specular hematite. The most important deposits are at Grangsberg in Central Sweden, where are specular hematite and magnetite ores containing 62 to 64 per cent iron and 0.9 to 1.5 per cent phosphorus, and at Gellivare, 100 miles from the Gulf of Bothnia, where are huge bodies of magnetite that run from 68.69 iron and 0.05 phosphorus to 60 per cent iron and 1.5 per cent phosphorus. The ores from this field and the neighboring districts of Kurunavara and Luossavara will be of great importance to British iron-masters, and shipments to the Atlantic seaboard of the United States are quite possible.

WORLD'S PRODUCTION OF IRON ORE — METRIC TONS.

United States	29,350,325	37.7
Germany	16,570,182	21.4
Great Britain	12,475,700	16.1
Russia	6,700,000	8.6
France	4,260,747	5.5
Austria-Hungary	3,623,115	4.7
Sweden	2,793,566	3.6
Other countries	1,800,000	2.4
Total	77,573,635	100.0

The total production was undoubtedly larger, since among the "other countries" are those that collect no returns of mineral output. The figures are for 1901 or 1902.

The iron ore supplies of South America have been little developed, and those of Mexico are just coming into prominence. In the province of Santiago, Cuba, are deposits of high-grade hematite. From there over 690,000 tons were exported to the United States in 1902. At Belle Isle, N. F., beds of hematite are now worked on a large scale. In Ontario, Quebec, and British Columbia are deposits of good hematite and magnetite, and the Dominion will soon be a large producer. There is a possibility of iron ores being mined in Labrador.

The United States leads the world in the production of iron ore. The ores mined range from low grade limonite to the highest grade hematites and magnetites. The purest ore ever mined in the United States in quantity was probably the magnetite from the Lovers Pit at Mineville, N. Y., which ran 72 per cent iron in carload lots, though the Lake Angeline mine at Ishpeming, Mich., has shipped hard hematite running 68 per cent iron and 0.008 phosphorus in thousand-ton lots. Minnesota now leads the States in production, with Michigan second, Alabama third, and Pennsylvania fourth. The chief centre of iron-ore production is about Lake Superior, where the ores occur along five mineral belts or "ranges," in Pre-Cambrian rocks. The Marquette range, in Michigan, was opened in 1856; the Menominee, mostly in Michigan, but partly in Wisconsin, in 1887; the Gogebic, in Michigan and Wisconsin, in 1884; the Vermilion, in Minnesota, in 1884; and the Mesabi, in Minnesota, in 1892. The ores shipped are nearly all red hematite. The Marquette produces some magnetite. As much of the ore is hauled long distances to a furnace, 60 per cent iron was once about as low grade ore as could be shipped profitably, but now some mines ship Bessemer ores containing but 45 per cent iron. The ore-bodies are sometimes of great size. The Chapin mine, on the Menominee range, is working lenses 100 feet wide and 600 feet thick in the middle, and 2,500 feet long. The Fayal mine, on the Mesabi range, in 1902 shipped 1,681,000 tons, and the Chapin in the same year 927,747 tons. The Mesabi deposits are flat-lying, covered by a varying depth of clay, sand, and boulders. By stripping off the surface and working the granular ore with steam-shovels, an enormous output is possible. The output of the various ranges in 1902 was: Mesabi, 13,342,840 long tons; Menominee, 4,627,524; Marquette, 3,853,010; Gogebic, 3,663,484; Vermilion, 2,084,263; making a total of 27,571,121 long tons.

In the South there are three important iron-mining centres — one near Birmingham, Ala., another in southeastern Tennessee, and the third in southwestern Virginia. The ores are red hematites and low-grade limonites. The growth of the Alabama industry is due to cheap ore, limestone and coking-coal being found in close proximity. Pennsylvania leads the Union in the production of magnetite, chiefly from the great ore-body at Cornwall, and also produces much limonite. New York and New Jersey also produce magnetite, and the former State some red hematite. Carbonate ores now come chiefly from Ohio. Of the western States, Colorado produces limonite, and in Utah and Wyoming are great deposits of magnetite and hematite, destined to be of importance in the near future. The famous specular hematite mines at Pilot Knob and Iron Mountain, Mo., are exhausted. Texas has large deposits of ore, and several other States are or will be important producers.

Mining and Handling Iron Ores.— Some extraordinary records of cheap mining and transportation have been made in the Lake Superior iron-ore trade. Large ore-bodies, effi-

UNITED STATES IRON ORE PRODUCTION — IN LONG TONS.

	1880	1890	1900	1902
Lake Superior	1,985,334	7,558,076	19,095,393	27,571,121
Southern States	627,517	2,904,322	5,100,000	4,850,000
Other States	4,884,658	4,056,469	1,758,000	2,215,000
Total	7,497,509	14,518,867	25,953,393	34,636,121

cient labor, and excellent management have been the factors in reducing mining costs, while the long lake-water haul, nearly 900 miles, in specially designed vessels, has made it possible to put down Lake Superior ores at Pittsburg, over 1,100 miles from the mine, at a total transportation cost of under $2 per ton. On the Mesabi range, in some large mines steam-shovels load the ore directly upon the cars, one shovel having loaded 170,000 tons in 26 days, or at the rate of over 6,500 tons per day. The shovels are each operated by five men, and the labor cost for mining and loading averages but about 16c per ton, and at one mine which dug and loaded 293,651 tons in 174 days, the labor cost was only 4c per ton. The loaded ore-trains go 50 to 115 miles to a shipping port. There they are run on to long, high docks having large pockets or bins into which the ore runs through openings in the bottoms of the cars. From these pockets the ore passes by gravity down along chutes into the hold of the vessel, so that no hand-labor is required. The ore-pockets hold about 160 tons each, and number from 90 to 384, according to the length of the dock.

In unloading the ore from the vessels, the use of labor-saving machinery is even more notable. A series of steel bridges, easily moved along the docks, is supplied with hinged arms which can be lowered into the hatch of the vessel. Along each arm and across the bridge runs a trolley-train to which are attached automatic grabs similar to a double scoop. The grab or scoop holds about five tons of ore, and when it begins to draw together it digs into the ore. The grabs can remove over half of the cargo without any assistance, and the remaining half is brought directly under the hatch by use of a scraper, operated by similar machinery. The grabs are so controlled by the engineer that he can drop them at any point over the hold he may wish, and after a grab seizes its load of ore it is raised at full speed, carried rapidly along the trolley to any given point, and dumped into railroad cars or on stock piles. This 5-ton grab has a hoisting speed of 100 ft. a minute, and can run along the bridge at the rate of 1,000 ft. a minute. The bridges to which the arms with their grabs are attached are worked by electricity. By such a device 26 men can do the work of 300 under the old system. Another unloading device, the Hulett unloader, requires even fewer men, and takes out a larger proportion of the cargo without aid.

Bibliography.— Owing to the enormous growth of the iron industry, there is no recent single work covering the production and use of iron ores. Statistics of production can be found in 'The Mineral Industry,' the 'Mineral Resources of the United States,' and the 'Engineering and Mining Journal.' Descriptions of geological occurrence and mining methods can be found in the monographs and bulletins of the United States Geological Survey; and the 'Transactions' of the American Institute of Mining Engineers. See GOETHITE; HEMATITE; ILMENITE; LIMONITE; MAGNETITE; MINING; ORE DEPOSITS.

SAMUEL SANFORD,
Assoc. Editor 'Engineering and Mining Journal.'

Iron Skeleton Construction, a modern system of constructing high buildings, by which architects and builders are enabled to plan and erect buildings as high as 15 or 20 stories on plots of ground 20 to 30 feet wide. By the use of this system the thickness of walls is considerably reduced, thus giving a larger floor space, a very desirable consideration, especially in office buildings. Iron and steel columns are carried up from foundation to roof, and then covered in with bricks or stone. Thus a carrying capacity equal to that of walls of much greater thickness is produced. A 12-story building in New York city thus constructed upon a lot 25 by 100 feet means a saving in floor space of thousands of feet.

Ironclad. See ARMOR-PLATE.

Ironclad Oath, The, an act passed by the United States Congress in 1866, excluding voters, in the States lately in rebellion, from the franchise. The act practically disfranchised all Southerners over 25 years of age. It was repealed shortly after its passage.

Irondale, ī'ėrn-dāl, Wash., a place in the northeastern part of Jefferson County, a few miles south of Port Townsend. The first blast-furnace on the Pacific coast was erected at this place in about 1880. The furnace was in operation about 12 years, and was then abandoned because of the great expenses incurred in production. The ore was obtained from Texada, an island belonging to British Columbia, and 130 miles distant. The last of the 19th century the Pacific Steel Company, a corporation in which practical iron-makers of Pennsylvania are the chief owners, began investigations as to the nature of the ore, and the possibility with improved machinery, to manufacture iron at Irondale or vicinity at paying rates. As a result the Pacific Steel Company have taken up the work abandoned by the Puget Sound Iron Company. The works have been so improved as to be practically new, and 20 brick charcoal kilns have been erected for the use of the company. Coke is obtained in Washington.

Ironton, ī'ėrn-tŏn, Ohio, city, county-seat of Lawrence County; on the Ohio River, and on the Detroit S., the Norfolk & W., and the Cincinnati, H. & D. R.R.'s; about 100 miles directly southeast of Columbus. The Chesapeake & Ohio railroad, in Kentucky, has here a ferry for passengers and freight, which practically gives the city the benefit of four important railroads. Ironton was settled in 1832, and for some years was known as a river-trading town. It was incorporated in 1849. It is situated in a section of country noted for its clay (suitable for pottery), iron ore, and bituminous coal. Its chief industrial establishments are foundries, rolling-mills, blast-furnaces, machine-shops, nail-works, furniture factories, and planing-mills. It has also among its manufactures doors and mantels, stoves, boilers, cement, and fire-bricks. The clay in the vicinity is much used for pottery. The parks, River View, Lincoln, and Beechwood, are attractive. Some of the principal buildings are the Briggs Public Library, the Kingsbury school, Odd Fellows' Hall, Masonic Temple, City hospital, and several churches. Ironton was the home for some time of the artist Sarah Cotter-King. Pop. (1900) 11,868.

Ironweed, a tall, coarse, composite plant of the genus *Vernonia,* three species of which

grow abundantly in woods and along roadsides throughout the southern half of the Union, bearing heads of magenta-colored flowers somewhat like miniature thistles. The most conspicuous species (*V. gigantea*) is often 10 feet high, and blooms in August and September. A similar species (*V. noveboracensis*) grows in low grounds throughout the Northern States.

Ironwood, Mich., city in Gogebic County, on the Wisconsin C. and the Chicago & N. W. R.R.'s; about 12 miles south of Lake Superior and 33 miles southeast of Ashland. It was settled in 1884 and incorporated in 1887. It is situated in a region rich in iron ore and timber; the section is known as the "Gogebic iron region." The famous Norrie mine is in this vicinity. Ironwood is the trade centre for the greater part of the mining and lumbering business of the county. Some of the principal buildings are the Carnegie library, the city-hall, the high school, and several churches. Trolley lines connect the city with Gile and Hurley, Wis. The government is vested in a mayor, who is elected annually, and a council. The mayor appoints, subject to the approval of the council, all the subordinate officials except the members of the board of education. Pop. (1900) 9,705.

Ironwood, a popular name for many trees whose timber is very hard and heavy. Probably the best known species in America is also known as leverwood, *Ostrya Virginica,* of the natural order *Cupuliferæ,* indigenous from Nova Scotia to Florida and westward to Minnesota and Texas. It is a medium sized tree with furrowed bark, birch-like foliage, pistillate flowers in catkins resembling the female flowers of hop, hence its popular name hop-hornbeam. The name ironwood is also sometimes applied to *Carpinus Americana* or *Caroliniana,* of the same natural order. (See HORNBEAM.) Among foreign "ironwoods," perhaps the most widely known is *Mesus ferea,* an East Indian tree planted around Buddhist temples for its fragrant flowers, which are used to decorate the images of Buddha. Another Asiatic species is *Metrosideros vera,* from which the Chinese and Japanese make rubbers. In Australia and South Africa various species of *Olea, Melaleuca, Sideroxylon, Notelaca,* and *Myrtus* are valued for their timber, locally called ironwood, employed where great toughness is desirable and weight no obstacle.

Iroquoian Stock, a linguistic stock of North American Indians deriving their name from the form Iroquois (q.v.), the name given to the "Five Nations." The Saint Lawrence River was probably their first habitat, and from there they gradually spread to the Great Lakes, primarily because of the hostility of the Algonquins. Cartier found, in 1535, a people living between Montreal and Quebec whose language showed them to be Wyandots, but 100 years later these had entirely disappeared and the Algonquins occupied their territory. The Iroquoian stock is divided into four groups: the northern — Wyandot, Tionontati, Wenrorono, Tohotænrat, Neuter, Hochelaga; the central — Mohawk, Oneida, Cayuga, Onondaga, Erie, Conestoga, Seneca; the southern — Tuscarora, Meherrin, Nottaway, Chowanoc, Coree; the Cherokee — Elati or Lower Cherokee, Middle Cherokee, and Atali or Upper Cherokee. The tribes of the Iroquoian stock were all agricultural, and were noted for their houses and fortifications. They have also made considerable advance in education. The whole population is about 43,000, of whom 10,000 are in Canada. The major portion of the population are Cherokee. See IROQUOIS.

Iroquois, ĭr-ō-kwoi', the name given by the French to the confederacy of North American Indians, called by the English the "Five," and afterward the "Six Nations." The Mohawks, Oneidas, Onondagas, Cayugas, Senecas, and Tuscaroras, after they were driven from their hunting-grounds in North Carolina in 1712, were the members of this confederacy. They formerly resided on the Mohawk River in New York State and on the lakes which still bear their names, and extended their conquests to the Mississippi and beyond the St. Lawrence. Their valor and successes had procured them the name of the Romans of America. Their territory abounded with lakes well stored with fish; their forests were filled with game, and they had the advantage of a fertile soil. The sachems owed their authority to public opinion; the general affairs of the confederacy were managed by a great council, composed of the chiefs, which assembled annually at Onondaga. The history of the Iroquois probably dates back to 1535, when Cartier found the peoples who had settled along the shores of the Saint Lawrence River, from Quebec to Montreal, and who, judging from the similarity in languages were undoubtedly the ancestors of the later Iroquois. The Algonquins, who at this time were more powerful, drove those people from their habitations and scattered them throughout the country, some, like the Hurons, traveling west, and the majority, among whom were the Iroquois, going south, settling mainly in North Carolina. Hiawatha, their leader, then persuaded them to form a league or confederacy for their own protection, and the league thus formed became known as the "Five Nations," and was based upon such sound and well-ordered plans that it is in existence at the present time. In 1712 they were driven from their territory in North Carolina and coming north again settled in Central and Western New York. Here they gathered other tribes and merged them into the confederacy; and in 1715 took in the Tuscaroras, after which the league was known as the "Six Nations"; they bought firearms and supplies from the Dutch and gradually strengthened themselves so that in 1630, they took the offensive in a long and bloody war against the Algonquins, first attacking the French missions among the Hurons in Canada and either slaying, capturing, or sending into exile all this tribe; they then rapidly subdued the Neutral Nation, the Erie, the Ottawa, and all the remaining tribes of the Algonquin race; and conquered in quick succession the Conestogas in the south, those east of the Hudson, among whom were the Mohicans, and the Miami and Illinois tribes of the Middle West, the only tribes who successfully opposed them being the Ojibwas of the Northwest and the Cherokees of the South. In the long wars between the British and the French, which continued with some interruption for nearly a century, until 1763, they were with a few exceptions in the British interest. These exceptions were notably the

Cayugas and the Mohawks, over whom the French Jesuit missionaries exercised a great influence, and who later withdrew from the league and settled in the villages of Caughnawaga and Saint Regis. In the Revolution the Iroquois as a league were neutral, but the separate tribes took up the warfare generally in favor of the British, the Oneidas and some of the Tuscaroras being the only ones who sided with the Americans. Brant led the Mohawks and Cayugas into Canada, where, at the end of the war, the Canadian government gave them several reservations, and where a majority of them are at the present time. The reservations for the Iroquois in the United States are mostly in New York, where all now live except the Oneidas, who in 1820 migrated to Wisconsin, and a small band of Senecas, who have a small reservation in the Indian Territory. According to the United States census, and a Canadian report, the total number of the Iroquois in 1902 was about 17,000, of whom about 8,000 were in the United States. See SIX NATIONS, THE.

Irradiation, an apparent enlargement of a bright body when seen against a background darker than itself. A simple method of observing this phenomenon is to view a bright sky through the spaces between a grating. If the breadth of the opening can be made equal to the breadth of the bars of the grating it will be seen that, when viewed from a little distance the bars look narrower than the spaces between them. This is obviously owing to the encroachment of the light upon the dark spaces around it. The first question to arise and one which was long discussed was whether the encroachment was due to an excitation of the nerves of the retina outside the limits on which the light fell upon the nerves, or whether it was necessary that the light should actually fall outside of its geometrical limits. The latter view is found to be the correct one, unless in cases of extreme brilliancy of the light. Irradiation is almost entirely in the nature of an optical defect or aberration of light. It begins with the atmosphere, which, when light passes through long stretches of it, slightly deflects the rays, so that a point is no longer seen as such, but as a small ill-defined waving surface. No lens ever brings the rays from a point to exactly the same focus. The lenses of the eye itself have defects which everyone who consults an oculist is acquainted with. The result of all these imperfections is to produce the enlargement we have described.

Irradiation is a notable subject in the history of astronomical observations. It was necessarily larger with the imperfect telescopes of former times than with the improved ones of our own period. Total eclipses of the sun, the transits of Venus and Mercury were especially productive of the phenomenon. The enlargement of the moon resulted in a star appearing as if within the bright disc of the moon when its light was really only grazing the surface. The sharp points or horns of light formed by the limb of the sun during the transits of Venus and Mercury were rounded off, so as to present quite an illusory view of their form. Just at the beginning and end of total eclipses of the sun the phenomenon known as Bailey's beads, really enlargements of the last points of light from the sun's limb, which could be seen before the sun was quite covered, looked like a string of beads. Many learned memoirs have been written on the subject, but the consensus of opinion to-day is toward the very simple and comprehensive theory above mentioned.

Irrawad'dy. See IRAWADI.

Irredentists, an Italian political party formed in 1878, having for its object the redemption and incorporation into the kingdom of Italy of all those regions near Italy having an Italian-speaking population and which they called "*Italia Irredenta*" (unredeemed Italy). This immense territory included some of the lands now belonging to France, Austria, Switzerland, and England. The immensity of the undertaking was probably the cause of the downfall of the movement, though the formation of the Triple Alliance also gave it a setback, as Austria was the enemy against whom the main efforts of the party were directed.

Irrigation, the watering of land by artificial means to make it productive. Historically, irrigation seems coeval with the earliest attempts to construct complicated machinery, and the systems of irrigation used in the earliest times in the Far East, in Babylonia, and in Egypt, dating in the last-named country 20 centuries before Christ, furnish as important a chapter in the history of invention as in the story of agricultural development. In our times the systems of India (q.v.) and Egypt (see ASSOUAN; NILE) are probably the best organized, being largely under governmental control. In Europe, irrigation is widely used in northern Italy, southern France, and throughout Spain. The British colonial possessions of the southern hemisphere, notably Australia and South Africa, benefit more and more by artificial water-supply.

Early Irrigation in America.— Irrigation was practised in prehistoric times by the town-building Pueblo Indian tribes inhabiting portions of New Mexico and Arizona. The descendants of these Indians still utilize some of the lands which were tilled by irrigation at the time when the Spaniards first came from the south, and practise many of the primitive customs of their ancestors. The Mexicans of mixed Spanish and Indian origin, gradually extending their settlements from the south, through necessity practised irrigation. The early missions of the Pacific coast also used it, and in southern California particularly are to be found the ruins of substantial dams and headworks built of masonry and constructed by Indian labor. But the first systematic application of irrigation in the arid West by English-speaking people was made by the Mormons on the shores of the Great Salt Lake. The soil was so barren that crops could not be raised by ordinary means, and they turned the waters of the little cañon streams upon the ground where Salt Lake City now stands. After many years they succeeded in mastering the art of irrigation, and under the wise rules of Brigham Young, limiting the size of irrigated farms, the Mormons have become a prosperous people. At about the time the Mormons were settling Utah, the gold-miners in California were building ditches for placer-washing, and were using water from these ditches for irrigation. The results obtained attracted public attention, and irrigation slowly

1. Scene in Southern California, showing the furrow method of irrigation.
2. Desert land reclaimed by irrigation, showing recently planted orchards.

developed as an adjunct to mining. With the stoppage of hydraulic mining, the ditches built for mining were either abandoned or used exclusively for irrigation. Many of them have been enlarged, and have now even greater value than in the old days of mining excitement.

Development in the United States.—The successful irrigation attained by the Greeley colony in Colorado, and the wonderful results shown by the Mormon communities in Utah, Idaho, and Arizona greatly stimulated the colony idea; many organizations brought people in large bodies from the Eastern States, and even from Europe, and placed them on small farms located near each other and supplied with water from a common ditch. Individual settlers also sought opportunities for bringing land under cultivation by artificial watering; and thus, at many widely scattered points, irrigation has been introduced. There are no statistics concerning the area irrigated in 1870, but it is probable that in that year there were not over 20,000 acres under irrigation in the whole United States; but 1870–80 saw a rapid development of small ditches, constructed by individuals and associations of farmers. At the end of that period there were probably 1,000,000 acres under irrigation. In the decade 1880–90 occurred the "boom" of speculative enterprise in irrigation canals. Large sums of money were obtained for irrigation works, but nearly all of these failed, and although they aided in the extension of irrigation, they did not enrich the investors. The 11th census showed that in 1889 there were 3,631,381 acres irrigated on 54,136 farms, with an average irrigation area of 67 acres. During the following decade the irrigated acreage doubled in extent. This was due to the extension and enlargement of the many canals existing in 1889, and to the more complete practice of irrigation on the lands under ditch.

In addition to the statistics obtained at the Eleventh (1889), and Twelfth (1899) Censuses, a special investigation was ordered in 1902 of irrigated farms and extent of irrigation in acres in the principal arid States, and also the total in the semiarid States, namely, North and South Dakota, Nebraska, Kansas, Oklahoma, and Texas. These lie east of the truly arid region but extend in parts into regions of deficient rainfall.

NUMBER OF IRRIGATED FARMS.

States	1902	1899	1889
Arizona	3,867	2,981	1,075
California	29,255	25,611	13,732
Colorado	19,688	17,613	9,659
Idaho	10,077	8,987	4,323
Montana	9,496	8,043	3,706
Nevada	2,260	1,906	1,167
New Mexico	9,314	7,884	3,085
Oregon	5,133	4,636	3,150
Utah	21,618	17,924	9,724
Washington	4,585	3,813	1,046
Wyoming	3,721	3,721	1,917
Semiarid States	6,994	4,970	1,552
Total	126,008	107,789	54,136

ACRES IRRIGATED.

States	1902	1899	1889
Arizona	247,249	185,396	63,821
California	1,708,720	1,445,872	1,004,233
Colorado	1,747,332	1,611,271	890,735
Idaho	713,595	602,568	217,005
Montana	1,140,694	951,154	350,582
Nevada	570,001	504,168	224,403
New Mexico	254,945	203,893	91,745
Oregon	439,981	388,310	177,944
Utah	711,184	629,293	263,473
Washington	154,962	135,470	48,799
Wyoming	773,111	605,878	229,676
Semiarid States	372,751	273,117	66,965
Total	9,034,526	7,536,390	3,631,381

National Irrigation Act.—The latest and most important step in American irrigation is marked by the National Irrigation Act, which was passed by Congress in 1902, and received the countenance of President Roosevelt. The act provides for the construction of irrigating works under the control of the secretary of the interior, the funds being derived from the disposal of public lands in the 13 States and 3 Territories. The public land is withdrawn from entry excepting under the Homestead Act. The holdings when reclaimed are to be restricted to between 40 and 160 acres, the area being limited to the acreage which in the opinion of the Secretary may be reasonably required for the support of a family. The cost of the reclamation works is to be apportioned to the reclaimed lands and is to be refunded in not exceeding 10 annual installments, the charges being determined with a view of returning to the Reclamation Fund the estimated cost of construction. For land in private ownership no right to the use of water shall be sold for tract exceeding 160 acres to any one landowner, and he must be an actual resident on or near the land. The result of the law is to give free land under the terms of the Homestead Law and supply water at cost from permanent systems without charging profit or interest to the settler. The management and operation of the irrigation works will ultimately pass to the owners of the lands to be maintained under such rules as may be acceptable to the Secretary, the title and operation of the reservoirs and similar works remaining in the government. It is believed that during each 10 years for the next third of a century an acreage equal to the total now under irrigation in all the West may be added to the agricultural area of the 16 States and Territories affected; thus rapidly multiplying production, furnishing new homes for millions, and providing the food products needed for shipment from the Pacific coast for use in the lands across the Pacific where new markets are now being opened for the surplus products of this country.

Upon the passage of the Reclamation Law in 1902, examinations and surveys were begun in the arid States and construction started in Arizona and Nevada. In Arizona flood water is to be stored on Salt River by a dam below the mouth of Tonto Creek, furnishing a supply for arid lands in the vicinity of Phœnix. In Nevada the flood water of Truckee River is to be diverted by a canal under construction taking it to Carson River, storage being there provided for the excess water of both streams. This will be used upon the desert area in the vicinity of Carson Lake. Other principal projects favorably reported upon are Colorado River in Arizona and California; Gunnison River in Colorado; Snake River in Idaho; Milk River in Montana; North Platte River in Nebraska; Rio Grande and Pecos rivers in New Mexico; Yellowstone River in North Dakota; Umatilla River in Oregon; Belle Fourche in South Dakota; Bear Lake in Utah; Palouse River in Washington, and Shoshone River in Wyoming.

Surface streams supply over 90 per cent of the irrigated land of the United States. Streams within the arid region of the United States rise high, and at one point or another flow for a time through upper valleys or parks. But after passing through rocky defiles to a fertile lower valley, the typical stream of the arid West loses itself in a shallow sandy channel.

Water-Supply and Regulation.— The water used in irrigation is for the most part taken from the river or creek by natural flow or gravity. The cost of lifting or pumping water is usually too great in proportion to the value of crops raised to permit the general use of pumps. Water will flow rapidly in a ditch having a fall of two feet per mile, and the stream supplying the ditch may be falling at a rate of 12 feet per mile. At the end of the first mile the water in the ditch will be 10 feet above that in the river, and at the end of the tenth mile will be 100 feet higher, and will thus cover land which is less than 100 feet in altitude above the stream at this locality. It is usual to construct some device at the upper end of each ditch or canal by which the amount of water entering from the river can be regulated. Without this, flood-waters would fill the ditch beyond its capacity, and would overflow and wash away the banks. In times of low water, also, the stream may fall to such an extent that it must be raised somewhat and forced into the ditch, and at all times it may be necessary to regulate the flow in order to apportion the water fairly to all concerned. In the case of the simplest ditch, a small dam of brush and stone is built diagonally or into or across the stream-bed as the water becomes low in summer, and this is made tight by means of sod and earth. More permanent dams are sometimes built of timber, or masonry. The head-gate or regulator of the canal placed at the end of the dam consists of a stout framework firmly bedded in the earth or rock with one or more openings, each of which can be closed by a gate sliding vertically. The water enters under the gates, the quantity being controlled by raising or lowering them.

A considerable slope can be used for small ditches, since the volume of water is not sufficiently great to move the large particles of sand and gravel. As a general rule, conduits of this character built in common earth should be so proportioned as to have an average velocity of a little less than three feet per second, or two miles per hour, when carrying their full capacity. It is necessary, therefore, to take into consideration the amount of water to be carried and from this deduce the size and shape of the cross-section of the canal or ditch in order to obtain the desired velocity. If the grade be excessive the seepage or loss of water becomes large. The shape of the cross-section of a canal depends largely upon the character of the surface soil. In light or sandy soil, where the earth is easily eroded, very gentle side slopes are given, while in harder materials the side slopes can be steeper. When the fall of the canal is so great that it is impracticable to allow the water to flow freely down the slope, devices known as drops are introduced. These consist of an arrangement whereby the water can drop to a lower level without injury to the canal. Drops are usually built of planks with a sharp overfall edge, and a low dam or obstruction below the fall in order to maintain the pool. Occasionally they are made in the form of an incline, with a pocket at the bottom to break the force of the falling water. They are expensive to build, and difficult to maintain, because of the rapidity with which the timbers decay and the wearing action of the water, which constantly tends to cut exposed portions.

It is necessary in the construction of nearly every ditch or canal to take water across a depression at some point in its course. This is usually done by means of a flume or long box, usually rectangular and supported above the ground by a frame or trestle of timber or iron. Such flumes are often used across rocky ground where it is impracticable to dig a ditch. This is particularly the case near the head, where the water, after being taken from the river, is often carried through a narrow, steep-walled cañon. Here the foundation for a flume is prepared along the rocky cliffs, supports being devised to suit the inequalities of the ground. A better, though more expensive, type of flume is that having a semicircular section, and built of narrow planks or staves laid side by side and held in place by iron bands run around the flume, joined by nuts and threads by which the bands can be drawn up and the staves brought together. In crossing very deep depressions it is necessary to have a correspondingly high trestle in order to carry the flume across on grade. Such high trestles are expensive and liable to destruction from storms. In their place there have been built inverted siphons, wooden stave-pipe, or aqueducts of other form. The stave-pipes are similar in construction to the semicircular frame of narrow plank, carefully planned to a given dimension, and held in place by circular iron bands or hoops.

Application of Water.— The methods of irrigation practised in various parts of the United States differ with the climatic conditions and soil, and especially with the early habits of training of the irrigators. The methods of conserving and applying water have been improved under the stimulus of modern invention, although there has been little if any scientific or well-considered information available. Water is applied to the irrigated field in three ways — by flooding, by furrows, and by sub-irrigation.

Flooding.— This is done by the check system and by wild flooding. By the latter process the irrigator turns the water from a ditch over a level field and completely submerges it. Perfectly level fields are, however, camparatively rare, and the first step in primitive agriculture by irrigation has been to build a low ridge around two or three sides of a slightly sloping field, so that the water is held in ponds. These low banks are commonly known as levees or checks. In construction they are frequently laid out at right angles, dividing the land into a number of compartments. Water is turned from a ditch into the highest of these compartments, and when the ground is flooded the bank of the lower side is cut or a small sluice-way opened, and the water passes into the next field, and so on until each in turn is watered.

Furrows.— Irrigation in checks has gradually been given up, owing to the expense of leveling and leveeing the ground. With experience the irrigator has become able to apply water to crops which are cultivated in furrows, without resorting to such expensive means. The furrows are plowed in such a direction that the water

when turned into them from the lateral ditches will flow freely down them without washing away the soil. When the water has completely filled the furrows, and has reached the lowest points, the little streams are cut off and turned into another set of furrows. The methods of doing this differ. Sometimes the irrigator simply cuts the bank of the distributing ditch with a shovel and then closes the opening after sufficient water has escaped. A more systematic method is commonly employed in California. Water is carried to the furrows in a small box-flume with openings in the side. These openings are closed by little shutters and a number can be opened at once, permitting a certain quantity of water to escape into each furrow. The slope given the furrows determines to a certain extent the amount of water received by the soil. If the fall is very gentle, the water moves slowly and a large portion is absorbed while the furrow is being filled. If steep, the water quickly passes to a lower end and the ground does not absorb so much. When the entire field has been watered the furrows are usually plowed out and a thin layer of the top soil stirred to make an open, porous covering or mulch, preventing excessive evaporation and allowing the air to enter the ground. Without such cultivation a hard crust may be formed. The loosening of this crust breaks the capillary connection with the moisture beneath and thus lessens the loss of water. For irrigating small grain, such as wheat, the ordinary plow furrows are not used. The fields, brought to a uniform surface, are thoroughly cultivated, and after the grain has been sown, small parallel lines are made similar to furrows, but smaller and nearer together. These tiny channels are made either by a peculiar drag or by a roller upon which are projections so arranged as to make small grooves in the soil. These are made in the direction of the desired slope, so that the water can flow down the marks through the grain as it would in furrows through a cornfield. The rapidly growing grain shades the surface and prevents the formation of crust, rendering subsequent cultivation unnecessary. In order to cause the water to spread from the lateral ditches into the furrows through the ground, use is made of the tappoon — a small sheet of metal of such shape as to fit across the ditch. This can be forced into the soft earth, making a small dam and causing the water to back up and overflow the field of grain. Sometimes a canvas dam is used.

Furrow-irrigation is usually employed in watering trees and vines. In some localities, however, basin or pool irrigation is practised. The supply is conducted often in cement-lined ditches and by wooden flumes as near as possible to the trees and vines, and is then turned out into the furrows plowed around or near the trees. The water issuing from small apertures in the side of the wooden box falls into the furrows and is immediately conducted to the vicinity of the trees. Care is usually taken that the water shall not actually touch the tree-trunks, and it is extended far enough about the extremities of the roots to encourage these to spread outward. After the water has traversed the furrows to the lower end of the orchard, the supply is cut off, and the ground is tilled as soon as the surface dries sufficiently.

Sub-Irrigation.— Attempts have been made to conduct the water beneath the surface immediately to the roots of the trees, thus preventing waste by evaporation from the surface of the ground. Few devices have been successful, owing to the fact that the roots of the trees rapidly seek and enter the openings from which the water issues, or, surrounding the pipe by a dense network, cut off the supply. Porous clay tiling has been laid through orchards, and also iron pipes perforated so as to furnish a supply of water along their length. A machine has been invented and successfully used for making cement-pipe in place. Small trenches are dug through the orchard between the trees and the pipe-making machine deposits the material in the trenches, which are filled with earth as soon as the cement is set. Water is thus distributed underground where needed. In orchards where sub-surface irrigation has been unsuccessful because of roots stopping up minute openings beneath the surface, the system has been reconstructed and water has been brought to the surface at or near each tree by means of small hydrants. Vertical pipes are placed at short intervals leading to the level of the ground, and in these are small iron gates or shutters so arranged that the flow can be cut off in the buried pipe. For annual or root crops sub-irrigation has been successfully practised by the use of small iron pipes partly open at the bottom, allowing a small amount of water to escape. These pipes are laid 12 inches or more beneath the surface, and are connected with lines of tile or clay pipes leading from the reservoir or source of supply. As the crops are removed each year, and the ground cultivated, the roots have no opportunity to stop up the pipes. The term sub-irrigation is occasionally applied to conditions occurring in nature where water percolates freely beneath the ground for a considerable distance sufficiently near the surface to supply the need of crops. Where the subsoil transmits water freely, irrigation ditches may sub-irrigate large tracts of country without rendering them marshy. Thus farms may obtain an ample supply of water from ditches half a mile or more away without the necessity of distributing small streams over the surface. In the San Joaquin Valley, California, vineyards in certain localities are thus maintained in good condition, although water has not been visibly applied for many years.

Quantity of Water.— The amount of water required for raising crops varies according to the character of the soil. The plants themselves need a certain minimum supply, but a far larger quantity is required to saturate the surrounding soil to such a degree that the vitalizing processes can continue. Prof. F. H. King of Madison, Wis., has found by direct measurements that from 300 to 500 pounds of water are required for each pound of dry matter produced. When the ground is first irrigated an enormous quantity of water is sometimes required to saturate the subsoil. The quantity of water turned upon the surface during the first year or two has frequently been sufficient to cover the ground to a depth of 10 to 20 feet, and in some cases an amount equal to a depth of 5 feet or more per annum has been thus employed for several years. Gradually, however, the dry soil is filled. The pioneers of irrigation frequently use too much water, often to their disadvantage.

The quantity of water used in irrigation is usually stated in one of two ways: (1) In

terms of depth of water on the surface; (2) in quantities of flowing water through the irrigating season. In the humid regions the rainfall is usually from three to four inches per month during the crop season. In the arid region, where the sunlight is more continuous, and the evaporation greater, there should be for the ordinary crops at least enough water during the growing season to cover the ground from four to six inches in depth each month. The second method of stating the quantities necessary for irrigation is of convenience when considering a stream upon which there is no storage. It is estimated that one cubic foot per second, flowing through an irrigating season of 90 days, will irrigate 100 acres. One second-foot will cover an acre nearly two feet deep during 24 hours, and in 90 days it will cover 180 acres one foot deep, or 100 acres to a depth of 1.8 feet, or 21.6 inches. This is equivalent to a depth of water of a little over seven inches per month during the season of 90 days. Successive years of deficient rainfall in southern California from 1897 to 1900 served to prove that, with careful cultivation, crops, orchards, and vineyards can be maintained by using very small quantities of water. In some cases an amount not exceeding six inches in depth was applied during the year, this being conducted directly to the plants, and the ground kept carefully tilled and free from weeds. As estimated by various water companies in southern California, one miner's inch of water will irrigate from five to ten acres, the miner's inch equaling 12.960 gallons in 24 hours, or almost exactly 0.02 second-foot, this being the amount delivered under a 4-inch head, measured from the centre of the opening. Under this assumption one second-foot should irrigate from 250 to 500 acres. If it be assumed that one miner's inch is allowed for ten acres, or one second-foot for 500 acres, this quantity of water flowing from May to October, inclusive, will cover the ground to a depth of a little over seven tenths of a foot. The method of applying water largely governs the amount used. With alfalfa flooding is practised; with small grains the water is run in furrows; while with orchards the water is sometimes applied directly to each tree, or is run in furrows, four or five in each case between two rows of trees.

The annual charges for water by the acre in southern California, where this economy of water is practised, have been as low as $3, and from this rising to $15 or more per acre. For good farming in parts of the arid region outside of southern California, a depth of from 24 to 30 inches of water during the crop season should be sufficient. The usual charge for this quantity is from $1.00 to $2.00 per acre irrigated per annum. The temperature and the wind-movement introduce so many conditions that broad statements of this kind are merely suggestive, and not to be followed as rules.

Where an excessive amount of water is put upon irrigated land, as high as 70 per cent has been known to pass by seepage to the lower grounds. Growing plants evaporate in many cases 300 times their own weight of water each year. If a crop be carelessly cultivated and weeds allowed to grow with plants, the worthless plants waste as much water as is used by those that are valuable. But with careful cultivation the evaporation is lessened and the waste of water is prevented. Thus the quantity of water required is only one half or one third of the amount needed where the farming is carelessly done.

Users' Rights.— The first settlers frequently laid claim to the whole flow of the stream. Soon after the first ditch was built others were constructed a few miles above or below. As long as the stream is of sufficient volume to fill each of the ditches, no difficulties from this arise; but sooner or later the increasing size and number of ditches and canals result in diminishing the flow in the river to such an extent that it becomes low, and water does not reach the ditches farthest downstream.

The result has been that in many parts of the arid region, owing to scarcity of water, lawlessness has prevailed, and every man has endeavored to obtain for his own crops as much as possible of the scanty supply. Usually the irrigators elected a water-master to apportion to each claimant a certain amount of water, or assign certain days or hours upon which water can be used. Often the quantity of the water has been settled only after vexatious lawsuits or neighborhood quarrels. In some parts of the arid region, notably in Wyoming and Colorado and Idaho, the States have undertaken the regulation of disputes, and have created special boards or tribunals to consider the matter and apportion water.

Methods of Obtaining Water.— In the arid region water can be obtained frequently by digging or boring wells at points near stream-channels or along the foot-hills. Out on the broad valleys it may be necessary to go to a depth of from 100 to 300 feet or more before reaching moisture. Where the supply of water from wells is ample, various devices have been employed, such as windmills and gasoline engines, for bringing it to the surface. It is very important to continue the borings through the water-bearing sands or gravel, so as to take advantage of the full thickness of the pervious deposits. Perforated pipe is often driven into the layers of coarse gravel, and adds greatly to the capacity of the well. Artesian or flowing wells may be sunk wherever water held under pressure in pervious material is overlaid by clay. In a well dug through the impervious layer into the gravel the water will rise to a height equal to the line of saturation of the gravel stratum in the surrounding country. Artesian conditions occur in nearly every State, but they do not extend over any considerable portion of the country, excepting on the Great Plains and in California. Wherever they occur the water has especial value on account of the convenience incident to its rising above the surface. In some places, as the James River Valley of South Dakota, the pressure is 100 pounds or more to the square inch, throwing the water to a considerable height and enabling the wells to be used as sources of power. The quantity of water to be had from deep wells is governed by the diameter of the well, the structure and thickness of the water-bearing rocks, and the pressure sustained by the water. With relatively dense rocks a slight head of water will throw only a feeble stream, but from thick layers of open gravel or sand rock large volumes are delivered. It frequently occurs that a 4-

rises. Selby has shown it to be a consequence of the principles of thermodynamics that the amount by which the surface tension changes should be proportional to the change in the absolute temperature. Most of the older measurements of the temperature coefficients do not confirm this conclusion, but the recent observations of Knipp on water, and of Feustel on various organic liquids are in agreement with it.

The magnitudes of the constants of capillarity manifestly depend on the magnitudes of the forces between molecules and on the range of molecular action. The theory of van der Waals leads to an estimate of the molecular pressure within a liquid, the values obtained for it ranging from 1,430 atmospheres in the case of ether to 10,700 atmospheres in the case of water. The same theory indicates that the range of molecular action is proportional to the linear dimensions of the molecule, and is of about the same magnitude as the radius of the molecule. By the help of a modified form of this theory, Eötvös came to the conclusion that the rate of variation with the temperature of the product of the surface tension and the two-thirds power of the molecular volume should be constant, and the same for all liquids, within a certain temperature range, if their molecules are single, and not double or compound. Observation shows that this law holds true for many liquids, and in cases in which it fails, there are often other reasons to support the conclusion that the molecules of the liquid are compound.

Before closing, we may consider a few examples of the effects produced by surface tension.

When waves are set up on the surface of water, they are transmitted across the surface at a rate which depends on the hydrostatic pressure and on the surface tension. The surface tension is practically the only agent in transmitting the waves when they are very short. Such waves may be set up by the use of a vibrating tuning fork, and the measurement of their lengths furnishes a means for the determination of the value of the surface tension. The ripples set up on the smooth surface of a pond by a breath of air, or which proceed in front of a slowly moving boat, are largely due to surface tension.

When a glass tumbler is partly filled with water, the surface tension draws the water up the sides. As more water is carefully poured in, the line of contact rises until it reaches the edge of the glass. It often happens that the line of contact is checked at the edge, so that the water does not run out over the top of the glass. In this case the glass can be filled above the level of its edge, and the water will stand in it under a surface that is convex upward, the surface tension in which keeps the water from running out.

The surface tension in the convex surface of the mercury in the tube of a barometer produces a pressure downward, which has to be estimated and allowed for when accurate observations are to be made.

A fine needle that has been slightly oiled or greased, if laid gently down on the surface of water, will float there. It lies in a concave trough formed in the water surface. The water cannot wet the needle, because of its coating of oil, and so the needle is supported by the uplift due to the surface tension acting in the concave surface in which the needle rests. In a way generally similar, the insects which run over the surface of water are supported in little hollows in the water surface. Their feet are not wetted by the water.

When two light bodies, floating on the surface of a liquid, are moved toward each other until the curved parts of the liquid surface near them intersect, they seem to exert forces on each other. If they are both wetted by the liquid, or are both not wetted by it, they move together and adhere to each other. If one of them is wetted by the liquid and the other not, they move apart. If water is run in between two parallel sheets of plate glass, they are drawn closely together and adhere very strongly to each other. These actions are ascribed to differences in the pressures on opposite sides of the bodies. In case the bodies are wetted by the liquid, the pressure in the region between them, in the elevated portion of the liquid under its concave surface, is less than the pressure on their outer sides, and they are pushed together. This action takes place even in a vacuum, in which case the pressure under the concave surface is a negative pressure or tension. In case the bodies are not wetted by the liquid, the liquid is depressed between them, and the pressure inward on their outer sides is greater than that acting outward, and they are pushed together. A curious effect, predicted by Laplace from the theory of capillarity, and verified by experiment, is exhibited by two bodies, one of which is wetted by the liquid and the other not. These bodies, as the distance between them is diminished, at first appear to repel each other, but as the distance is reduced the repulsion changes to an attraction and the bodies come together.

If a small lump of camphor is dropped on clean water, it begins to move about over the surface in an irregular way, and continues to do so, generally, for some time. These motions are explained by noticing that one part of the lump of camphor dissolves more freely than the rest, and so, near it, the surface tension of the water surface is lowered below that near the other parts of the lump. The camphor is accordingly drawn toward that part of the surface in which the tension is greatest.

If a thread of water is at rest in a horizontal capillary tube, and one of its two end surfaces is touched by a wire that has been dipped in turpentine or benzine, the tension at that end will be diminished, and the greater tension of the other end will draw the water along the tube. This effect is taken advantage of in cleaning off grease spots from cloth. The surface tension of benzine is very low, and when benzine is applied in a gradually narrowing ring around the spot of grease, the grease is drawn in toward the centre of the ring, and if the cloth is laid on a piece of blotting paper, the grease will be taken up by it. This action is promoted if a hot iron is applied to the other side of the cloth, for the heat lessens the tension in the ends of the pores nearest the iron, and the greater tension at the other ends draws the grease into the blotting paper.

William Francis Magie,
Professor of Physics, Princeton University.

Capilupi, Camillo, Italian poet: b. Mantau in the early part of the 16th century. He was the author of a work issued in 1572 entitled 'The Stratagem of Charles IX. against the Huguenots,' in which the Massacre of St. Bartholomew was justified, and made it appear that the action was premeditated. Cardinal Lorraine, who at the time was attending the Pope in Rome, endeavored to suppress the book from motives of policy.

Capistrano, Giovanni di, jō-vän'nē dē kä-pē-strä'nō, or **Capistranus, Johannes, Saint,** Italian monk: b. Capistrano, a small Neapolitan town of the Abruzzi, 24 June 1386; d. Illock, Slavonia, 23 Oct. 1456. He at first studied law, but in his 30th year, impelled by a vision, entered the Franciscan order, and was soon distinguished by the austerity of his manners, and a great zeal against the numerous heretical sects in Italy. The Popes Martin V., Eugene IV., and Felix V., often employed him as legate and inquisitor in suppressing the sect of the Fraticelli, which had spread widely over Naples and the Papal States. In 1444 he became vicar-general of the strict order of Franciscans called Observants, and in 1450 proceeded as legate to Germany with a view to suppress the Hussites, and rouse the Germans to a crusade against the Turks. Although he was successful in his opposition to the Hussites in Moravia, he was expelled from Bohemia by George Podiebrad. His fanaticism often led him into many acts of cruelty, one of the worst being the racking and burning of 40 Jews in Breslau, on the charge of profaning the Host. His harangues in favor of a crusade against the Turks failing to make much impression on the German princes he resolved to try their effect on the populace, and easily persuaded great numbers to join him in marching against the Turks, who were advancing under Mohammed II., and had closely invested Belgrade, the key of Hungary, with an army of 150,000 men. At the instigation of Capistranus, John Corvinus Hunnyades furnished a force of 60,000, destroyed the Turkish fleet on the Danube, and threw into Belgrade succors both of men and provisions. On this expedition Capistranus in person commanded the left wing of the party, forced his way into Belgrade, repulsed a general assault by the Turks, and on 6 Aug. 1456, in conjunction with Hunnyades, signally defeated the whole Turkish host. His exertions, and the pestilential atmosphere caused by the dead bodies lying unburied around Belgrade, laid him on a sick-bed, and he died in the same year in the Franciscan monastery at Illock. He was canonized in 1690. He was the author of 'Speculum Conscientiæ.'

Capisucchi, kā-pe-sook'kē, or **Capizucca, Biago,** or **Biasio,** Marquis of Monterio, Italian general: b. Rome about the middle of the 16th century; d. 1613. He was in the service of Spain in the Low Countries, under the Duke of Parma, in 1584, afterward becoming lieutenant-general and commander of the army of Ferdinand I. de Medici, duke of Tuscany.

Capisucchi, Paolo, Italian ecclesiastic: b. Rome 1479; d. there 1539. Having become bishop of Neocastro he was summoned to Rome by Clement VII., who referred to him the question of a divorce between Henry VIII. of England and Queen Catherine. In this matter Capisucchi made a report against Henry.

Capital, in architecture the uppermost member of a column, that is to say, a separate piece of stone set upon the shaft and supporting an epistyle or the abutment of an arch — in short the mass of the building which is imposed upon the column.

A column must always have a shaft and a capital; without these features it would be a post, perhaps a pillar or a pier, but would have no architectural character. The capital, moreover, has generally received the most elaborate decorative treatment of the whole composition. Thus in Egypt, while the shaft might be cylindrical or conical, the capital would spread out immediately in curves either concave or convex, and would be carved and painted. It is even practicable to divide Egyptian columns into four orders by their capitals, which spread in different ways, and are ornamented by different sculpture, more or less imitative of nature. The idea of the spread given to the capital is, of course, that in this way the superstructure is taken more easily, as it is always and of necessity much larger horizontally than the column itself.

The stone uprights left in rock-cut temples in India and called ordinarily pillars, because of their varied forms — octagonal, square, and the like — are still divided into shaft and capital, though the forms of these are entirely remote from Egyptian or later European examples. Thus, some capitals consist of a mere enrichment of the uppermost band of the shaft and a superincumbent block very elaborately carved. In some cases this upper block gives off corbels and consoles which help to carry the roof by their greater spread.

The capitals which have excited the most interest among European students of art are those of the three Greek orders and of the five Renaissance orders which were deduced from the first three. The capital of the Grecian Doric is a reversed cone rounded off at top and carrying a square plinth or die; this plain *echinus* was richly painted in bright colors. The capital of the Ionic order is a curious device consisting of scrolls or volutes, two on each of the two opposite sides, so that this capital, almost alone, has not the same appearance from every point of view. The capital of the Corinthian order is a circular bell, surrounded by acanthus leaves and having at each corner a couple of projecting scrolls not unlike those of the Ionic order but small. This Corinthian order received many modifications in ancient Roman practice, and one of these was erected by the Renaissance men into a separate order, the so called Composite. From the Grecian Doric the Roman Doric took shape, and this was used by the Renaissance men, while a still simpler order was made from it and called the Tuscan. The capitals of these two orders are very thin and low in vertical measurement, and consist of moldings running round the continuation of the shaft, and either plain or slightly carved into the simplest of the egg and dart moldings or the like.

In mediæval architecture, both Romanesque and Gothic, the capitals are almost infinitely varied. The strong tendency of the time toward elaborate carving made this block of stone, from 5 to 20 feet above the aisles and in a prominent place, a most tempting vehicle for sculpture, and

the abandonment of the classical orders left every artist free to design his own system of leafage, animal forms and the like. In this way mediæval capitals are often of extraordinary beauty; but no attempt has been made to classify them except as they form part of a style. See COLUMN.

RUSSELL STURGIS.

Capital, in political economy, the accumulated wealth, in possession of individuals or of a community, which is available for use in further production. In estimating the capital of any individual we necessarily take into consideration the debts due to and from him; and many men of large capital are only possessed of claims upon others; their whole stock is in the hands of others at interest; and they have only promises for a certain amount of money, and actually possess neither lands nor goods to any considerable value; while others possess large quantities of both, and yet have little or no capital, since they owe in money the value of the greater part or the whole of their possessions. Now it is plain that no individual can undertake production, to any large extent, without an extensive stock. He must have land to cultivate, or materials to work up, and implements to work with. Even a savage must have a capital, such as his hut, clothes, cooking utensils, food enough to support him until he can obtain a new supply, and implements, such as a hatchet, gun, canoe, fishing gear, to procure this supply. The first effort of industry is to supply the implements, apparatus, and machinery for his own employment; and as society and the arts advance, and the operations of industry are extended, the implements, apparatus, machinery, and materials requisite in conducting the processes of production must be proportionally accumulated; and these will constitute a part of the capital of a community, and also of an individual, which is essential to success in productive processes. And these can be commanded by any one in proportion to the extent of his individual capital; or, if he have credit, then his resources for production will depend upon the capital of others — in other words, that of the community to which he belongs.

In considering the aggregate capital of a community we may put out of the question all the debts due from any of the members to others; for, whether these be great or small — and they will vary according as the practice of giving credit is more or less in use — still the capital of the community will consist in its lands, buildings, ships, machinery, materials on hand, implements; in short, in all those things which bear a value in the market. Provided the community owes no debt abroad, these will constitute its aggregate capital; and, if its members are indebted abroad, we find its actual net capital, as in the case of an individual, by deducting the amount of its debts from the value of its possessions, without regarding the debts due from some of its members to others.

Capital has long been recognized as necessary as an auxiliary to labor, despite the fact that in more recent times it has been urged by unscholarly writers and by demagogues that capital is really the tyrant of labor and that the latter could readily dispense with it. The cultivator of the soil demands a spade or a plow, the blacksmith an anvil, hammer, and bellows, etc. All trades and industries demand certain instruments,— tools, raw material, every kind of supplies, and all these are capital. This, being true on a more primitive basis, is proportionately truer in a civilized state, where labor is complicated and returns are not immediate. "In that rude state of society," says Adam Smith, "in which there is no division of labor, in which exchanges are seldom made, and in which every man provides everything for himself, it is not necessary that any stock should be stored up in order to carry on the business of the society. . . . But when the division of labor has once been thoroughly introduced, the produce of a man's own labor can supply but a very small part of his occasional wants. The far greater part of them are supplied with the produce of other men's labor, which he purchases with the produce, or, what is the same thing, with the price of the produce of his own. But this purchase cannot be made till such time as the produce of his own labor has not only been completed but sold. A stock of goods of different kinds, therefore, must be stored up somewhere sufficient to maintain him and to supply him with the materials and tools of his work." At any given time, capital may be arranged under the three heads above indicated — subsistence, tools, and materials.

An owner of capital, possessing an amount larger than he is capable of using in his own work, obtains the labor of others. He either attempts an industry with the assistance of workmen to whom he pays a remuneration agreed upon, or diverts a portion of his capital as a loan, or as stock, or in some other way, such capital being made effective by others. On the contrary one not possessing capital adequate to the useful employment of his activities, undertakes the combination of his labor with the capital of another. This combination may vary according to circumstances, and may of course be at times unfavorable to labor.

Capital is distinguished into floating or movable, and fixed; the former consisting of things that may be transferred by delivery of any kind from place to place, the latter of land, houses, and other property which must be taken delivery of in the place where they stand. Another use of the distinction is made to represent the difference between the permanent plant of a business and the current capital necessary to carry it on. Capital may thus be said to be fixed either when it is physically incapable of being moved, or when it is rendered immovable by the permanent arrangement of its owner. Thus one carrying on a flour-mill wants a floating or disposable capital, over and above the cost of his works, to be invested in wheat to be floured, and flour not yet disposed of. This instance illustrates what is meant by the floating or disposable capital of a whole community, being that movable exchangeable stock of things on hand, over and above the fixtures and apparatus of production, including lands, buildings, ships, working animals, all the implements of the arts, with necessary food, clothing, and a stock of seed sufficient for the time requisite for reproduction. What remains over these is the disposable capital, and, in a flourishing community, the disposable floating capital is constantly invested in new fixed capital, implements and apparatus of production. A declining community, on the contrary, consumes a part of its implements and apparatus of in-

dustry; or what is in effect the same thing, it does not repair and replace the damage of use and decay. The idea is held out in many economical treatises that a community cannot have a surplus capital; that is, it cannot have more capital than it can make use of in its consumption and reproduction. As no grounds whatever are given for this doctrine, it seems to be hardly entitled to a consideration; for the position is certainly, at the first view, very improbable, since we know very well that men may accumulate; and why they may not, in any possible case, accumulate a surplus, does not appear by any plausible reason, and whether such surplus accumulation may be useful or not will depend entirely upon the kind of articles of which such accumulation consists. If it consist in articles the value of which depends on the prices in foreign markets the excess may be of no value at all; for it may so depress the foreign prices as to countervail all the direct advantage arising from the cheaper supply, for a time, of the domestic demand.

Fictitious capital generally means nothing more nor less than excessive credits, which throw the management and disposition of a great deal of property into the hands of persons who are not able to answer for the risks of loss from its bad management, or other causes. A whole community, in the aggregate, can have fictitious capital only in case of its members having an excessive credit in a foreign country. But the members may, among themselves, have a fictitious capital by too great credits in their dealings with each other, and the fiction, in this case, is in their false promises of payment. See Political Economy; Trusts; Wages.

Capital (*Das Kapital*), a noted work by Karl Marx, published in 1867. English translation edited by Fred Engels, 1887. A book of the first importance, by the founder of international socialism. The conservative aspect of Marx's teaching is in the fact that he honestly seeks to understand what, apart from any man's opinion or theory, the historical development actually is; and that he does not think out and urge his own ideal programme of social reform, but strives to understand and to make understood what must inevitably take place.

Capital Punishment (Latin, *caput*, "the head"; hence *capitalis*, "pertaining to or affecting the head"; hence "affecting the life"), the punishment of death. The questions most commonly discussed by philosophers and jurists under this head are: (1) as to the right of governments to inflict the punishment of death; (2) as to the expediency of such punishment; (3) as to the crimes to which, if any, it may be most properly confined and limited; (4) as to the manner in which it should be inflicted.

1. As to the right of inflicting the punishment of death. This has been doubted by some distinguished persons; and the doubt is often the accompaniment of a highly cultivated mind, inclined to the indulgence of a romantic sensibility, and believing in human perfectibility. The right of society to punish offenses against its safety and good order will scarcely be doubted by any considerate person. In a state of nature individuals have a right to guard themselves from injury, and to repel all aggressions by a force or precaution adequate to the object. This results from the right of self-preservation. If a person attempts to take away my life, I have, doubtless, a right to protect myself against the attempt by all reasonable means. If I cannot secure myself but by taking the life of the assailant, I have a right to take it. It would otherwise follow that I must submit to a wrong, and lose my life rather than preserve it by the means adequate to maintain it. It cannot, then, be denied, that in a state of nature men may repel force by force, and may even justly take away life, if necessary, to preserve their own. When men enter society, the right to protect themselves from injury and to redress wrongs is transferred generally from the individuals to the community. We say that it is generally so, because it must be obvious that in many cases the natural right of self-defense must remain. If a robber attacks one on the highway, or attempts to murder him, it is clear that he has a right to repel the assault, and to take the life of the assailant if necessary for his safety; since society in such a case could not afford him any adequate and prompt redress. The necessity of instant relief, and of instant application of force, justifies the act, and is recognized in all civilized communities. When the right of society is once admitted to punish for offenses, it seems difficult to assign any limits to the exercise of that right, short of what the exigencies of society require. If a state have a right to protect itself and its citizens in the enjoyment of its privileges and its peace, it must have a right to apply means adequate to this object. The object of human punishments is, or may be, threefold: (1) to reform the offender; (2) to deter others from offending; and (3) to secure the safety of the community, by depriving the offender of the power of doing mischief. The first consideration rarely enters into human legislation, because of the inadequacy of our means to produce great moral results by the infliction of punishment. The two latter considerations enter largely into the theory and practice of legislation. Who is to be the judge in such cases? what is the adequate punishment for any offense? Certainly punishments ought not to be inflicted which are utterly disproportionate to the offense, and beyond the exigencies of society. No government has a right to punish cruelly and wantonly and from mere revenge; but still, the discretion must be vested somewhere, to say what shall be the degree of punishment to be assigned to a particular offense. That discretion must be, from its nature, justly a part of the legislative power, and to be exercised according to the actual state of society. It may,— nay, it must,— be differently exercised in different ages and in different countries; for the same punishment which in one age or country may be sufficient to suppress an offense, or render it comparatively harmless, may, in another age or country, wholly fail of the effect. If mild punishments fail of effect, more severe ones must be resorted to if the offense be of a nature which affects society in its vital principles, or safety, or interests. The very frequency of a crime must often furnish a very strong ground for severe punishment, not only as it furnishes proof that the present punishment is insufficient to deter men from committing it, but from the increased necessity of protecting society against dangerous crimes. But it is often said that life is the gift of God,

and therefore it cannot justly be taken away, either by the party himself or another. If he cannot take it away, he cannot confer that power on others. But the fallacy of this argument is obvious. Life is no more the gift of God than other personal endowments or rights. A man has, by the gift of God, a right to personal liberty and locomotion, as well as to life; to eat and drink and breathe at large, as well as to exist, yet no one doubts that, by way of punishment, he may be confined in a solitary cell; that he may be perpetually imprisoned or deprived of free air, or compelled to live on bread and water. In short, no one doubts that he may be restrained in the exercise of any privileges or natural rights short of taking his life. Yet the reasoning, if worth anything, extends to all these cases in an equal degree. If, by his crimes, a man may justly forfeit his personal rights, why not his life? But we have seen that it is not true, even in a state of nature, that a man's life may not be taken away by another if the necessity of the case requires it. Why, then, may not society do the same if its own safety requires it? Is the safety of one person more important than the safety of the whole community? Then, again, as to a man's inability to confer on others a right which he does not himself possess. Suppose it is so; the consequence which is deduced from this does not, in fact, arise. Blackstone, indeed, seems to deduce the right of society to punish capital offenses in certain cases (that is, in cases of *mala prohibita* and not *mala in se*) from the consent of the offenders. The Marquis Beccaria, on the other hand, denies than any such consent can confer the right, and therefore objects to its existence. But the notion of consent is, in nearly all cases, a mere theory, having no foundation in fact. If a foreigner comes into a country and commits a crime at his first entrance, it is a very forced construction to say that he consents to be bound by its laws. If a pirate commits piracy, it is absurd to say that he consents to the right of all nations to punish him for it. The true and rational ground on which the right rests is not the consent of the offender, but the right of every society to protect its own peace, interests, property, and institutions, and the utter want of any right in other persons to disturb, or destroy, or subtract them. The right flows, not from consent, but from the legitimate institution of society. If men have a right to form a society for mutual benefit and security, they have a right to punish other persons who would overthrow it. There are many cases where a state authorizes life to be taken away, the lawfulness of which is not doubted. No reasonable man doubts the right of a nation, in a just war, especially of self-defense, to repel force by force and to take away the lives of its enemies. And the right is not confined to repelling present force, but it extends to precautionary measures which are necessary for the ultimate safety of the nation. In such a war a nation may justly insist upon the sacrifice of the lives of its own citizens, however innocent, for the purpose of ensuring its own safety. Accordingly we find that all nations enrol militia and employ troops for war, and require them to hazard their lives for the preservation of the state. In these cases life is freely sacrificed by the nation; and the laws enacted for such purposes are deemed just exercises of power. If so, why may not life be taken away by way of punishment if the safety of society requires it? If a nation may authorize, in war, the destruction of thousands, why may it not authorize the destruction of a single life, if self-preservation require it? The mistake, however, is in supposing that life cannot be taken away without the consent of the party. If the foregoing reasoning be correct, such consent is neither supposed nor necessary. In truth, the supposition of an original compact between all the persons who are subject to the regulations of a society, by their own free consent, as the necessary and proper basis on which all the rights of such society depend, is at best a gratuitous supposition, and it sometimes leads to very incorrect results. It may be added that the Scriptures most clearly recognize and justify the infliction of capital punishments in certain cases.

2. As to the expediency of capital punishment. This opens a wide field for discussion. Some able men who do not doubt the right do still deny the expediency of inflicting it. It may be admitted that a wise legislature ought to be slow in affixing such a punishment to any but very enormous and dangerous crimes. The frequency of a crime is not of itself a sufficient reason for resorting to such a punishment. It should be a crime of great atrocity and danger to society, and one which cannot otherwise be effectually guarded against. In affixing punishments to any offense, we should consider what are the objects and ends of punishment. It is clear that capital punishment can have no effect in reforming the offender himself. It may have, and ordinarily does have, the effect of deterring others from committing a like offense; but still, human experience shows that even this punishment, when inflicted for small offenses, which are easily perpetrated, and to which there is great temptation, does not always operate as an effectual terror. Men are sometimes hardened by the frequent spectacles of capital punishments and grow indifferent to them. Familiarity deprives them of their horror. The bloodiest codes are not those which have most effectually suppressed offenses. Besides, public opinion has great weight in producing the acquittal or condemnation of offenders. If a punishment be grossly disproportionate to the offense, if it shock human feelings, there arises, insensibly, a sympathy for the victim and a desire to screen him from punishment; so that, as far as certainty of punishment operates to deter from crimes, the object of the legislature is often thus defeated. It may be added that a reasonable doubt may fairly be entertained whether any society can lawfully exercise the power of punishing beyond what the just exigencies of that society require. On the other hand, a total abolition of capital punishments would, in some cases at least, expose society to the risk of deep and vital injuries. A man who has committed murder deliberately has proved himself unfit for society and regardless of all the duties which belong to it. The safety of society is most effectually guarded by cutting him off from the power of doing further mischief. If his life be not taken away, the only other means left are confinement for life or transportation and exile for life. Neither of these is a perfect security against the commission of other crimes, and may not always be

within the power of a nation without great inconvenience and great expense to itself. It is true that the latter punishments leave open the chance of reform to the offender, which is indeed but too often a mere delusion; but, on the other hand, they greatly diminish the influence of another salutary principle, the deterring of others from committing like crimes. It seems to us therefore that it is difficult to maintain the proposition that capital punishments are at all times and under all considerations inexpedient. It may rather be affirmed that in some cases they are absolutely indispensable to the safety and good order of society. Some states have, however, entirely abolished capital punishment, as is the case in Holland, Rumania, Portugal, a certain number of the Swiss cantons, and some States of the American Union. It was entirely abolished in Switzerland in 1874, but a few years after, owing to the increase of murders, it was again made permissible. It was also for a time done away with in Austria and in one or two of the States of this country.

3. As to the crimes to which capital punishments may most properly be limited. From what has been already said it is plain that this must depend upon the particular circumstances of every age and nation; and much must be left to the exercise of a sound discretion on the part of the legislature. As a general rule humanity forbids such punishments to be applied to any but crimes of very great enormity and danger to individuals or the state. If any crimes can be effectually suppressed by moderate means, these ought certainly to be first resorted to. The experience, however, of most nations, if we may judge from the nature and extent of their criminal legislation, seems to disprove the opinion so often indulged by philanthropists that capital punishments are wholly unnecessary. The codes of most civilized nations used to abound with capital punishments. That of Great Britain long continued to be very sanguinary. Blackstone, in his 'Commentaries,' admits that in his time not less than 160 crimes were by the English law punishable with death. Forgery was one of these up to the reign of William IV. The only crimes for which capital punishment may now be inflicted, according to the law of England, are high treason and murder. The law in Scotland is substantially the same, a sentence of capital punishment now being competent only in cases of treason, murder, and attempts to murder in certain cases. By United States statutes nine crimes are so punishable, including treason, murder, arson, rape, piracy, and robbery of the mail. In several States of the Union still fewer crimes are generally punishable with death. Beyond treason, murder, arson, piracy, highway robbery, burglary, rape, and some other offenses of great enormity and of a kindred character, it is extremely questionable whether there can be necessity or expediency in applying so great a severity. Beccaria, with his characteristic humanity and sagacity, has strongly urged that the certainty of punishment is more important to deter from crimes than the severity of it.

4. As to the manner of inflicting the punishment of death. This has been different in different countries, and in different stages of civilization in the same countries. Barbarous nations are generally inclined to severe and vindictive punishments; and, where they punish with death, to aggravate it by prolonging the sufferings of the victim with ingenious devices in cruelty. And even in civilized countries, in cases of a political nature or of very great atrocity, the punishment has been sometimes inflicted with many horrible accompaniments. Tearing the criminal to pieces, piercing his breast with a pointed pole; pinching to death with red-hot pincers; starving to death; breaking his limbs upon the wheel; pressing to death in a slow and lingering manner; burning at the stake; crucifixion; sawing to pieces; quartering alive; exposure to wild beasts; and other savage punishments, have been sometimes resorted to for the purposes of vengeance, public example, or public terror. Compared with these the infliction of death by drowning, strangling, poisoning, bleeding, beheading, shooting, or hanging is a moderate punishment. In modern times public opinion is strongly disposed to discountenance the punishment of death by any but simple means; and the infliction of torture is almost universally reprobated. Even in governments where it is still countenanced by the laws it is rarely resorted to; and the sentence is remitted, by the policy of the government, beyond the simple infliction of death. In Prussia, where atrocious criminals were required by the penal code to be broken upon the wheel, the king latterly used always to issue an order to the executioner to strangle the criminal (which was done by a small cord not easily seen) before his limbs were broken. So in the same country, where robbery attended with destruction of life was punished by burning alive, the fagots were so arranged as to form a kind of cell in which the criminal was suffocated by the fumes of sulphur, or other means, before the flame could reach him. Not only is torture now abolished by civilized nations, but even the infliction of capital punishment in public has been given up by most of them. In England, in high treason, the criminal is sentenced to be drawn to the gallows, to be hanged by the neck until he be dead, to have his head cut off, and his body divided into four parts, and these to be at the disposal of the Crown. But, generally, all the punishment is remitted by the Crown, except the hanging and beheading, and these too may be altogether remitted according to circumstances. In other cases the punishment is now simply by hanging, or, in the military and naval service, by shooting. In France formerly the punishment of death was often inflicted by breaking the criminal on the wheel. The usual punishment now is beheading by the guillotine. In 1853 a kind of guillotine (*Fallschwert*) was introduced into the kingdom of Saxony, and it has since been adopted as the means of execution in several other German states. In Austria the general mode of punishment is by hanging. In Prussia hanging is rarely inflicted; but the usual punishment is beheading with a heavy axe, the criminal's head being first tied to a block. In one or two German states execution by the sword still exists. It should be remarked, however, that in Germany hanging has always been deemed the most infamous sort of punishment; and the sentence has often been commuted for beheading by the sword as a milder or less dishonorable mode of punishment. In the United States of America hanging is the almost universal mode of capital punish-

ment, though electricity has recently been tried. The Constitution of the United States contains a provision against "cruel and unusual punishments." In China decapitation by the sword is the usual form: murderers are cut to pieces; robbers not. In Russia the punishment of death has been frequently inflicted by the knout. In Turkey strangling and sewing the criminal up in a bag, and throwing him into the sea, are common modes of punishment. In the Roman code many severe and cruel punishments were prescribed. During the favored times of the republic many of these were abolished or mitigated. But again, under the emperors, they were revived with full severity. In the ancient Grecian states the modes of punishment were also severe and often cruel. The ancient Greek mode of capital punishment by taking poison at such hour as the condemned party should choose, seems never to have been in use among any Christian people.

Whether execution ought to be public or private has been a question much discussed, and one upon which a great diversity of opinion exists among intelligent statesmen. On the one hand, it is said that public spectacles of this sort have a tendency to brutalize and harden the people, or to make them indifferent to the punishment; and the courage and firmness with which the criminal often meets death have a tendency to awaken feelings of sympathy, and even of admiration, and to take away much of the horror of the offense as well as of the punishment. On the other hand it is said that the great influence of punishment in deterring others from the like offense cannot be obtained in any other way. It is the only means to bring home to the mass of the people a salutary dread and warning; and it is a public admonition of the certainty of punishment following upon crime. It is also added that all punishments ought to be subjected to the public scrutiny, so that it may be known that all the law requires, and no more, has been done. Since 1868 the law of the United Kingdom has required all executions to take place privately within the prison walls, and this system seems to have given general satisfaction. The same method is also practised in various other countries. In 1870 a similar measure was proposed in the French Assembly, but the war prevented it being passed and it is not yet law.

In England, the court before which the trial is held declares the sentence and directs the execution of it. In the courts of the United States there is a like authority; but in the laws of many of the States there is a provision that the execution shall not take place except by a warrant from the governor, or other executive authority. In cases of murder and other atrocious crimes the punishment in England is usually inflicted at a very short interval after the sentence. In America there is usually allowed a very considerable interval, varying from one month to six months. In Great Britain there lies no appeal from the verdict of a jury and the sentence of a court, in capital cases, and the very fact that the verdict and sentence are final produces great caution and deliberation in the administration of criminal justice, and a strong leaning toward the prisoner on trial. In the United States there is considerable latitude of appeal. In France there may be a review of it in the court of cassation. In Germany there is, in criminal as in civil cases, a right of appeal; hence, in that country, few innocent persons have suffered capitally since the 16th century. Capital punishment cannot be inflicted, by the general humanity of the laws of modern nations, upon persons who are insane or who are pregnant, until the latter are delivered and the former become sane. It is said that Frederick the Great required all judgments of his courts condemning persons to death, to be written on blue paper; thus he was constantly reminded of them as they lay on his table among other papers, from which they were readily distinguished. He usually took a long time to consider such cases, and thus set an excellent example to sovereigns of their duty.

Capitals (*majuscula*), the large letters used in writing and printing, most commonly as the initial letters of certain words, or of all words in certain positions, and distinguished from the small letters (*minuscula*). As among the ancient Greeks and Romans, so also in the early part of the Middle Ages, all books were written without any distinction in the kind of letters used; but gradually the practice became common of beginning a book, subsequently, also, the chief divisions and sections of a book, with a large capital letter, usually illuminated and otherwise richly ornamented. In legal or state documents of the 13th century capital letters are found dispersed over the text as the initial letters of proper names, and of the names of the Deity, and in the next century the same usage was followed in ordinary manuscripts. The practice with regard to the use of capitals varies in different countries. Sentences and proper names begin almost universally with capitals, but there are several other cases in which the usage is not so general. In English there cannot be said to be any invariable rule regulating their use. The first personal pronoun is always written and printed with a capital letter, and it is common also to begin titles and the names of well-known public bodies, societies, institutions, etc., with capitals. Formerly, it was a frequent practice to begin all substantives in English with a capital, which is still the rule in German. The Germans also begin all titles and pronouns of address with capitals, but not the first personal pronoun. One point in which the English practice differs from that of Germany, France, Italy, and other continental countries, is in beginning adjectives derived from proper names, such as Spanish, Italian, etc., like proper names themselves, with capitals, such adjectives being printed in other countries entirely with small letters.

Capitanis, kăp-ĭ-tā′nēs. See ARMATOLES.

Capitation is applied to anything that concerns a number of persons individually. Thus a capitation-tax is a tax imposed upon all the members of a state, each of whom has to pay his share, and is distinguished from taxes upon merchandise, etc. A capitation-grant is a grant given to a number of persons, a certain amount being allowed for every individual among the number.

Capito, or Kopfel, Wolfgang Fabricius, vōlf′gäng fā-brēt′sē-oos cä′pē tō, or kėp′fĕl, Alsatian reformer: b. Haguenau, 1478; d. Strassburg, November 1541. Entering the Benedictine order, he became professor of theology at Basel, where he showed in his lectures

a tendency to shake off the trammels of the scholastic writers. He approved of Luther's action, but nevertheless in 1519 entered the service of Albert of Mainz; and it was not till some years later that he finally declared for the Reformation. He then entered zealously into its work, shared with Bucer the composition of the Confessio Tetrapolitana, and took part in the Synod of Bern in 1532.

Cap'itol, now *Campidoglio,* the citadel of ancient Rome, standing on the Capitoline Hill, the smallest of the seven hills of Rome, anciently called the Saturnine and the Tarpeian Rock. It was planned and said to have been begun by Tarquinius Priscus, but not completed till after the expulsion of the kings. At the time of the civil commotions under Sulla it was burned down, and rebult by the senate. It again suffered the same fate twice, and was restored by Vespasian and Domitian. The latter caused it to be built with great splendor, and instituted there the Capitoline games. Dionysius says the temple, with the exterior pillars, was 200 feet long and 185 broad. The whole building consisted of three temples, which were dedicated to Jupiter, Juno, and Minerva, and separated from one another by walls. In the wide portico triumphal banquets were given to the people. The statue of Jupiter, in the capitol, represented him sitting on a throne of ivory and gold, and consisted in the earliest times of clay painted red. Under Trajan, it was formed of gold. The roof of the temple was made of bronze; it was gilded by Quintus Catulus. The doors were of the same metal. Splendor and expense were lavished upon the whole edifice. On the pediment stood a chariot, drawn by four horses, at first of clay, and afterward of gilded brass. The temple itself contained an immense quantity of the most magnificent presents. The most important papers were preserved in it. The Capitoline Hill consists of three parts, namely, the northern summit, now occupied by the church of Santa Maria in Aracœli; the southern summit, crowned by the Palazzo Caffarelli, now occupied by the German ambassador; and the depression between these, in which is now the Piazza del Campidoglio. The above church, which is approached from the northwest by a lofty flight of steps, is of great antiquity. In 1888 the Franciscan monastery which was connected with it was replaced by a large monument of Victor Emmanuel II. The Piazza del Campidoglio was designed by Michael Angelo. In its centre is a fine equestrian bronze statue of Marcus Aurelius. On the southeast side there is the Palazzo del Senatore, with a fine flight of steps erected by Michael Angelo. The Palace of the Conservatori occupies the southwest side of the square, and contains valuable collections in art and antiquities. Directly opposite is the Capitoline Museum, founded by Innocent X. The southern summit of the hill is now called Monte Caprino, and on it, beside the Palazzo Caffarelli already mentioned, stands a hospital and a German archæological institute. (See Rome.) Besides the edifice in Washington where Congress assembles, some of the statehouses in States of the Union are officially called capitols.

Capitol at Washington, History of the. After the national capital had been located on the Potomac in 1789, Washington and Major P. C. L'Enfant selected sites for the public buildings. On the first map (1791), the "Congress House" is situated as now, on a low hill commanding the best view in Washington, with 12 broad streets radiating from it, so that it closes the vista of every main avenue. On the decision of a board of three commissioners, with Washington and Jefferson, the plans of the capitol and the President's house were given out in 1792 to public competition, for a prize of $500 or a medal of that value, at the winner's option. For the President's house James Hoban's plans were accepted at once, and he was made superintendent of its erection. For the capitol none were satisfactory, but the three foremost competitors were given another trial, and one, Stephen Hallet, a French artist living in Philadelphia, was employed at a salary and indemnity to revise his plans under the commissioners' criticism. But later in the year Dr. William Thornton (q.v.) of Tortola Island, W. I., submitted plans whose "grandeur, simplicity, beauty, and convenience" forced the committee to accept them. They were too grand for the commissioners' ideas of national needs or resources at the time, however, and specified too costly materials. Thornton wished marble and mahogany and the best of construction, and under a bitter assault from several of his rejected competitors, headed by Hallet, whom the commissioners had joined with Thornton in a revising board, he was forced to reduce its scale and material greatly. Their suggested modifications of his general plan were, however, disapproved. These plans were for what is now the central portion of the capitol.

Work was begun about 1 August. The corner-stone was laid 18 September in the southeast corner of the old north wing, now the supreme court section, with imposing ceremonies, Masonic rites and procession, and a barbecue. Hoban was made superintendent, and Hallet his assistant; but Hoban gave his whole time to the White House, as the President's house came to be called, and Hallet was the real manager. He proceeded to change Thornton's plans and specifications at will, was repeatedly censured for it, and at last ordered to stop it. He resigned, but refused to give up the drawings; the commissioners at last secured them and discharged him, 15 Nov. 1794. Thornton, now one of the commissioners of the District of Columbia, was asked by Washington to obliterate Hallet's changes as injurious, and did so. Hoban now acted as superintendent until George Hadfield, an English architect, was engaged to succeed Hallet, on Jonathan Trumbull's recommendation of him as a modest man and good artist. He outdid Hallet; spent his whole energy in fighting Thornton and Hoban (who always worked in harmony), and after repeated resignations and reconsiderations, was discharged for practical incompetence 10 May 1798. Hoban again took charge. On 17 Nov. 1800 the second session of the sixth Congress met in the north wing of the building. Much of this early construction was of wood or poor material. This was on account of haste, the local interests being very urgent for the coming of the government to that seat. A few years later more durable material was substituted. The commissionership was abolished May 1802, and Thornton and Hoban ceased direct superintendence, though often called in

consultation. At this time the north wing was complete, the foundation of the central rotunda and dome in place, and the basement story of the south wing partly done. These are still as Thornton planned them.

On 6 March 1803 Jefferson appointed Benjamin H. Latrobe (q.v.) "surveyor of public buildings." He at once began, like the others, to besiege the President with the bitterest assaults on Thornton's designs, and when the former declined to interfere, appealed to Congress. Thornton, however, now in charge of the patent office, though he defended himself with severity, made no further attempt to prevent the alteration of his plans; and Latrobe made many serious changes, some of them since judged harmful to beauty and utility. Thus, the Representatives' hall was changed from a graceful, ellipse to a square with semicircular ends; a bad echo gave trouble for many years, caused by the changes. The number and size of entrances to the rotunda were curtailed, the splendid open staircases, cut down and placed in obscurity, were difficult for strangers to find; and the grand semicircular western portico was abolished. The principal entrance was also changed from the west front, facing the White House, to the eastern side. Latrobe was constantly in hot water with both Jefferson and Congress, and published a pamphlet against them in 1806; but till 1811 had pretty much his own way. When the War of 1812 broke out, the capitol consisted of the north and south wings, connected by a corridor of rough boards over the central foundations. On 24 Aug. 1814 the British burnt it as far as possible, piling the furniture and platforms in the rooms with rocket stuff and igniting them; the interior was dreadfully damaged, but the outside walls remained, also the inside brickwork and some stone. A strong movement arose for removing the capital elsewhere; but the same considerations prevailed against it as later. In fear of such a result, however, the local interests formed the "Capitol Hotel Company," and erected a building for government occupancy till the repairs on the capitol were finished. It was occupied, 1815–19, and was afterward known as the "Old Capitol," and used in the Civil War as a military prison. In the reconstruction the House wing was entirely altered.

Near the end of 1817 Latrobe became embroiled with a new commissioner of the Federal building, Samuel Lane, and resigned. In his place was appointed Charles Bulfinch (q.v.), from 1 Jan. 1818; he remained supervising architect for the next decade. In the winter of 1819–20 Congress took its seat in the new hall. The centre was pushed forward to completion, and on 10 Dec. 1824, the entire interior was finished. In 1825 a public competition was held for the figures on the pediment of the eastern portico. From 1826 on Bulfinch was employed on special detail, and the landscape gardening and work on the grounds, which were of his designing. The capitol was set in a park of 22½ acres, encircled by an iron railing somewhat taller than a man, affixed in the sandstone coping of a low wall. There were four carriage and five pedestrian entrances. On 2 March 1828 the position of architect of the capitol was abolished; but Bulfinch remained in employment till the end of June 1829, when Jackson dismissed him. He designed and planned the modern form of the then west extremity of the building, the Senate galleries, and the terraces on the east; and made the dome higher than in Thornton's plan. Among others who should have great credit for the beauty of the capitol are Peter Lenox, clerk of works under Latrobe; George Blagden, superintendent of stonecutters; and Giovanni Andrei, an Italian, superintendent of carvers. That so beautiful and harmonious a structure should have emerged from the contentious of so many different minds is due partly to the really great ability of the three chief architects, Thornton, Latrobe, and Bulfinch, and partly to the determination of successive Presidents that the changes should harmonize with the original design. Latrobe's material external alterations of Thornton's plan have been mentioned; Bulfinch designed the western central portico as it now stands.

From 1829 to 1836 there was no architect of the capitol. On 6 June 1836, Jackson appointed as Federal architect Robert Mills (q.v.), who had studied under Latrobe; and he held the place till 1851. Thomas U. Walter (q.v.) then took the post, having drawn the plans for the two modern wings that extended the original capitol, which the government needs had outgrown, into the modern one. The corner-stone of the extension was laid by President Fillmore, 4 July 1851; the new Representatives' hall was occupied in 1857; the Senate hall in 1859. The great lengthening of the dimensions required a correspondent heightening of the dome; and Mr. Walter designed a new one, which was constructed during the Civil War, and completed at the close of 1863, the statue of Freedom being then lifted into place. Mr. Walter, however, had foreseen a future need of still further extension, and had drawn plans for it while the other work was going on. These have been awaiting their time since; and Congress in the spring of 1903 authorized their execution, at a probable expenditure of $2,500,000 and three years' time, under the supervision of the present Federal architect, Mr. Woods. This extension is to the eastward, and involves the removal of Latrobe's portico at the east front, but none of the old walls. The present front wall will become the rear wall of an open court, which is to light the west side of the addition. This will contain 66 new and handsome rooms, divided equally between the Senate and the House. (For a minute history of the capitol down to 1851, see Glenn Brown in the 'American Architect,' Vols. LXII.–LXV.).

Capitoline Games, games held in ancient Rome in celebration of the deliverance of the city from the Gauls, and in honor of Jupiter Capitolinus, to whom the Romans ascribe the salvation of the capitol in the hour of danger. They were instituted 387 B.C., after the departure of the Gauls.

Capitoli'nus, Julius, Roman historian, who lived toward the end of the 3d century, and wrote the lives of nine emperors. He is one of the writers of the 'Historia Augusta,' in the editions of which his works are to be found.

Capitulary, ka-pit'ū-la-ri (Lat. *capitula,* "chapters"), a writing divided into heads or chapters, especially a law or regal enactment so divided into heads. Laws known by this designation were promulgated by Childebert, Clothaire, Carloman, and Pepin, kings of France;

but no sovereign seems to have put forth so many of them as the Emperor Charlemagne, who appears to have wished to effect, in a certain degree, a uniformity of law throughout his extensive dominions. With this view it is supposed he added to the existing codes of feudal laws many other laws, divided or arranged under small chapters or heads, sometimes to explain, sometimes to amend, and sometimes to reconcile or remove the differences between them. These were generally promulgated in public assemblies composed of the sovereign and the chief men of the nation, both ecclesiastical and secular. They regulated equally the spiritual and temporal administration of the kingdom; and the execution of them was entrusted to the bishops, the courts, and the *missi regii*, officers so called because they were sent by the French kings of the first and second race to dispense law and justice in the provinces. Many copies of these capitularies were made, one of which was generally preserved in the royal archives. The authority of the capitularies was very extensive. It prevailed in every kingdom under the dominion of the Franks, and was submitted to in many parts of Italy and Germany. The earliest collection of the capitularies is that of Anségise, abbot of Fontenelles. It was adopted by Louis the Debonnaire and Charles the Bald, and was publicly approved of in many councils of France and Germany. But as Anségise had omitted many capitularies in his collection, Benedict, the Levite or deacon of the church of Mentz, added three books to them. Each of the collections was considered to be authentic, and of course was appealed to as law. Subsequent additions have been made to them. The best editions of them are those of Baluze (two volumes, Paris 1677), and of Pertz in the 'Monumenta Germaniæ Historica' (2d div. Vols. I. and II.; Hanover 1835–7). The capitularies remained in force in Italy longer than in Germany, and in France longer than in Italy. The incursions of the Normans, the intestine confusion and weakness of the government under the successors of Charlemagne, and above all the publication of the epitome of canon law termed the Decretum of Gratian, about the year 1150, which totally superseded them in all religious concerns, put an end to their authority in France.

Capitula'tion ("a writing drawn up in heads"), in military language, the act of surrendering to an enemy upon stipulated terms, in opposition to a surrender at discretion.

In the 15th century capitulations, as they were called, were presented by the ecclesiastical establishments in Germany to their newly chosen abbots and bishops, who were obliged to swear to observe them as laws and conditions for their future rule. The ecclesiastical Electors obtained, after the fall of the Hohenstaufen family, certain advantageous promises from the new emperors, which were called capitulations. When Charles V. was proposed as emperor, and it was apprehended, on account of his foreign education, that he would disregard the German constitution, he was obliged to make oath that he would not reside without the German empire, nor appoint foreigners to office in the empire, etc. This was called his "election capitulation." Such a *Wahlcapitulation* was afterward presented to every new emperor as a fundamental law of the empire. In this way the authority of the German emperors was constantly more and more diminished, so that at last it became merely nominal, since the electors, at the choice of every new emperor, made some new infringement on the imperial privileges. The *Wahlcapitulationen* were acknowledged bargains, certainly unique in history.

Capiz, kä pēth', Philippines, capital of the province of Capiz, situated in the northern part of the island of Panay, four miles from the mouth of the Panay or Capiz River. The river is navigable to the city, and there is also an excellent roadstead at its mouth. There is a large local trade, particularly in rice, and connection by steamer with Manila. Capiz is also a telegraph and military station. Pop. 13,676.

Cap'lin, or **Capelin**, a small savory smelt (*Mallotus villosus*), found in large numbers on the Arctic coast as far south as Cape Cod. The inhabitants of Newfoundland and Labrador catch it in large quantities at certain seasons, and many are dried and exported to Great Britain.

Capmany y Montpalau, Antonio de, än-tō'-nē-ō dā käp mä nē ē mōnt-pạ-läṅ', Spanish critic and historian; b. Barcelona, 24 Nov. 1742; d. Cadiz, 14 Nov. 1813. He served in the wars with Portugal in 1762, left the army in 1770, and joined Olavide in his scheme for colonizing and cultivating the Sierra Morena. This enterprise terminated disastrously, and Capmany removed to Madrid, where he was chosen secretary of the Royal Historical Academy of Spain in 1790, and filled several offices in the gift of the government. He traveled in Italy, Germany, France, and England. When the French entered Madrid in 1808, he fled to Seville, arriving there destitute and in rags. He was chosen a member of the Cortes of Cadiz, in which capacity he made himself conspicuous by his patriotism and active opposition to the new rulers. His works, which enjoy a high reputation in Spain, are numerous; among them are 'Memorias historicas sobre la Marina, Commercio y Artes de la antiqua Ciudad de Barcelona'; 'Questiones criticas sobre varios puntos de historia, economica, politica y militar'; 'Teatro historico-critico de la Elocuencia Española'; and 'Dictionario Frances-Español.'

Cap'nomancy, divination by smoke, one of the modes of divination resorted to by the ancients. They used to burn vervain or some other sacred plant, and observe the form and direction which the smoke took in escaping, and from these circumstances they drew their auguries. Sometimes the smoke of sacrifices was observed instead of that of vervain. When this smoke was thin and transparent, it was considered a good omen; if, on the contrary, it was thick and opaque, the omen was bad. Another method of acquiring a knowledge of the future by capnomancy was to throw the seeds of jasmine or poppy on burning coals, and to observe the smoke which rose from them.

Capo d'Istria, Austria (the ancient Ægida, later Justinopolis), a seaport on the Gulf of Trieste, nine miles south of Trieste. It is connected with the mainland by a causeway rather more than half a mile long. It is defended by an old fort now going to decay. It contains a cathedral, a lofty edifice, faced in the Venetian

style with marble, and containing some fine paintings, sculptures, and arabesques. It is the seat of a bishop, and has six monasteries and two nunneries, a gymnasium, several hospitals, and a penitentiary. There are manufactories of soap, candles, leather, and sea-salt; and there is also a considerable trade in wines, oil, and fish. After the 10th century Capo d'Istria belonged, alternately, to the Venetians and Genoese, till finally, in 1478, it succeeded in making itself independent of the latter with the aid of the former. Capo d'Istria now became the capital of Istria, and along with it came into the possession of Austria in 1815. Pop. (1903) about 12,000.

Capo d'Istrias, or **Capo d'Istria, Ioannes Antonios,** yō-än'nēs än-tō'nyōs kä-pō-dēs'-trē-as, COUNT, Greek statesman: b. Corfu, 11 Feb. 1776; d. Nauplia, 9 Oct. 1831. His family had been settled in Corfu since 1373, but originally came from the Illyrian town of Capo d'Istria. He devoted himself to political life, and in 1809, after holding a high place in the Ionian Islands, entered the diplomatic service of Russia. Here his policy tended to the separation of Greece from Turkey. In 1828 he entered on a seven years' presidency of Greece: but whether from his attachment to Russian interests, or from the jealousy and impatience of restraint of the chiefs, he speedily became extremely unpopular. Several of these unruly chiefs belonging to the islands and to the province of Maina at last, in the spring of 1831, rose in open rebellion against him, demanding a convocation of the national assembly, the establishment of the liberty of the press, and the release of certain state prisoners, especially of Petros Mauromichalis, one of their own number whom D'Istrias had arrested and imprisoned. The president obtained the aid of Russia, but before the insurrection could be quelled he was assassinated in a church at Nauplia, by Constantine and George Mauromichalis, the brother and nephew of Petros Mauromichalis.

Caponière, kä-pō-nyār, or **Caponnière,** in fortification, a place covered against the fire of the enemy on the sides, sometimes also above, and serving for the connection of two works or for maintaining an important point. In particular:

1. A passage secured by two parapets, in the form of glacis, which leads through the dry ditch from one work to another; for instance, from the chief wall to the ravelin. If danger is to be apprehended only from one side, and consequently only one parapet is made, it is called a demi-caponnière; if it is covered above with hurdles or with wood, it is called a coffer: but this word is often used indifferently for caponnière.

2. Small block-houses in the covered way, for its defense. Coehorn laid out similar but less useful works below the glacis, and Scharnhorst proposes them, under the name of field-caponnières, for the salient angles of field fortification.

Capote, Domingo Mendez, dō-mēng'gō mĕn-dāth' kä-pō'tā, Cuban statesman: b. Cardenas, 1863. He was graduated at the University of Havana, and became one of the best-known lawyers in Cuba. Susequently he was a professor in the University of Havana for many years. In December 1895 he joined the insurgents under Gen. Maximo Gomez; became a brigadier-general; and was appointed civil governor of Matanzas and of Las Villas. In November 1897 he was elected vice-president of the Cuban republic. When the Cuban Constitutional Convention appointed a commission of five members to confer with President McKinley and Secretary Root concerning the future relations of the United States and Cuba, he became its leader. The conference was held in Washington, D. C., in April 1901.

Capoul, Joseph Amédée Victor, zhō-zĕf a-mā-dā vēk-tōr kä-pool, French tenor singer: b. Toulouse, 27 Feb. 1839. He was educated at Paris; and sang there in the Opéra Comique, 1861–72, where he was very popular, especially in his role as Gaston de Meillagré in Auber's 'Premier Jour de Bonheur.' He has also sung in New York, London, Vienna, St. Petersburg, and other cities, being everywhere very successful.

Cappadocia, kăp-pä-dō'shĭ-a, in antiquity, one of the most important provinces in Asia, once a famous kingdom; in its widest extent bounded west by Lycaonia, south by Cilicia and Syria, east by Armenia, and north by the Pontus Euxinus. In the period of the Persian government Cappadocia comprehended all the country between the Halys and Euphrates. By the former river it was separated from Phrygia and Paphlagonia; by the latter, from Armenia: therefore the region afterward called Pontus was comprehended in this territory. The Persians divided it, according to Strabo, into two satrapies, which bore the name of Cappadocia Magna, afterward Cappadocia Proper; and Cappadocia Minor, afterward Pontus. This division, however, was not always strictly observed. The Persian satraps governed, at a later time, under the title of kings, and sometimes made themselves independent. At the time of the famous retreat of the 10,000 Greeks, both the Cappadocias seem to have been under the rule of Mithridates I., who had participated in the conspiracy of Cyrus the Younger, but retained his government and became, after the defeat of Cyrus, again dependent upon the kings of Persia. It became a Roman province in 17 A.D. Cappadocia Magna was a good grazing country, and also well adapted for the cultivation of grain, especially wheat; but wood was scarce. Mazaca, afterward Cæsareia, now Kaisariyeh, was the residence of the kings of Cappadocia. The name of Leukosyri (White Syrians) is said by Strabo to have been applied to the Cappadocians, as if to distinguish them from the dark Syrians who dwelt to the east of Mount Amanus.

Cappel, kä'pĕl, Switzerland, a village in the canton of Zürich, and 10 miles from the town of Zürich. It contains an old Cistercian convent, founded in 1185, and a simple monument erected in 1838 to the reformer Zwingle, who was killed 11 Oct. 1531.

Cap'pon, James, Canadian educator: b. Scotland, 8 March 1854. He was educated at Glasgow University, and since 1888 has been professor of English language and literature at Queen's University, Kingston, Ontario. He has published 'Victor Hugo: a Study and a Memoir'; 'Britain's Title in South Africa.'

Capponi, Gino, MARCHESE, gē'nō mär-kā'zĕ käp pō'nē, Italian scholar and historian: b. Florence, 14 Sept. 1792; d. there, 3 Feb. 1876. He traveled widely and devoted himself almost entirely to his studies in spite of the fact that he became blind early in life. For a short time in 1848 he was at the head of the Tuscan government; in 1859 he was a member of the Constitutional Convention of Tuscany; he was also made a senator of Italy; and in 1862 was at the head of the Historical Commission for Tuscany, Umbria, and the Marches. He wrote 'Storia della Repubblica di Firenze' (1875); and had a part in the preparation of a lexicon by the Accademia della Crusca, and in the editing of texts of Dante's 'Divine Comedy.'

Capps, Edward, American philologist: b. 21 Dec. 1866. He was graduated from Illinois College, 1887; took his doctor's degree at Yale, 1891; and was tutor in Latin at the latter place, 1890–2. Since then he has been successively associate professor and professor of Greek in the University of Chicago. Besides a number of philological papers, he has written 'From Homer to Theocritus' (1891).

Caprara, Giambattista, jäm-bät-tēs'tä käprä'rä, CARDINAL, Italian ecclesiastic: b. Bologna, Italy, 29 May 1733; d. Paris, 21 June 1810. He studied theology, became vice-legate of Ravenna in 1758 under Benedict XIV., and in 1785 was sent by Pius VI., as nuncio to Vienna, to remonstrate with the Emperor Joseph on his conduct in relation to Church matters. His remonstrance proved ineffectual, but in 1792 he was appointed a cardinal, shortly afterward a member of the state council, and in 1800 bishop of Jest. In 1801 he went to Paris as legate of Pius VII., and conducted the negotiations with the French republic with so much success that in 1802 the first concordate was concluded. Shortly after he was appointed archbishop of Milan, and in 1805 he crowned Napoleon king of Italy.

Caprera, kä-prā'ra, a small island in the northeast of Sardinia, and separated from it by a narrow strait. It is six miles long from north to south, and two miles broad. It is fertile, and produces both corn and good pasture. It is well known as the ordinary residence of Garibaldi, who since 1854 possessed a dwelling-house on the island, along with a piece of ground which he farmed until his death here in 1882.

Capri, kä'prē, an island in the beautiful Gulf of Naples, which contributes not a little to the charms of this favorite scene of nature. Capri, five miles long and two broad, lies at the entrance of the gulf, and consists of two mountains of limestone, remarkable for their picturesque shape, and a well-cultivated valley. The inhabitants, amounting to 4,600, are occupied in the production of oil and wine, in fishing, and in catching quails, which come in immense numbers from Africa to the shores of Italy. Every spot on the island which can be made productive is cultivated. In fact, agriculture all around Naples is in the highest state of perfection. The town of Capri is the seat of a bishop, to whom all the quails belong. A high rock separates Capri from the little town of Anacapri, which is reached by 522 steps cut in the rock. With the Romans Capri was called Capreæ. Augustus obtained it from the Neapolitans in exchange for Ischia, and made it a place of agreeable retreat, but never made use of it. Tiberius spent here the last seven years of his life in degrading voluptuousness and infamous cruelty. The ruins of his palaces are still extant, and other ruins are scattered over the island. The island of Capri is remarkable for several remarkable caverns or grottoes in its steep, rocky coast. By far the most remarkable of these is unquestionably the celebrated Grotta azzurra (Blue Grotto), which was discovered by a singular accident in the summer of 1832, an Englishman while bathing having observed the opening in the rocks which forms the entrance to the grotto, and swum into it. It gets its name from the fact that, while the sun is shining outside, all the objects within the cavern — rocks, water, and sand — are tinged with a beautiful blue color, very soft and agreeable to the eye. The cavern is elliptical in form, measuring about 1,200 or 1,300 feet in circumference; its height is considerable, and its roof and sides bristle with stalactites. The blue color within the grotto is supposed to be caused by the refraction of the rays of light in passing through the water before entering the cave. The blue rays, with those next to them, the violet and the indigo, being the most refrangible, are the only rays that are admitted, the others — red, orange, etc., being dispersed in the water. In another part of the coast there is another grotto which exhibits phenomena precisely similar, except that the objects in this one are clothed with a green instead of a blue color. It is hence called the Grotta verde (Green Grotto).

Cap'ric Acid. See DECOIC ACID.

Capriccio, kä-prē'chō (*Caprice*), is the name applied to a musical composition, in which the composer follows the bent of his humor. The *capriccio* may be used with propriety in pieces for exercise, in which the strangest and most difficult figures may be introduced, if they are not at variance with the nature of the instrument or of the voice.

Capricor'nus (Lat. *caper*, "a goat," and *cornu*, "a horn"), "the goat," one of the 12 signs of the Zodiac, between Sagittarius and Aquarius; also the corresponding zodiacal constellation, one of Ptolemy's original 48. One of its brightest stars, Alpha, is a wide double, easily separated by the naked eye by any one with good eyesight. Capricornus is surrounded by Aquila, Aquarius, Piscis Austrinus, Microscopium, and Sagittarius.

Caprification, käp-rĭ-fĭ-kā'shŏn, the fertilization of the flowers of the Smyrna fig with pollen derived from the wild fig, or caprifig. From time immemorial it has been the custom of Orientals to break off the fruits of the caprifig, bring them to the edible-fig trees, and tie them to the limbs. From the caprifigs thus brought in there issues a minute insect, which, covered with pollen, crawls into the flower receptacles of the edible fig, fertilizes them, and thus produces a crop of seeds and brings about the subsequent ripening of the fruit. It has been shown that the varieties of the wild fig or caprifig are the only ones which contain male organs, while the varieties of the Smyrna fig are exclusively female. In the caprifig there are said to exist in Mediterranean regions three crops of fruit,— the spring crop, a summer crop, and a

third, which remains upon the trees through the winter. The fig-insect (*Blastophaga grossorum*) over-winters in the third crop, oviposits in the spring crop, develops a generation within it, each individual living in the swelling of a gall-flower (a modified and infertile female flower), and, issuing from it covered with pollen, enters the young flower receptacles of the young Smyrna fig, which are at that time of the proper size, and makes an attempt to oviposit in the true female flowers, fertilizing them at the same time by means of the pollen adhering to their bodies. The life history of the insect from that time on is not well understood, but the *Blastophaga* has been known to occur again in the over-wintering crop of figs. The effect of caprification on the young Smyrna figs becomes readily visible within a few days; before the *Blastophaga* enters the fig the latter is transverse and strongly ribbed, while a few days after fertilization the fig swells up and becomes rounded and sleek. The male *Blastophaga* is always wingless. It has no ocelli, and its compound eyes are greatly reduced in size. The fact that the male rarely leaves the fig in which it has hatched might almost be inferred from these facts of winglessness and partial blindness. When this wingless male issues from the seed-like gall in which it is contained, it seeks a female gall in the interior of the same fig, gnaws a small hole through its cortex, inserts its extremely long, almost telescopic, abdominal extremity through the hole, and fertilizes the female. The female subsequently, with her powerful jaws, gnaws the top of the gall off and emerges, crawling around the interior of the fig, and eventually forcing her way through the ostiolum, almost immediately seeking for young figs, which she enters, and, should the fig entered prove to be a caprifig, lays her eggs at the base of as many flowers as she can find, and then dies. Should the fig entered, however, be a Smyrna fig, either through the fact of the caprifig from which she issued having been hung in the branches of a Smyrna-fig tree, or from the fact that she has flown to an adjoining Smyrna-fig tree, she walks around among the female flowers seeking for a proper place to oviposit. It is this futile, wandering search, when her body is covered with pollen from the caprifigs, that produces the extensive and almost perfect fertilization of the entire number of female flowers. The young larva is a delicate little maggot curved upon itself and showing no visible segmentation. In the full-grown larva the segments are more apparent, and with the growth of the larva the gall at the base of the male florets becomes hard, and greatly resembles a seed, turning light brown in color. The male and the female pupa each occupies a greater portion of the interior of the gall. Consult: 'The Fig' (United States Department of Agriculture, Washington 1901).

Although figs are raised in California and the southern States they have long been inferior to the Smyrna fig, the standard kind of commerce, which owes its peculiar flavor to the number of ripe seeds which it contains. These seeds are obtained only by the process described above, and the United States Department of Agriculture has recently devoted much attention to caprification, with a view to the development of the American fig industry.

Caprimulgidæ, kăp-rĭ-mŭl'jĭ-dē, the goat-suckers (so called from a superstition regarding their habits), a family of birds of puzzling affinities, but nearest to the swifts (*Cypselidæ*), with which, and the humming-birds, they are often considered to constitute an order, *Macrochires*. The family is characterized by a small bill, enormous gape fringed with elongated, stiff bristles, elongated tail of 10 soft rectrices, long pointed wings, very small feet with the middle claw pectinate, and very lax plumage. Two subfamilies, the *Caprimulginæ* or true goatsuckers, and the *Nyctibiinæ* of tropical America, are recognized, to which the oil-birds (*Steatornis*), and *Podargus* and its allies, are sometimes added as two more. The family is nearly cosmopolitan, and comprises 12 or 15 genera and perhaps 100 species, all birds of more or less crepuscular habits, which catch insects on the wing like swallows. The "night-hawk" and "whip-poor-will" are the common species of the eastern United States.

Caprivi, Georg Leo, gā ōrg lā ō kä-prē'vē, Graf von, sometimes called Caprivi de Caprara de Montecuculi, German soldier and statesman: b. Charlottenburg, 24 Feb. 1831; d. Skyren, 6 Feb. 1899. He entered the army in 1849; fought in the campaigns of 1864 and 1866; and in the Franco-German war of 1870 was chief of staff to the 10th Army Corps. In 1883–8 he was at the head of the Admiralty; in 1888 he became commander of his old army corps. Hence he was removed, on the fall of Bismarck, in 1890, to become imperial chancellor and Prussian prime minister. His principal measures were the army bills of 1892 and 1893, and the commercial treaty with Russia in 1894, in which year he retired.

Capro'ic Acid. See Hexoic Acid.

Capron, Allyn, American soldier: b. Tampa, Fla., 27 Aug. 1846; d. Fort Myer, Va., 18 Sept. 1898. He was graduated at West Point, 1867, and entered the 1st Artillery, receiving his captaincy 4 Dec. 1888. During the Sioux campaign of 1890 he made a brilliant record at the battles of Wounded Knee and Drexel Mission. During the war with Spain, 1898, he opened the fight at El Caney, Cuba, and shattered the first flagstaff in Santiago. During this campaign he was taken ill with typhoid fever, and succumbed to its attack. He was a fine mathematician, and a recognized authority on artillery and tactics. His father, Erastus Allyn Capron was killed at Churubusco, in the Mexican war, 20 Aug. 1847.

Ca'pron, Allen Kissam, American military officer (son of Allyn Capron, q.v.): b. Brooklyn, N. Y., 24 June 1871; d. Las Guasimas, Cuba, 24 June 1898. He enlisted as a private (1890), and rose to a second lieutenancy (1893), joining the "Rough Riders" on the outbreak of the war with Spain. He was made a captain for bravery, and was the first American army officer who fell in that war.

Capryl'ic Acid. See Octoic Acid.

Cap'sicin, kăp'sĭ-sĭn, a name given to two apparently different substances. One described by Braconnot, obtained from chilli pepper, is an acrid oil or oleoresin, of a reddish-brown color, the vapor of which excites sneezing and coughing. It is probably a mixture of different bodies. The other is a resinoid substance ob-

tained from cayenne pepper; it is brown with a golden tint, has the consistence of tar, an aromatic smell and pungent taste, and is used in America as a powerful stimulant in influenza, fever, indigestion, and other disorders, and externally as a rubefacient. Quite recently a volatile alkaloid has been obtained from chilli pepper, by first removing the acrid resin, then making the fluid alkaline, and extracting with petroleum spirit. On evaporating, a substance is produced with an odor like that of conia. It is distinguished from conia and nicotine by a variety of reactions.

Capsicum, a genus of plants of the order *Solanaceæ,* consisting of annual or biennial plants, bearing membranous pods containing several seeds, noted for their hot, pungent qualities. *C. annuum,* a native of South America, furnishes the fruits known as chillies. These, as well as the fruits of *C. frutescens* and other species, are used to form cayenne pepper. For this purpose the ripe fruits are dried in the sun or in an oven, and then ground to powder, which is mixed with a large quantity of wheat flour. The mixed powder is then turned into cakes with leaven; these are baked till they become as hard as biscuit, and are then ground and sifted. Cayenne pepper is largely adulterated with red lead and other substances. *C. fructus* is the dried ripe fruit of *C. fastigiatum,* imported from Zanzibar. It is a small, oblong, scarlet, membranous pod, divided internally into two or three cells containing numerous flat, white, reniform seeds. It has no odor; its taste is hot and acrid. Capsicum fruits are used medicinally, in powder or as a tincture, externally, or as a gargle in cases of malignant sore throat, and internally as a stimulant in cases of impaired digestion.

By reason of the resin-like body, capsicin, which is contained in the fruits of these plants, they possess very active irritant properties. The pure crystals of capsicin are extremely virulent, and readily cause severe poisoning; but the ground fruit is less active, and is of service in medicine, both for external and internal medication.

Externally, capsicum is used as an irritant to cause redness of the skin or to blister, thus affecting related visceral areas within the body. It is thus employed in bronchitis, in early stages of pneumonia, in pleurisies, and in joint and nerve affections. Internally, capsicum is used to stimulate the appetite and to increase the amounts of gastric and intestinal juices. It is particularly serviceable in the gastritis of alcoholism. All capsicum should be excluded from the diet of patients with disease of the kidneys or acute disease of the genito-urinary system.

Cap'stan (Fr. *cabestan,* probably from a derivative of Lat. *capistrum,* a halter, from *capere,* to hold), an apparatus constructed on the mechanical principle of the wheel and axle, used for moving heavy weights and by various methods for the application of power. Its axis, unlike that of the windlass, is vertical. The capstan may be operated either by steam-power or by means of a lever set in its socket and worked by horses or pushed by hand, the last method usually requiring several men. When used elsewhere than on shipboard, the capstan generally has some specific name. Thus, when employed for raising coal from pits it is commonly called a gin; if worked by horses, it is known as a whim-gin. Capstans were formerly made of wood, but are at present almost universally of iron. The upright barrel of a capstan is constructed around a spindle. The barrel is sometimes smooth, and sometimes for increase of friction has, running up and down its surface, ribs or ridges called whelps. In the capstan-head or drum-head, surmounting the barrel, are holes for the levers or capstan-bars used to revolve the barrel. Being smaller at its centre than at the top or bottom end, the barrel has a curve from above and below, whereby a rope wound by working the capstan slips toward the concave part so formed. By this device a length of rope may be compactly and securely wound and kept in place for repeated use. On the circumference of a pawl-head at the bottom of the barrel are pivoted pawls which catch a pawl-rim or ratchet-ring fastened to the platform or floor on which the capstan is fixed. There are various other devices for increasing friction, the prevention of slipping, and reverse operation of the mechanism.

Cap'sule, in botany, a dry fruit containing several seeds, sometimes a large number, and opening of itself by means of valves or pores when it comes to maturity. According as it contains one, two, three, or more cells, the capsule is called unilocular, bilocular, trilocular, etc., and when it has many cells it is called multilocular.

In anatomy a capsule is a mass of fibrous, connective tissue cells surrounding or supporting an organ, either as a bag, as is the case in the kidneys; or as a framework, as in the liver. The capsule is usually an integral portion of the structure of an organ.

In pharmacy gelatin capsules are widely used for purposes of rendering medicines tasteless.

Captain. This is one of those many words derived from the Latin of the Middle Ages, and now to be found in all the different idioms of Europe. Captain comes from the Latin *capitaneus,* from *caput,* head, and signified, first, a governor of a province, who in the first half of the Middle Ages was generally a military man. Thus the word captain soon came to be used chiefly to denote a high, or rather the highest military officer. Like many other words, however, this has in the course of time lost much of its dignity, and in military technology now signifies the commander of a small body, a company, and in maritime language the master of a vessel. In the navy it indicates a specific rank, the captain being distinctively the officer commanding a war-vessel. In the latter part of the Middle Ages, when armies were not yet so regularly divided and subdivided as at the present time, captains were the commanders of those small bodies of which the armies consisted. These were generally collected by their commander, who entered with his company into the service where most pay or most booty could be obtained. The practice of carrying war by troops collected in this manner prevailed to the greatest extent in Italy, where the continual quarrels of the numerous small states afforded ample employment to the unsettled and the dissolute. These companies play an important part in the history of the Middle Ages, particularly that of the two centuries preceding the Reformation, and had a very important influence on

the manners and morals of the south of Europe. They are further interesting to the student of history, because they are so unlike anything at present existing.

Captain, in modern armies, is the commander of a company of foot or a troop of horse. In the United States army he nominates the sergeants, corporals, and lance-corporals of his company, who are appointed by the commander of the regiment.

Captain, in the navy, an officer commanding a ship of war. The naval captain is next in rank above the commander, and in the United States ranks with a colonel in the army.

Captain-General, the commander-in-chief of an army or of all the military forces of a country. In France it was an ancient title which conferred an almost unlimited power on the person who possessed it in the district where he commanded. But it never corresponded to that of generalissimo except in the case of the Duke of Savoy, in 1635, in the time of Louis XIII. The title is not in use at present, nor would it agree with the existing organization of the administration. In Spain the rank of a captain-general corresponds with that of a marshal of France, the captain-general having command of an army or army-corps. The title was also given to the head of a province in the Spanish colonies in South America, which were divided into viceroyalties and captain-generalships (*capitanias-generales*); thus Chile used to be a captain-generalship. The captains-general were not placed under the viceroys, but accountable only to the king through the council of the Indies. The captain-general of Venezuela, for instance, had no connection with the viceroy of New Granada. They decided, in the last instance, on all legislative, judicial, and military affairs, and presided in the *real audiencia*. The time during which these governors remained in power was limited to a few years, probably in order to prevent them from becoming too powerful. The consequence was, that the colonies were oppressed the more to enrich the governors, for rich every one was when he left his office.

Captain of a merchant ship, he who has the direction of a ship, her crew, lading, etc. In small vessels he is more ordinarily called master, which indeed is the correct title.

Caption, in law, signifies that part of a legal instrument such as an indictment or commission, which states when, where, and by what authority it is executed. In Scotch law it signifies a warrant of imprisonment issued against a party to enforce an obligation, being now confined to a warrant served upon a party who has illegally retained papers in a lawsuit that had been borrowed by him, and intended to compel the return of the papers.

Capua, kä'pö-ä, Italy, a city in the province of Caserta, 18 miles north of Naples, on the Volturno, which is crossed by a handsome bridge. The district is very fertile, but somewhat unhealthy. It is the seat of an archbishopric, and is the principal fortress that covers the approach to Naples. It has two magnificent gates, three principal streets, two handsome squares, and three public fountains. The town is dirty and badly built. The principal public buildings are the cathedral, with a cupola supported by 18 columns, entirely modernized; the church of the Annunciation; the governor's palace, the town-hall, a museum with many ancient works of art, etc. The ancient city was situated two and a half miles southeast from the modern town, which was built from its ruins on the site of the ancient Casilinum by the Lombards in the 9th century. The site is now occupied by a considerable town, called Santa-Maria-di-Capoa-Vetere. The ancient Capua, one of the finest and most agreeable cities of Italy, was of such extent as to be compared to Rome and Carthage. Hannibal wintered at ancient Capua after the battle of Cannæ, and thus not only lost time, but also is commonly said to have rendered his army unfit to follow up the advantage he had gained. It was a favorite place of resort of the Romans, on account of its agreeable situation and its healthy climate; and many existing ruins attest its ancient splendor. In 456 A.D. it was devastated by the Vandals under Genseric, and in 840 the Saracens completely destroyed it. Pop. about 14,000.

Capuana, Luigi, loo-ē'jē kä-poo-ä'nä, Italian poet, novelist, and critic: b. Mineo, Sicily, 27 May 1839. Having devoted himself to journalism, he settled in Florence in 1864, where he wrote dramatic criticisms; from 1868 until 1877 he lived in his native town, then in Milan, again as a journalist. His best-known work is 'Giacinta' (1879), a naturalistic novel. Besides this he has published several volumes of short stories, among them: 'Profiles of Women' (1881); 'Homo' (1883); and two collections of charming fairy tales: 'Once upon a Time' (1882) and 'Fairy Land' (1883). A curious specimen of rhythmical prose is his 'Semi-Rhythms' (1888), in praise of worldly joy and beauty.

Capuchin, kăp ū shĕn or kap ū chĕn, the name of several animals in which the growth of the hair or feathers upon the head forms a sort of hood suggesting that of a Capuchin friar. Certain monkeys are so called, especially the South American sapajous (q.v.) and one or more of the macaques (q.v.). A breed of domestic pigeons is also so called.

Capuchins, an order of mendicant friars in the Roman Catholic Church founded in 1528 in virtue of a bull of Clement VII. Its founder, Matteo Barro, was a member of the rigorist section of the Observantine Franciscans, who sought to restore the rule of perfect poverty and humility, and to be of aid to parish priests in the cure of souls. The Capuchin friars obtained their name from the capuerce, cowl, or hood which they wore. They were vowed to live according to the rule of St. Francis in hermitages and to labor for the conversion of notorious sinners. Their churches were to be bare of ornament. Soon after their foundation they did heroic service in ministering to those stricken by the plague which at that time ravaged all Italy. The third vicar-general of the order, Bernardino Ochino (q.v.) brought the Capuchins into discredit by his notorious leanings toward protestantism, and the fraternity was interdicted from preaching by Paul III., and would have been suppressed had not Cardinal Sanseverino, archbishop of Naples, interceded for them. Paul also forbade them to establish any convents beyond the Alps, but his successor, Gregory XIII., revoked that decree. Again, Gregory XIV. in 1591 withdrew from them the fac-

ulty of ministering in the confessional; but it was restored to them 10 years later by Clement VIII. Finally, in 1619 the fraternity was restored to good standing, and was even erected into an order administratively independent of the general of the Franciscans, and their vicar-general assumed the style of minister-general. Ever since, the Capuchins have been recognized as eminently useful servants of the Church. The order conducts missions in all quarters of the globe, and has the reputation of being very successful in winning converts.

Cap'ulets and Mon'tagues, the English spelling of the names of the Cappelletti and Montecchi, two noble families of northern Italy, according to tradition of Verona, chiefly memorable from their connection with the legend on which Shakespeare has founded his tragedy of 'Romeo and Juliet.'

Ca'put Mor'tuum (Latin), literally, a dead head; a fanciful term much used by the old chemists to denote the residuum of chemicals when all their volatile matters had escaped; hence the word is figuratively used of anything from which all that rendered it valuable has been taken away.

Caputiati, kă-pū-shĭ-ā'tī, a Christian sect which arose in France in the 12th century. They wore on their heads a leaden image of the virgin Mary. They wished liberty, equality, and the abolition of all civil government. Hugo, bishop of Auxerre, suppressed them by military force.

Capybara, kă-pē-bä'ra, an aquatic rodent (*Hydrochoerus capyoora*), of the family *Caviidæ*, native to South America. It is the largest rodent known, being four feet long, and weighing nearly 100 pounds. It has a rough brown coat, a heavy flat head, small, pig-like eyes and ears, and a blunt muzzle. Its feet are supplied with hoof-like claws, and its tail, unlike that of most rodents, is very short. The animal is herbivorous, browsing on grass along river banks, and often creating havoc in sugar plantations. It is awkward on land, but swims and dives well, and can remain under water a long time. The flesh is edible, except that of very old males.

Carabao, kä-ra-bä'ō. See BUFFALO.

Car'abas, Marquis of, the exalted personage who figures in Perrault's story of 'La Chat Botté' ('Puss in Boots'). The name is often applied to an extremely conservative aristocrat. In Disraeli's 'Vivian Grey' the Marquis of Clanricarde is satirized as the Marquis of Carabas.

Carabidæ, the family of *Coleoptera*, comprising the ground-beetles. In form the species vary greatly; the antennæ are inserted behind the base of the mandibles under a frontal ridge; maxillæ with the outer lobe palpiform, usually biarticulate, while the inner lobe is usually curved, acute, and ciliate, with spines. The epimera and episterna of the prothorax are usually distinct; the three anterior segments of the abdomen, usually six, rarely seven or eight in number, are connate. The legs are slender, formed for running; anterior and middle coxæ globular, posterior ones dilated internally, and the tarsi are five-jointed. They are, with few exceptions, predaceous and carnivorous beetles; they are runners, and do not fly, the hind wings being often absent. Their colors are dull metallic or black. They run in grass, or lurk under stones or the bark of trees, whence they go out to hunt in the night-time. The larvæ are found in much the same situations as the adult beetles, and are generally oblong, broad, with the terminal ring around, with two horny hooks or longer filaments, and with a single false leg beneath. *Carabus serratus* and *Calosoma calidum* are common examples.

Car'abine, or **Carbine.** See RIFLE.

Carabobo, kä-ra-bō'bō, a state of Venezuela, bounded on the north by the Caribbean Sea; area, 2,984 square miles. The capital is Valencia, and the chief port Puerto Cabello. Coffee, cacao, and sugar are cultivated. The village of Carabobo, 20 miles southwest of Valencia, was the scene of the battle fought 24 June 1821, which was decisive of the independence of Colombia. Caracas, La Guayra, Carthagena, Cumana, and all that portion of Venezuela which is dependent upon them, were permanently secured to the patriots by this victory. Pop. (1900) 225,000.

Caracal, kăr'a kăl, a lynx-like wild cat of Africa and southern Asia, slender in form and usually red-brown in color. See LYNX.

Caracal'la, Roman emperor: b. Lyons, 188 A.D.; d. 217. His real name was MARCUS AURELIUS ANTONINUS BASSIANUS, and he was the eldest son of Septimius Severus. On the death of his father he succeeded to the throne with his brother, Antoninus Geta, whom he speedily murdered. To effect his own security upward of 20,000 other victims were butchered. He was himself assassinated by Macrinus, the pretorian prefect, near Edessa, in 217. Among the buildings of Caracalla in Rome, the baths — *Thermæ Caracallæ* — near Porta Capena, were most celebrated, and their ruins are still magnificent.

Caracara, kä-ra-kä'ra, a genus of large carrion-eating hawks of the tropical parts of America, with black and white plumage, the head somewhat crested, legs long and naked and the general aspect vulture-like. They have increased greatly with the spread of the cattle-raising industry in South America, and have proved of much service as scavengers about the ranches and villages. The species to which the name most strictly applies is *Polyborus cheriway*, which is found from Venezuela to Texas and southern California. Another prominent species is the carancho (*P. tharus*) numerous and well known all over Brazil and Argentina. Darwin gives interesting facts in regard to this and related vulture-hawks in his journal. Compare CHIMANGO.

Caracas, kä-rä'käs, city and capital of the United States of Venezuela, was founded in 1567 by Diego de Lozada, who called the city Santiago de Léon. But in popular usage a more distinctive name was adopted — that of the Caracas tribe of Indians, formerly inhabiting the valley in which the city is built. Its altitude being about 3,000 feet above sea-level, the climate is generally mild and agreeable, the temperature seldom rising above 82° F. (with 84.2 as a maximum), or falling below 65° F. (with a minimum of 48.2). Toward the end of December the temperature is lowest, and it is highest from June to September. Mean temperature, 66.2° F. Lat. 10° 32′ N., lon. 67° 4′ 45″ W.

separated by hand and each leaf scraped on both sides with a kind of dull edged knife, in order to release the fibre, which lies just under the epidermis. After drying, the fibre is sold at the haciendas, put up in bundles of about 75 pounds, and transported on the backs of pack animals to the neighboring towns, where it is sorted, baled, and sent by rail to the port of Tampico for shipment, hence the commercial name Tampico. For further information see article on Istle Fibre in Mexico, Scientific American Supplement, (1902). See CORDAGE: CORDAGE INDUSTRIES: FIBRE; MEXICO.

CHAS. RICHARDS DODGE.

Itacolumite, ĭ-ta-kōl'ŭ-mīt, also known as flexible sandstone, is a mineral curiosity. It is a light colored, laminated-granular quartzite containing besides quartz grains, mica, talc and chlorite. Usually thin bedded, pieces an inch thick or more have considerable flexibility. This property is attributed to the presence of thin laminæ of mica, talc, etc. and also to the shape of the sand grains which have interlocking angles, due to a secondary growth of the grains by deposition of silica. Itacolumite is found in Brazil, also at several localities in the southern Appalachians.

Itagaki, Taisuke, tī-soo'kā ē-tä-gā'kē, COUNT, Japanese statesman: b. Tosa province, island of Shikoku, 1838. He received a military education, and in the war of the Restoration (1868) was prominent in the imperial army. From 1871 until his resignation in 1873 he was a privy councillor to the emperor. He then became the centre of a movement for constitutional government which in 1877 addressed to the government a memorial asking for a representative assembly and broaching popular rights. Itagaki aimed at a system based on that of Great Britain or the United States, as opposed to the system based on that of Germany, drafted by the Marquis Ito and promulgated in 1890. But he would have been satisfied at first, it is said, with an assembly which quite excluded the popular element. He organized the *Jiyuto,* or Liberals, the first Japanese political party, which rapidly increased in numbers. In 1878 he became minister of public works, in 1880 minister of the interior, and in 1898 the Liberals united with the Progressists, led by Count Okuma, to form the so-called Constitutional party, which had a large majority in the lower house of Parliament. At the Mikado's request Itagaki and Okuma formed a cabinet, with Itagaki as minister of the interior. The cabinet resigned after six months, and the Constitutional party was separated into its original parts.

Italian Architecture. See ARCHITECTURE: ITALY.

Ital'ic Languages, the languages of ancient Italy, before it had become Latinized by the predominance of Rome. These are generally described as Umbrian, Oscan, Etruscan, and Latin. The three first only survive in some fragments and inscriptions. Thus the Eugubine Tables, seven tablets of brass discovered in 1444 near Eugubium, are engraved with a series of sacerdotal inscriptions in ancient Umbrian. Taken together they contain about 450 lines, reading from left to right, some in Roman, others in Etruscan letters. The most important fragment of the Oscan language is that inscribed on a bronze tablet discovered in 1793, and called the Bantine Table, from the neighboring city of Bantia. The Oscan Bantine inscription contains 36 lines, and is much more easy to interpret than the Eugubine Tables. The Oscan language was spoken in the south of Italy. Another important monument of Oscan is the Cippus Abellanus discovered in 1685. The bronze tablet of Agnone discovered in 1848 also contains an Oscan inscription. The Etruscan language is most difficult of all to interpret. The most important remains which are known were discovered in the neighborhood of Perugia in the year 1822. The inscription is engraved on two sides of a block of stone, and consists of forty-five lines. The learned are divided about its interpretation. The most copious and important of the legal fragments which exhibit the Latin language in its earliest form are the Twelve Tables (q.v.).

Italy, a kingdom in southern Europe, consisting in the main of a large peninsula stretching southwards between the Adriatic Sea and the western part of the Mediterranean, but also including a considerable portion of the mainland and some of the adjacent islands. It is bounded on the north by the Alps, which separate it from Austria and Switzerland, except at the district lying to the north of Lake Garda, where its frontier does not follow the line of the Alps; on the west by France, from which it is separated along the larger part of the frontier line by the Graian, Cottian, and part of the Maritime Alps, and by the Mediterranean; on the south by the Gulf of Taranto and the Mediterranean; and on the east by the Adriatic and a portion of the Austro-Hungarian Empire. It is comprised between lat. 36° 40′ and 46° 40′ N. and between lon. 6° 35′ and 18° 35′ E.

Political Divisions.— For administrative purposes Italy is divided into 69 provinces, which are grouped under 16 departments (*compartimenti territoriali*), some of which consist of only a single province. The provinces are subdivided into circles (in Venetia and the province of Mantua called districts). The following table furnishes a list of the provinces and departments, with the area of each, and the population as estimated 1 Feb. 1901:

PROVINCES AND DEPARTMENTS	Area in sq. m.		Pop. on Feb. 1, 1901	
Alessandria	1950		811,833	
Cuneo	2882		638,235	
Novara	2553		743,115	
Torino (Turin)	3955		1,124,218	
PIEMONTE (Piedmont)		11,340		3,317,401
Genova (Genoa)	1582		934,627	
Porto Maurizio	455		142,846	
LIGURIA		2,037		1,077,473
Cagliari	5204		483,548	
Sassari	4090		308,206	
SARDINIA (Island)		9,294		791,754
Bergamo	1098		459,594	
Brescia	1845		538,427	
Como	1091		580,214	
Cremona	695		327,838	
Mantova (Mantua)	912		311,942	
Milano (Milan)	1223		1,442,179	
Pavia	1290		496,969	
Sondrio	1232		125,565	
LOMBARDIA (L'bardy)		9,386		4,282,728
Belluno	1293		192,800	
Padova (Padua)	823		443,227	
Rovigo	685		221,904	
Treviso	960		412,267	

Provinces and Departments	Area in sq. m.		Pop. on Feb. 1, 1901	
Udine	2541		592,592	
Venezia (Venice)	934		401,241	
Verona	1188		422,437	
Vicenza	1052		447,999	
Venetia		9,476		3,134,467
Bologna	1448		527,367	
Ferrara	1012		271,776	
Forli	725		280,823	
Modena	987		315,804	
Parma	1250		294,159	
Piacenza	954		245,126	
Ravenna	715		235,485	
Reggio nell'Emilia	876		274,495	
Emilia		7,967		2,445,035
Ancona	762		302,172	
Ascoli Piceno	796		245,172	
Macerata	1087		259,429	
Pesaro e Urbino	1118		253,982	
Marca (The Marches)		3,763		1,060,755
Perugia	3748		667,210	
Umbria		3,748		667,210
Arezzo	1273		271,676	
Firenze (Florence)	2265		939,054	
Grosseto	1738		144,722	
Livorno (Leghorn)	133		123,877	
Lucca	558		319,523	
Massa e Carrara	687		195,631	
Pisa	1179		320,829	
Siena	1471		233,830	
Toscana (Tuscany)		9,304		2,549,142
Roma (Rome)	4663		1,196,909	
Latium		4,663		1,196,909
Chieti (Abruzzo Citeriore)	1138		370,907	
Teramo (Abruzzo Ulteriore I.)	1067		307,444	
Aquila (Abruzzo Ulteriore II.)	2484		396,629	
Campobasso (Molise)	1691		366,571	
Abruzzi e Molise		6,380		1,441,551
Benevento	818		256,504	
Napoli (Naples)	350		1,151,834	
Salerno (Principato Citeriore)	1916		564,328	
Avellino (Principato Ulteriore)	1172		402,425	
Caserta (Terra di Lavoro)	2033		785,357	
Campania		6,289		3,160,448
Foggia (Capitanata)	2688		425,450	
Bari	2065		827,698	
Lecce (Terra d'Otranto)	2623		706,520	
Apulia		7,376		1,959,668
Potenza	3845		490,705	
Basilicata		3,845		490,705
Cosenza (Calabria Citra)	2568		465,267	
Reggio di Calabria (Calabria Ultra I.)	1221		428,714	
Catenzaro (Calabria Ultra II.)	2030		476,227	
Calabria		5,819		1,370,208
Caltanisetta	1263		327,977	
Catania	1917		705,412	
Girgenti	1172		371,638	
Messina	1246		543,809	
Palermo	1948		785,357	
Siracusa (Syracuse)	1442		425,507	
Trapani	948		368,099	
Sicilia (Sicily)		9,936		3,529,799
Kingdom of Italy		110,646		32,475,253

The principal islands belonging to Italy are Sicily and Sardinia; the others include the Lipari Islands, Capri, Ischia, Giglio, Monte Cristo, Elba, etc. Rome is the capital.

Physical Features.— The length of the coast of the mainland of Italy has been estimated at about 1,450 miles, that of the islands of Sicily and Sardinia at about 850 miles; so that the whole coast-line, inclusive of the smaller islands, must amount to about 2,400 miles. It is not much broken. The whole shore of the Adriatic presents a comparatively smooth and continuous line, interrupted only by the spur of Gargano, which, by its south side, contributes to form the Gulf of Manfredonia. The largest gulf of all is that of Taranto, in the south. The west coast, though much more indented than the east, is more remarkable for the number, and occasionally for the beauty, of its bays, than for their magnitude. Commencing at the south extremity and proceeding north, the most important which present themselves, in succession, are those of St. Eufemia, Policastro, Salerno, Naples, Gaeta, and Genoa. The eastern shore is generally flat and uninteresting, presenting, particularly along its northern part, a long series of sandy islands and lagoons, which retard the progress of the rivers, dam up their mouths, and, depriving them of a proper outlet, occasion the formation of pestilential marshes. On the west coast the same thing is occasionally seen, but occurs on a large scale only in the Roman territory, where the Pontine Marshes, notwithstanding the proved practicability of draining them, are permitted to spread their poisonous malaria, and convert extensive tracts, of great natural fertility, into almost uninhabitable deserts. But with this very prominent exception, the west coast is considerably elevated, the ramifications of the mountains often stretching down and terminating in lofty cliffs, with a magnificent background of alpine heights. Few countries can boast of possessing scenery of this description equal to that which is exhibited by the Gulfs of Genoa and Naples.

The interior of Italy is finely diversified. The loftiest mountains of the Alps stand on its northern and northwestern frontiers, and shelter it from the rigors of the north, giving here a climate which is unrivaled for the general mildness of its temperature and the brightness of its sky. In immediate connection with the branch of the Alps called the Maritime Alps is the chain of the Apennines, which, first proceeding east till the Adriatic is approached, then turn south, and run down the middle of the peninsula through its whole length to the Straits of Messina; while numerous branches are thrown off laterally, and form an endless succession either of loftier hills clothed with forests, or gentler slopes covered with olives and vines. In the spaces between the mountains and hills lie valleys remarkable either for their wild romantic beauties or the fertility of their soil. In the north, enclosed between the ranges of the Alps and Apennines, is a plain of vast extent, stretching from the western frontiers of Piedmont, across Lombardy, to the shores of the Adriatic, and perhaps the most fertile in Europe, other plains, still more attractive by their beauty, occur in various parts of the Italian peninsula.

Hydrography.— The Po is the only river of magnitude. It has the advantage of pursuing its course between the Alps and the Apennines, and deriving its supplies from both of them, conveyed from the Alps by the Dora Riparia, Dora Baltea, Sesia, Ticino, Adda, Oglio, and other tributaries on the left bank of the river, and by the Stura on its right bank; and from the Apennines by the Trebbia, Secchia, Panaro, etc., all on its right bank. Another river of some importance, which has its mouth at no great distance from the former, and is partly fed in the same way, is the Adige (*Etsch* in Austria); and the Bacchiglione, Brenta, Piave,

ROME
And Vicinity.
SCALE OF MILES.
AUSTRIA-HUNGARY
SWITZERLAND
FRANCE
PIEDMONT
LOMBARDY
VENETIA
EMILIA
TUSCANY
ROME
ABRUZZI
MOLISE
CAPITANATA
CORSICA
HERZEGOVINA
DALMATIA
ADRIATIC SEA
LIGURIAN SEA
GULF OF GENOA
GULF OF VENICE
Riviera di Ponente
Riviera di Levante
TURIN
MILAN
GENOA
Venice
Bologna
FLORENCE
ROME
Trieste
Ravenna
Ferrara
Modena
Reggio
Verona
Padua
Pisa
Leghorn
Lucca
Pistoja
Perugia
Ancona
Rimini
S.Marino
Nice
Monaco
Grätz
Innsbruck
Lienz
Fiume
Istria
Pola
Cherso
Veglia
Zara
Sebenico
Spalato
Lissa
Curzola
Lagosta
Meleda
Elba I.
Capraja I.
Gorgona I.
Giglio I.
Monte Cristo I.
Gran Sasso d'Italia
Apennines
Alps
Lake of Geneva
Mt.Blanc
Mt.Cenis
Mt.Viso
St.Gothard
Rhaetian Alps
Ortler Spitz
Carnic Alps
Pennine Alps
Maritime Alps
Cottian Alps
Foggia
Manfredonia
Gulf of Manfredonia
Barletta
Porto d'Anzio
Civita Vecchia
Bonifacio
Porto Vecchio
Ajaccio
Corte
Bastia
Tiber
Fiumicino
Ostia
Albano


ITALY.
SCALE OF MILES
Population of places is indicated
by different lettering, thus:
200,000 and over ROME
100,000 to 200,000 Venice
50,000 to 100,000 Ravenna
10,000 to 50,000 Brindisi
Smaller Places Montalto
Railroads
Copyright, 1904, by The Americana Company.
TYRRHENIAN SEA
MEDITERRANEAN
IONIAN SEA
GULF OF TARANTO
SARDINIA
NAPLES
PALERMO
Catania
Messina
Malta
Lipari Islands
Ustica
Pantellaria I.
Lampedusa I.
Tunis
AFRICA
12° Longitude East from Greenwich 14°

Livenza, and Tagliamento, which are of much less importance, have their basins in Venetia or the northeastern part of Italy, and all fall, like the Po and the Adige, into the Gulf of Venice. In the southern part of Italy, the peninsula of which it consists is not only narrow in itself, but is divided by the central chain of the Apennines into two watersheds, each of which lies so near the shore as to leave no room for the formation of large rivers. If the streams descend directly from the mountains to the shore, their course is necessarily so short as to give the character of mere torrents, often rising suddenly in their beds, and again as suddenly retiring within them. It sometimes happens, however, that the mountains, in ramifying, form parallel ridges, and thus give rise to longitudinal valleys, by pursuing which the course of the rivers is greatly lengthened, and their volume of course augmented. In this way the Italian peninsula, notwithstanding its narrowness, has obtained the Arno, Tiber, Garigliano, and Volturno. Numerous lakes are scattered over the surface. Many of them, independent of their natural beauties, derive much adventitious interest from classical associations; the most important are Lakes Maggiore, Como, and Garda.

Geology and Soils.— The general fertility of Italy is intimately connected with its geological structure. Except in the ranges of the Alps in the north, and the terminating branches of the Apennines in the south, granite and the metamorphic strata, which generally form soils of little natural fertility, are not of frequent occurrence, and occupy a very limited extent of surface. On the other hand, volcanic rocks, as might be expected in a country whose volanic agency is still active, occupy considerable tracts, particularly on the west coasts of Naples and of the Roman territory, where, by their decomposing lavas, soils of almost exhaustless fertility have been formed. The sedimentary rocks of the Italian continent, with exception of the metamorphic strata already referred to, are comparatively recent. At the bottom of the series is the Jura limestone, which is largely developed in the Apennines. The main body of it, commencing on the eastern frontiers of Tuscany, is continued in a broad zone far south into the old kingdom of Naples, where, after a partial interruption, it reappears in the southwest, chiefly in the province of Salerno, and partly in that of Potenza, and in the southeast in the province of Bari. It also occupies a considerable space on the north side of the Gulf of Gaeta, and on the western slope of Mount Gargano. It is likewise the prevailing rock in the north of Lombardy, where it stretches east from the shore of Lake Maggiore to the Austrian province of Illyria. Above the Jurassic limestone, and occupying almost an equal extent of surface, is the chalk, with its accompanying rocks. The main body of it stretches east along the Gulf of Genoa, and north into Emilia, then turns southward through Tuscany, forms a long narrow belt along the eastern side of the main body of the Jurassic limestone, and, though partially interrupted, finally reaches the extremity of the peninsula, where, in Cape St. Maria di Leuca, its white cliffs form the eastern entrance of the Gulf of Taranto. In the north of Naples a large tract, of a somewhat oval form, lies completely enclosed by the Jura limestone. The next strata in the ascending series belong to the Tertiary period, and consist of sandstones, travertin, and marl. These rocks occupy a considerable portion of Tuscany, and of the central part of Piedmont between Turin and Alessandria, but receive their chief development on the east coast, where, without attaining much width, they stretch without interruption from the neighborhood of Rimini to the northwest extremity of the spur. Here the main body, spreading out, is continued south-southeast, and forms the greater part of the shore of the Gulf of Taranto. Another branch, still skirting the east coast, reaches its extremity in the Gulf of Taranto. Above all the ancient strata now mentioned are immense diluvial and alluvial deposits, still in course of gradual augmentation. Of these partial tracts are found both on the coast of Tuscany and the maritime provinces on the west near Rome, particularly the Pontine Marshes; but they are insignificant in comparison with the space which they occupy in the luxuriant plains of Lombardy, not only forming extensive flats along the northern shores of the Adriatic from the Gulf of Trieste to the Gulf of Venice, but filling the greater part of the basin of the Po.

Mineral Resources.— The chief minerals are sulphur, zinc, lead, copper, coal, iron, antimony, gold, mercury, manganese, silver, arsenic, salt, graphite, borax, petroleum and asphalt. The chief sulphur mines are in Sicily; Elba is noted for the quality of its iron ore, and Lombardy and Sardinia for their zinc ore. In 1901 there were over 1,100 productive mines of various minerals, employing 68,000 workers, with a total output valued at nearly $17,000,000.

Climate.— The peninsula in its southern part has the dry and burning climate of Africa, as well as the sirocco which blows on its coasts, and resembles the simoom of that continent. In the continental part of the country the neighborhood of the Alps, the abundance of watercourses, and the direction of the fine valley which opens on the Adriatic are all circumstances which serve to maintain a delightful temperature. Yet this region is at times extremely cold. The climate of Italy generally is salubrious, but there are numerous exceptions to this character. In the north the lagoons and the rice-plantations of the basin of the Po give rise to exhalations which engender fevers. In central Italy the Maremma of Tuscany, the Campagna of Rome, the Pontine Marshes, and the environs of Volturno, produce miasmata which infect the air especially during the night.

Forestry.— The sweet chestnut constitutes the larger part of the forests that cover the lower slopes of the Alps and the Apennines, while pine, fir, poplar, myrtle, and other evergreens, clothe the hills of a considerable portion of rest of the country. There is a governmental department of forestry directed by the ministry of agriculture, industry and commerce, through a forestry council. Exclusive of chestnut plantations, the forest area is over 10,000,000 acres producing lumber, firewood, charcoal, and secondary produce to the annual value of over $17,600,000.

Flora.— The natural productions of the soil of Italy are as various as its climate. In the Alpine regions all the plants belonging to cold climates flourish, while the southern regions possess a real tropical flora. The olive, mulberry, fig, orange, citron, pomegranate, pistachio, jujube, and date grow in the south and in suit-

able places in the north. In the extreme south the cotton-plant, sugarcane, Indian fig, agave, and other tropical plants are cultivated. Everywhere is seen the grapevine. The other vegetable products are common to Italy and the rest of Europe.

Fauna.— The fauna of Italy differs little from that of the other countries of Europe situated in the same latitude. Its mountains afford a retreat to the lynx, chamois, brown bear, and wolf, while among those of Sardinia is found the moufflon or wild sheep. The porcupine is very generally found in the Apennines. The pale-red fox (different from the common species) and the blind mole are also found. The birds, which are very numerous, comprise most of the species of Central Europe, a large number of those belonging to the eastern part of Europe, and some African birds, especially the Egyptian vulture. Among the reptiles are the common viper and the asp; other noxious creatures are the scorpion and the tarantula. The marine fauna of Italy is also very comprehensive, including all the varieties of fish which are found in the Mediterranean. The fisheries embrace anchovies, sardines, tunnies, sword-fish, etc. The coral polyp (among other species the madrepore) is also of economic importance, there being a large number of persons employed in the coral fishery.

Land Tenure.— There are three systems of land tenure; that of peasant proprietorship which exists throughout Italy, but chiefly in Piedmont and Liguria; the rent system common in Lombardy and Venetia; and the partnership system, general in Tuscany, the Marches and Umbria, slightly in Sardinia, Calabria, and Apulia, but abandoned in Barese and the province of Naples. The latter system consists in a form of partnership between the proprietor and the cultivator, profits and losses being equally divided, and the families of the partners subsisting in many cases entirely on the common produce of the cultivation.

Agriculture forms the chief support of the population, and the land is very productive in almost all parts of the kingdom, although it is not everywhere equally well cultivated. The best cultivation, aided by an excellent system of irrigation, is found in Lombardy, Venetia, Piedmont, Tuscany, and the parts of Emilia adjoining the Po. The most neglected parts of the country in point of cultivation are the islands of Sicily and Sardinia. About 85 per cent of the surface of Italy is productive, and 15 per cent unproductive. Of the productive land again about 41 per cent consists of arable land and vineyards, 21 per cent of meadows and pastures, 5 per cent of olive and chestnut plantations, and 18 per cent of forests. Italy may be divided into four agricultural zones or regions:—(1) the olive, orange, and citron region, embracing Sicily and Sardinia, the Neapolitan provinces except the Abruzzi, and the part of the coast of Liguria called Riviera di Ponente; (2) the region of olives and pines, embracing the Abruzzi, Umbria, Tuscany, and the part of the Ligurian coast called Riviera di Levante; (3) the vine and oak region, embracing Lombardy, Venetia except the province of Udine, the provinces of Parma, Piacenza, Modena, Novara, Alessandria, and Lomellina, now part of the province of Pavia; (4) the vine and chestnut region, comprising the two large Piedmontese provinces of Turin and Cuneo, and the province of Udine in Venetia. All kinds of cereals are cultivated. The wheat is of fine quality, and is chiefly used as a breadstuff by the wealthier classes, while maize and rye are principally used by the poor, who also consume great quantities of pulse and chestnuts. Among plants used in commerce and manufacture the following are grown: hemp and madder, which are articles of export, flax, tobacco, hops, and rape in small quantities, saffron, cotton (in the level districts of the province of Salerno, and of Calabria, Sicily, and Sardinia), and sugarcane in Sicily and Sardinia. The commoner kinds of fruit-trees are the objects of attention everywhere, and the cultivation of southern fruits is carried on particularly in the Neapolitan and Sicilian provinces, and in Sardinia, and furnishes large quantities for export. Chestnuts are frequently used as a substitute for bread. In the cultivation of the olive Italy surpasses all other European states; so that, although the home consumption of olive-oil is very large, there remains a considerable quantity for exportation. There is also a very large production of wine. The average annual production of some of the above-mentioned objects of cultivation may be estimated as follows:

Wheat	143,400,000	bushels.
Maize	85,600,000	"
Oats	19,360,000	"
Rye and barley	18,400,000	"
Rice	26,800,000	"
Other cereals	18,000,000	"
Total cereals	311,560,000	"
Potatoes	19,360,000	bushels.
Hemp	111,000,000	lbs.
Flax	30,000,000	"
Cotton	22,000,000	"
Tobacco	7,250,000	"
Olive-oil	74,500,000	gals.
Wine	666,000,000	"

Italy anciently was celebrated for its wines, the best of which were obtained from the vineyards on the two slopes of the Apennines. Among the most celebrated were those of Liguria, Albanum (now Albano), near Rome, which received the warmest praises from ancient writers; those of Nomentum (Mentana), about 15 miles to the east of Rome, which are compared by Strabo to the best wines of Greece; those of Setia (Sezze), about 35 miles to the southeast of Rome, which were much prized by Augustus and all the wealthy Romans of his age; the Cæcuban wine, which grew in Campania, the province to the south of Latium, and which from the earliest times held the first place among the wines of Italy, and was particularly esteemed for the exquisite delicacy of its flavor; the Falernian and Massic wines, which also grew in Campania, and likewise had a high reputation; and the Mamertine wine from the neighborhood of Messana in Sicily. The southwest of Sicily, which now produces excellent wines, is nowhere mentioned for its wine-growing qualities in the writings of the ancients. At the present day the wines of Italy are admittedly inferior to their ancient reputation. The vines yield many wines, among which the liqueur wines are distinguished for their good quality; but those which serve for daily use cannot enter into competition with those of France. The most of them are at once sweet and harsh, often coarse, and although they appear to combine much body and strength they do not easily bear transport, and deteriorate in little time, even

without being removed to a distance. Their bad quality proceeds not only from the want of care shown in the cultivation of the vines, but also from the bad processes employed in the manufacture. Among the liqueur wines which are so abundant in Italy may be mentioned the lacryma-Christi, nasco, giro, tinto, Malmsey, aleatico, and muscat. The most famous of the Italian red wines are those of Carmignano in Tuscany, and those of the Isle of Elba, Bari, and Ischia. The white wines of Marsala and Castel-Veterano are compared to Madeiras of the second class.

Stock-raising.— The rearing of live-stock is an important industry in Italy, which exports cattle, sheep, goats, and swine. Horses are imported, and also sheep's wool. The cultivation of green crops as food for cattle is scarcely known. During the summer the animals are led to the pastures, and in winter they are furnished with straw and a little hay in their stalls. The farmers do not give much attention to the improvement of their domestic animals, which have lost much of their original excellence. The cattle are estimated to number about 5,000,000 (including 15,000 buffaloes), many of them team oxen. Sheep number 6,900,000. Some camels are perfectly acclimated near Pisa in the low-lying tracts of San Rossore. The cheese of Italy is famous, especially the Parmesan.

Commerce.— The foreign trade of Italy is not large in proportion to the size and population of the country, and does not make much progress. In 1882, 1889 and 1900 the imports and exports reached the following figures:

	1882	1889	1900
Imports	$269,080,000	$277,230,000	$341,295,925
Exports	231,160,000	190,130,000	270,979,920

Among the chief imports are coal, grain, cotton, silk, wool, sugar, coffee; by far the largest export is silk, raw and thrown, others being wine, olive-oil, oranges and lemons, hemp and flax, sulphur. In 1901 the import of coal reached the value of $30,001,763; of raw cotton, $31,618,501; cotton goods, $1,918,296; of silk, raw, twisted, etc., $14,766,680; of machinery, $14,521,488. In the same year the exports of silk and silk goods were valued at $86,272,986 (as against $101,764,494 in 1899); of animals and animal products at $10,504,021; of wine in casks at $7,405,762; olive-oil, $9,136,994; fruit, $10,710,753. The trade of Italy is chiefly with France, the United Kingdom, the United States, Germany, Austria, Switzerland, and Russia, the United Kingdom sending in 21 per cent of the imports, and the United States being second with 13 per cent.

In the foreign trade of the United States, Italy occupies the eighth place in exports, and the tenth place in imports, the largest items of import being raw silk, sulphur, and lemons.

Manufactures.— Since the consolidation of the Italian kingdom the manufactures of the country have made considerable advances, especially in the department of Tuscany and the northern provinces. They now afford support to 13 per cent of the whole population. Machine-making, although not sufficing to meet the internal wants of the country, nevertheless employs many workmen, especially in Genoa and neighborhood, Turin, Milan, and Naples. Coach and carriage making is an important industry in Milan. Ship-building is largely carried on in Liguria. Musical instruments are made in all the capitals. Especially famous are the bow instruments of Cremona, and nowhere are violin strings made so well as in the Abruzzi. In the iron industry the department of Lombardy stands at the head; and in that department more particularly the provinces of Brescia, Como, and Milan. The town of Brescia is the chief seat of the cutlery manufactures. The manufacture of gold and silver wares is very flourishing in Rome, Milan, Naples, Genoa, Venice, and Catania, and like that of articles in bronze has long been an important branch of Italian manufacturing industry. Italy is very rich in marble of the most beautiful and various colors and markings. The department most celebrated in this respect is Tuscany, especially the province of Massa e Carrara, and the district of Serravezza in the province of Lucca. The district of Volterra in the province of Pisa is noted for its alabaster quarries and the making of articles in alabaster. The cities of Rome, Naples, and Florence enjoy a world-wide reputation for their cameos and mosaics, as also (along with Leghorn and Genoa) for articles of coral. Earthenware manufactures have long been carried on in Italy with the best success. The articles in terra-cotta especially are remarkable for the beauty of their forms. Venice and the neighboring island of Murano are celebrated for the manufacture of glass beads, but the other glass manufactures of Italy do not nearly suffice for the home consumption. In the department of chemical industries the production of boracic acid (obtained from the lagoons of Tuscany) and of tartaric and citric acids, the manufacture of soap (of great consequence in Venice), and the preparation of alizarine or madder-red at the mouth of the Sarno, may be particularly mentioned. Among articles used for meat or drink, pickled meat and sausages (which are exported to a considerable extent), and liqueurs and rosolios, are the most important which are made in Italy. The sugar industry holds a very subordinate place, as does also the brewing of beer. The manufacture of tobacco is a state monopoly, and employs about 15,000 hands. The spinning and weaving industries in Italy are in some branches very highly developed. The most important of these are the silk manufactures, which form one of the chief sources of the national wealth. With the exception of Abruzzi, Basilicata, and the island of Sardinia, all the provinces of the kingdom take part in the preparation of the raw silk which is used in the manufacture, but this is more especially the case in Lombardy, Piedmont, and Venetia. The rearing of silkworms is more largely carried on in Italy than in any other country in Europe. Over 2,000,000 spindles are employed in spinning the silk, and the weaving is a very extensive branch of manufacture in Como, Genoa, Caserta, Milan, Turin, Florence, and Naples. Silk industries employ over 170,000 hands. The cotton manufacture is, as a textile industry, next to that of silk, and has greatly increased in recent years, the factories being chiefly in Lombardy, Piedmont, Lucca, and the Genoese district. About 1,900,000 spindles are now employed, the number of hands being 80,000. Woolen manufactures are carried on chiefly in Upper Italy, in Piedmont and Venetia, in the provinces of Novara, Vicenza, and Turin. The number of spindles at work is about 345,000, the

looms about 9,000 (half being power-looms), the hands employed about 28,000. The import of woolen yarns, and still more so of woolen fabrics, is large. Flax, hemp, and jute support industries of some importance. Hand-spinning is general where the raw material is grown. Good fabrics are woven, although they are not able to compete with those made in England, France, Germany, and Austria. Hempen fabrics, which are chiefly produced in the provinces of Bologna and Ferrara, where rope-making also plays an important part, are articles of export. Tanning is carried on in almost every part of the peninsula. There are in several places, but chiefly Genoa and Naples, factories for the making of gloves, boots, and shoes, which are of excellent quality, and exported to various countries, and even to America. The paper manufacture is very flourishing, and great advances have been made in the processes employed. In the making of straw hats and other articles in plaited straw, Italy maintains the first place among the countries of Europe. The chief seat of this industry is in Tuscany (especially Florence and its environs), where it supports a great number of persons. The products of this manufacture are known all over the world. The making of furniture, and of articles of turnery, and articles used for personal adornment, as well as the manufacture of felt and silk hats, may be mentioned among the other manufacturing industries carried on in Italy.

Shipping and Navigation.— In 1901 the merchant marine of Italy consisted of 5,511 sailing and 446 steam vessels, of 945,008 tons burden, the steamers being of 376,844 tons burden, these figures including vessels engaged in the coasting trade and in fishing from 1 ton burden upward. The total tonnage entered at Italian ports in 1901 amounted to 31,362,192 tons; cleared, 31,317,937 tons. The principal ports are Genoa, Leghorn, Messina, Naples, Palermo, Venice, and Catania, Genoa standing first and Naples second.

Railways, Telegraphs, and Post-office.— The length of the railways in operation, including Sicily and Sardinia, is now about 10,000 miles, of which considerably more than half belong to the state. The first line of railway was opened in 1839, but the process of construction was for a long time slow. In recent years the state has engaged in constructing railways, and has also obtained possession of others by purchase, but all are now worked by private companies. It is expected that when all the lines undertaken by the government have been completed, the total cost of construction will have amounted to 5,000,000,000 lire, or $1,000,000,000. The expenditure in 1900 amounted to $47,903,278, and the receipts to $63,673,265, of which $24,698,193 were from 60,029,673 passengers.

The total length of the telegraph lines in operation in the kingdom in 1900 was 27,918 miles, most of which belong to the state. The total number of inland despatches amounts to between eight and nine millions annually. The post-office in the course of the year now transmits considerably more than 373,000,000 letters and post-cards. The number of post-offices in the kingdom, including collecting boxes, is stated to be over 8,000.

Money, Weights, and Measures.— The monetary system of Italy is based on the Decimal System, the lira, equivalent to the French franc, being divided into 100 centesimi. The lira is equal to about 20 cents. The weights and measures also, are those of the metric system, the French names having such modifications as are necessary to give them an Italian form. Thus the Italian gramma = the gramme, the chilogramma = the kilogramme, the litro = the litre, the ettolitro = the hectolitre, and so on; the metro = the mètre, the ettometro = the hectomètre, the chilometro = the kilomètre, etc.; the aro = the are, the ettaro = the hectare; and the stero = the stère, and the decastero = the decastère. The quintale metrico is the same as the quintal metrique, and the tonnelata the same as the tonneau metrique. See DECIMAL SYSTEM.

Banking.— There is no national bank in Italy and since 1893 only three banks of issue. The chief of these is the Bank of Italy, formed by the union of the National Bank of the Kingdom of Italy, founded in 1850, with a share capital of $40,000,000, and having its chief seats in Florence, Genoa, Milan, Naples, Palermo, Rome, Turin, and Venice; with the National Bank of Tuscany, founded in 1857, share capital $10,000,000; and the Tuscan Credit Bank, founded in 1860, share capital $12,000,000. The other two banks of issue are the Bank of Naples, founded in the 16th century; and the Bank of Sicily, founded in 1843; chief seats, Palermo and Messina.

Constitution and Government.— The constitution of the kingdom of Italy is a limited monarchy. It is based upon the fundamental statute of 4 March 1848, fixing that of the kingdom of Sardinia. The throne is hereditary in the male line of the royal house of Savoy. The king attains his majority on completing his 18th year. He exercises the power of legislation only in conjunction with a national parliament, consisting of two chambers. The first chamber is called the senate, and is composed of the princes of the blood, and an indefinite number of members appointed for life by the king. These last must be above 40 years of age, and must be distinguished either by holding or having held some high office either in church or state, or by eminent services in literature, science, art, or any other pursuit tending to the benefit of the nation, or they must have paid for at least three years a sum not less than 3,000 lire ($600) in direct taxes. In 1902 the senate numbered 356 members. The second chamber is called the chamber of deputies, and consists of 508 members, who are elected by a majority of all the citizens above 21 years of age who are in the enjoyment of civil and political rights, can read and write, and who pay direct taxes to the state or the provincial administration to the amount of 20 lire ($4) yearly. Certain persons enjoy the franchise independently of the taxation test, such as members of learned academies and of chambers of commerce, professors, state officials, members of knightly orders, doctors, advocates, etc. For the election of the members of the chamber of deputies the whole country is divided into electoral colleges or districts. Any one who has the right of voting and has completed his 30th year may be elected, unless he be a clergyman or an officer of state. Some officers of state, however, may be elected. The king calls the chambers together every year. The sittings are public. The president of the senate is appointed by the king, that of the chamber of deputies is elected by the chamber itself

The chamber of deputies has the right of impeaching ministers of the crown, in which case the senate is the court before which the impeachment is tried.

The executive power of the state is exercised by the king through responsible ministers forming a council of ministers. In addition to this there is a state council possessing consultative powers, and authorized to decide on questions of competence arising between the administrative departments and the law-courts, as well as in cases of dispute between the state and its creditors. There are 11 departments in the government: 1, the ministry of foreign affairs, to which is attached the diplomatic council; 2, the ministry of the interior, with the supreme sanitary council, and the command of the national guard; 3, the ministry of justice and ecclesiastical affairs; 4, the ministry of finance, with the permanent council of finance; 5, the ministry of the treasury; 6, the ministry of war; 7, the ministry of marine, with the supreme council for naval affairs; 8, the ministry of public instruction, with the supreme council of instruction; 9, the ministry of public works, with the supreme council for public works; 10, the ministry of agriculture, manufactures, and commerce, with the councils for trade and manufactures, agriculture, mines, and woods and forests; and 11, the ministry of posts and telegraphs.

Finances.— The finances of Italy are not in a satisfactory condition, this being due partly to the expensive wars which were necessary in order to establish and consolidate the unity of the kingdom, partly to the increase of the public debt in consequence of the successive annexations of different portions of the Italian territory, since the present kingdom of Italy has naturally inherited the debt of each of the separate states of which it was formed partly to the large sums expended on railways and on the army and navy. At the end of 1874 the nominal capital of the whole Italian debt was valued at a sum equal to $1,976,717,845. In 1901 the total debt was $2,528,698,992. The difficulty experienced by the government in raising money to meet all its obligations has impelled it to resort to means which are, in some cases, extremely oppressive and unpopular (such as the grist tax), and in other cases scarcely creditable (state lotteries). The Italian budget divides the revenue and expenditure into ordinary and extraordinary. According to the budget of 1902–3 the total revenue estimated for that year was $365,133,700, and the total expenditure $362,472,708. For a number of years following the establishment of the kingdom (1861) the expenditure generally exceeded the revenue, the deficit rising in one year (1866) to $123,400,000. From that date the deficit decreased steadily, and 1884–5 showed a surplus of $12,000,000. Such a surplus, however, is rare, that for 1899–1900 being $1,042,097. The progressive increase of the receipts to balance the expenditure is mainly due to two causes, the establishment of new taxes and the more careful collection of the old ones. Besides the general budget there is one for communes and another for provinces, both of which exhibit, if not an altogether satisfactory condition, at least an improving one.

Army and Navy.— By the law of 7 June 1875, supplemented by subsequent enactments, all men capable of bearing arms are under obligation of military service from the end of their 20th to the end of their 39th year. The forces are divided into three main branches: the standing army, the mobile militia, and the territorial militia. The regular time of service for the infantry is two or three years with the flag, six or five years in the reserve, three or four years in the mobile militia, and seven years in the territorial militia. The cavalry serve three years with the flag, six years in the reserve, and ten in the territorial militia. A certain number of the annual recruits (decided by the ballot) are only called on to serve under the flag from two to six months, which may be spread over several years. A third category have to engage in military exercises for only 30 days during the 19 years. The whole kingdom is formed into 12 military districts, each with an army corps. In 1901 the permanent standing army numbered in all 819,069, of whom 261,976 were actually serving with the flag. Of the latter 120,975 were infantry, 20,980 cavalry, and 32,563 artillery. The mobile militia numbered 320,170, the territorial militia 2,275,631. The total army strength was 3,356,920.

Great efforts have been made to strengthen the fleet in recent years, and it now possesses some powerful vessels. There are 14 battleships of the first class, two of which, the Duilio and Dandolo, have their citadel armor 22 inches in thickness. These are reputed to be among the most powerful war-ships yet constructed, each carrying four 100-ton Armstrong guns. Three others carry 105-ton guns. There are also 11 first-class cruisers, all decks protected. The total strength of the navy is 25,595 men, including 1,799 officers, of which the chief are one admiral, 21 vice- and rear-admirals and 203 captains.

Colonies.— Italy possesses the colony of Eritrea on the African shore of the Red Sea, and some territory in Somaliland. The total area of these possessions is about 188,000 square miles, with a population of about 850,000.

Ethnology.— The inhabitants of Italy are a mixture of many different races who have successively obtained the mastery of the country. Central Italy was the seat of several races which had partly been settled in the land from time immemorial, and were thence regarded as aborigines, and had partly immigrated from foreign countries. Among the former were the Sabellians, a powerful, warlike, freedom-loving people, subdivided into various tribes, the chief of whom were the Sabines, Samnites, and Æquians; the Umbrians, who dwelt to the north of the Sabellians, and are considered to be the most ancient of all the races inhabiting Italy; the Latin tribes, living to the west of the Samnites in the region called, from them, Latium; and the Oscans, Opicans, or Ausonians, living farther south than the Latins, being the earliest inhabitants of Campania. Among the latter races who came into Italy from foreign countries, the most remarkable were the Etruscans, who dwelt between the Gauls in the north, the Umbrians, the Latins, and the sea. The region on both sides of the Po (Padus) in Upper Italy was inhabited by a Gallic race, divided into numerous tribes and states possessing a number of towns on the coast as well as on the fruitful plain in the interior. Adjoining them on the northeast were the Venetians, and on the west coast the Ligurians. Lower Italy was occupied by Apulians in the southeast, supposed

to be a member of the Oscan race; and by Lucanians, a Sabellian tribe; and the Brutii in the southwest, the former occupying the district to the south of Campania and Samnium, and extending as far as the root of the small peninsula in the extreme southwest, which was the habitation of the latter. The coasts of lower Italy as far north as Latium were studded many hundred years before Christ with Greek colonies, from whom the neighboring tribes derived some of the elements of Greek culture and an acquaintance with Greek mythology. Evidence of this is found in the Latin legend to the effect that after the destruction of Troy the hero Æneas, with a number of Trojan followers, came to Italy and formed a settlement in Latium, where he married the daughter of the Latin king.

The Gallic (Celtic) and the Roman elements have in the course of time become the principal ingredients of Italian nationality, but few traces of the character of the aboriginal population being now discernible. In upper Italy the Germanic element has contributed its share toward the formation of Italian nationality. Even the name of Lombardy is derived from that of a German tribe. In southern Italy and Sicily the Arab element enters into the mixture of national characteristics. The Italian has generally a fine exterior. He is slim rather than stout, but strong and agile. A dark complexion, an expressive countenance, sparkling eyes, black hair, and a grave gait combine to render the physique of the Italian characteristic and prepossessing. A great proportion of the inhabitants retain many of the characteristics of the Roman conquerors of the world. The predominating system of agriculture, however (see *Land Tenure*), the peasants being obliged to pay one half of their gross income to the landlords, and the minute subdivision of the soil, exert a depressing effect upon the condition of the lower classes.

Population.— The total population of Italy as shown in the table under *Political Divisions* was 32,475,253, or 293 people per square mile, as compared with 28,459,628 in 1881, thus showing an increase of about 14 per cent in 20 years. The foreign population in 1901 consisted of 37,706 residents and 23,709 transients, the majority being Austrians, Swiss, Germans, English and French. The natives of foreign extraction comprise 90,000 Albanians in southern Italy, 80,200 French in northern Italy, 31,200 Greeks in Calabria, 30,000 Slavs and 11,400 Germans in the northeast, and 9,800 Spanish in Sardinia.

Religion.— According to the provisions of the fundamental statute the Roman Catholic is the state religion, but all other creeds are tolerated, and adherents of all religions have equal municipal and political rights. The spiritual head of the Roman Catholic Church, the Pope, has his seat at Rome. His prerogatives are regulated by the law of 13 May 1871, which also determines the relation between church and state. By this law the person of the Pope is pronounced sacred and inviolable. The Italian government pays sovereign honors to the Pope, and guarantees him a yearly dotation of 3,225,000 lire ($645,000). The Pope also enjoys the possession of the palaces of the Vatican and the Lateran, and the villa of Castel Gandolfo, without being subject to taxes on their account, and these places are not put under the jurisdiction of the state. Temporary residences of the Pope, as well as places where a conclave or a council is held, are protected by similar immunities. The Pope is perfectly free in the exercise of his spiritual functions; and free intercourse is also guaranteed between the head of the church and the episcopate, as well as the whole Catholic world. The ambassadors of the Pope, and those accredited to the Holy See by foreign powers, enjoy all the privileges granted to such functionaries by international usage. The Church has the entire right of nominating to all ecclesiastical offices and benefices. The royal exequatur and placet are abolished. This guaranty-law, as it is called, which really determines the relations between church and state, at the present day, has never been acknowledged by the Popes, who have hitherto declined to accept the dotation. In the kingdom of Italy there are 51 archbishoprics and 223 bishoprics, beside 6 cardinal-bishops with sees in Italy. The number of parish priests is about 76,500. The monasteries and convents have been abolished by a royal decree dated 7 July 1866, and extended to the former Papal States, and to Rome itself, by another decree dated 25 June 1873. Among the Waldenses, who follow the religious observances of the Reformed Church, the highest spiritual authority is confided to a synod.

Judiciary.—For the administration of the law there are, beside numerous courts of first instance, 161 civil tribunals and the tribunals of correction, 92 assize courts, 24 courts of appeal, and 4 courts of cassation (at Turin, Florence, Naples, and Rome). The court of accounts occupies an independent position.

Local Government.— The constitution of the provinces and communes is based upon the law of 20 March 1865. Each province has the right of independent administration, and the executive power is entrusted to a provincial council, the members of which are elected by the communal electors for five years, and to a provincial deputation or commission elected by the council from its own members, and managing the business of the province when the council is not sitting. The provincial councils elect their own presidents and other officials. In each commune there is a communal council elected like that of the provinces for five years, and a municipal giunta elected by the council. The head of the communal administration is the sindaco, who in all the chief communes is elected by the council from among its own members, and in other cases is nominated by the king from the members of the communal council.

Education.— Compulsory education is enforced by the law of 15 July 1877, for all children who have completed their sixth year, and do not receive adequate instruction either at their homes or in private schools. Attendance is obligatory at the rudimentary schools in the commune for such children up to their ninth year, and in case of failure to pass the requisite examination they may be detained a year longer. The elementary communal schools are entirely supported by the municipalities, which nominate and pay the teachers, and carry out the educational laws under the supervision of the state school-inspectors. The subjects of compulsory instruction are reading, writing, arithmetic, the metric system, the rudiments of Latin, and the first duties of a man and a citizen. Religious instruction is not obligatory. There are many schools supported by the Church, as well as

private schools, but all must adopt the government code, and are open to government inspection, while all teachers must hold the government certificate. The urgency of the need for all practicable measures being used to advance the cause of popular education in Italy may be gathered from a return issued by the Italian government in March 1870, which gives information regarding the amount of education received by the military conscripts born in 1847, and called up for active service in 1868, and shows that throughout the kingdom of Italy the average percentage, reckoned over the different provinces of the kingdom, of these conscripts who were totally unable to read or write was 64.27. In the province of Girgenti it was 85.82, and in the southern provinces generally it was above 80. The average percentage by 1897 had decreased to little more than 37. It is now comparatively rare to meet a boy or girl who cannot at least read. Education is practically free up to the university. Beside the regular day schools there are evening schools, in which elementary education may be carried further. The principal institutions for secondary education are the gymnasiums and lyceums, the former having a course of five years, the branches taught being Greek, Latin, Italian, history, geography, and arithmetic; the latter, having a course of three years, add to these subjects philosophy, mathematics, physics, chemistry, and natural history. No fees are charged either in gymnasium or lyceum. In addition to these there are a number of technical schools, in which fees are charged. There are also schools of agriculture, mining, commercial education, etc. For the higher education there are no less than 21 universities, many of them of ancient foundation, and at one time of considerable renown. The oldest are those of Bologna (founded in 1119), Padua (1222), Naples (1224), Rome (1244), Perugia (1320), Pisa (1329), Siena (1349), Pavia (1390), Turin (1412), and Parma (1422). The other universities are Cagliari, Camerino, Catania, Ferrara, Genoa, Macerata, Messina, Modena, Palermo, Sassari, and Urbino. The number of students at all the universities was returned in 1897–8 at 22,540, of whom Naples had 5,465, Turin 2,551, and Rome 2,300. In all universities the theological faculty has been abolished. Cooperating with these institutions for the education of the people there are about 150 training schools for teachers, with an attendance of about 18,000 students. There are government art schools at Bologna, Carrara, Florence, Lucca, Milan, Modena, Parma, Ravenna, Rome, Turin, Venice, etc., with a total of 3,300 pupils; and in addition the academies of Genoa, Bergamo, Verona, Siena, Pisa, and Perugia. Musical conservatories are supported by the government at Florence, Milan, Naples, Palermo, and Parma.

Emigration.— Military conscription, oppressive taxation, and the agricultural conditions already enumerated, are the causes of extensive emigration, the great bulk of which finds its way to the United States, Argentina, and Brazil, European nations adjacent to Italy also receiving their share. From 1870 to 1902 the total number of Italians who arrived in the United States amounted to 1,391,076. If to this is added the children born here, a total of 1,500,000 is reached. It is estimated that for 10 years Italian immigration will continue in the present proportion and then gradually decrease, so that in 1920 the Italian population of this country will probably number from four to five millions.

The Italian immigration has a peculiar character. Until 1890 the percentage of women was less than 15, but now it has increased to 39. This indicates that the immigration has a marked tendency to become permanent. Thirty per cent or more of Italian adults who had been in this country more than 10 years went back at least once to Italy, and 80 per cent of these came to this country again, bringing their families with them. During the time in which the family is not here the man sends money weekly to Italy. It is calculated that about $50,000,000 crosses the ocean every year in this way.

The Italian population in this country is changeable; roughly speaking, it is better the farther we go westward. New York has about 250,000 Italians, who are chiefly the worst kind of those coming to America. Philadelphia has about 80,000; Newark, N. J., 40,000; Boston, 25,000. In the New England States, where about 50 per cent of the entire population are foreigners, the Italian element is no more than 10 per cent, but is rapidly increasing. Cincinnati, Ohio, has only 5,000 Italians; Pittsburg, 12,000; Chicago, 15,000. California has about 60,000 Italians, of whom 25,000 are in San Francisco. The Italians in California are of the best kind, mostly Genoese, clean and intelligent.

Unfortunately many Italians coming from their farms abroad, who could be a valuable and strong agricultural element in this country, mass in the unclean and narrow quarters of the big cities. The only difficulty in directing them to the farming West, where they would be easily Americanized, is their ignorance of the state of things in this country and the lack of money to make the journey.

History.— Italia did not become the general name of this country until the age of Augustus. It was known to the Greeks under the name of Hesperia, and also, either in whole or in part, by those of Ausonia, Saturnia, and Œnotria. The name of Italia was at first merely a partial name for the southern extremity. From the earliest times Italy was inhabited by many tribes of different origin. See paragraph on *Ethnology*. At an early period Rome, the chief town of Latium (founded, according to the received date, 753 B.C.), became predominant among the cities and tribes of Central Italy, and it gradually extended its influence over the whole country until, by the end of the 3d century B.C., it had brought into allegiance or subjection all the tribes of Italy from north to south, including those of the islands of Sicily, Corsica, and Sardinia. The history of ancient Italy thus merges to a great extent in that of Rome, to which article, as well as those treating of the more important races of Italy, the reader is referred for further information concerning ancient Italy, while the subsequent history of Italy is resumed from the overthrow of the empire in the west, 476 A.D.

From 476 to 568 Italy was under the dominion of the Herulians and Rugians, and of the Ostrogoths. Odoacer, the leader of the Roman-Germanic troops, dethroned the Emperor Romulus Augustus, assuming the title of King of Italy, and after ruling 12 years was defeated by Theodoric, king of the Ostrogoths, who

ruled over Italy with Ravenna as his capital. Theodoric, who combined the vigor of the north with the cultivation of the south, is justly termed the Great, and, under the name of Dietrich of Bern (Verona), has become one of the principal heroes of old German story. About 568 the country was invaded by the Lombards (Langobardi, Longobardi), a German people which had emigrated from the Elbe to Pannonia. Under King Alboin they conquered the Po basin, which received from them the name of Lombardy. The kingdom of the Lombards included Upper Italy, Tuscany, and Umbria. Alboin also created the Duchy of Benevento, in Lower Italy, with which he invested Zotto. The popes, in their efforts to defend the freedom of Rome against the Lombards, had recourse to the Frankish kings. In consideration of the aid expected against King Astolphus, Pope Stephen III. (754) anointed Pepin, who, with the approbation of Pope Zacharias, had been made king of the Franks in 752, and with the assent of the municipality of Rome, appointed him patrician. In 756 Pepin presented the exarchate of Ravenna, with the five cities, to the Pope. At the invitation of Pope Hadrian I. Charlemagne made war upon Desiderius, the king of the Lombards, took him prisoner in his capital, Pavia, united his empire with the Frankish monarchy (774), and eventually gave Italy a king in his son Pepin. Charlemagne was unsuccessful in his attempts against the Duchy of Benevento, the independence of which was maintained by Duke Arichis, and against the republics in Lower Italy, where Naples, Amalfi, and Gaeta in particular, had become rich by navigation and commerce. Leo III. bestowed on the king of the Franks, on Christmas day, 800 A.D., the imperial crown of the West. But dislike to the Franks united the free cities, Rome excepted, more closely to the Eastern Empire. During the lifetime of Charlemagne Frankish Italy was given to his grandson Bernard (810), who having attempted to become independent of his uncle, Louis the Debonnaire, was deprived of the crown, and had his eyes torn out. Italy now remained a constituent part of the Frankish monarchy, till the partition of Verdun (843), when it was allotted, with the imperial dignity, and what was afterward called Lorraine, to Lothaire I., eldest son of Louis. Lothaire left the government (850) to his son Louis II., the most estimable of the Italian princes of the Carlovingian line. After his death (875) Charles the Bald of France first took possession of it, and after his death (877) Carloman, who was succeeded, in 884, by his brother Charles the Fat, who united the whole Frankish monarchy for the last time. His dethronement (887) was the epoch of anarchy and civil war in Italy. Berengarius, duke of Friuli, and Guido, duke of Spoleto, disputed the crown between them. Guido was crowned king and emperor, and after his death (894) his son Lambert, although Berengarius got himself crowned king in the same year. Arnulf, the Carlovingian king of the Germans, enforced his claims to the royal and imperial crown of Italy (896), but like most of his successors was able to maintain them only during his residence in the country. After the death of Lambert (898) and Arnulf (899) the struggle for supremacy in Italy continued, the competitors now being Berengarius, of Friuli, and Louis, king of Lower Burgundy (Arles), but at last the former succeeded in restoring quiet by driving out his rival. He reigned from 915 when he was crowned emperor till 924, when he was assassinated. Hugh of Provence, who succeeded, sought to strengthen the insecure throne of Italy by a bloody tyranny. His nephew, Berengarius, marquis of Ivrea, fled to Otho the Great of Germany, assembled an army of fugitives, returned, and overthrew Hugh (945), who was succeeded by his son Lothaire. Berengarius became his first counsellor, and after the death of Lothaire, in 950, poisoned, it was said, by Berengarius, wished to compel his widow — the beautiful Adelaide — to marry his son. Escaping from his cruelty she applied for aid to Otho I., king of Germany, who passed the Alps, conquered Pavia, became king of the Franks and Lombards (in 951), and married Adelaide. To the cession of Friuli, the key of Italy, which Otho gave to his brother Henry, Berengarius was indebted for permission to reign as the vassal of Otho. But 10 years after, on complaints, Otho returned (961), deposed him, and led him prisoner to Bamberg. Early in the following year (962) Otho was crowned emperor by Pope John XII., thus uniting Italy with Germany, and from this event dates the foundation of what is known in history as the Holy Roman Empire.

Otho granted to the Italian cities privileges that were the foundation of a free constitution. Owing to the corruption existing in the Papal Court he deposed John XII., who had crowned him emperor, and chose Leo VIII. in his stead; but the people, jealous of its right of election, chose Benedict V. From this time the popes instead of ruling the people of Rome, became dependent on them. In Lower Italy the Republics of Naples, Gaeta, and Amalfi defended their independence against the Lombard duchy of Benevento,. with the more ease in that they had a common enemy in the Saracens, who previously invited over from Sicily by both parties (about 830), as auxiliaries against each other, had settled and maintained themselves in Apulia. Forty years later the Greeks in Lower Italy, who had adhered to the Byzantine Empire, succeeded, with the aid of Louis II. of Germany, in recovering the territory that had been wrested from them by the Saracens, and out of the recovered region formed a separate province, called the Thema of Lombardy, which continued under their dominion upward of a hundred years, being governed by a capitan (governor-general) at Bari. Otho the Great did not succeed in driving them from Italy, and the marriage of his son, Otho II., with the Greek princess Theophania, put an end to his exertions for this purpose.

In opposition to the designs of the Count of Tusculum, who wished to supplant the absent emperor at Rome, a noble Roman, the consul Crescentius, attempted to govern Rome under the semblance of her ancient liberty (980). Otho II., king since 973, occupied with his projects of conquest in Lower Italy, did not interfere with this administration, which became formidable to the two popes Boniface VII. (anti-pope) and John XV. But when Otho III., who had reigned in Germany since 983, raised his kinsman Gregory V., to the popedom, Crescentius caused the latter to be expelled, and John XVI., a Greek, to be elected by the people. He also endeavored to place Rome again under the nominal supremacy of the Byzantine Em-

pire. Otho, however, reinstated Gregory, besieged Crescentius in the castle of San Angelo, took him prisoner, and caused him to be beheaded with 12 other noble Romans (998). But the Romans again threw off their allegiance to the emperor, and yielded only to force. On the death of Otho III. (1002) the Italians considered their connection with the German Empire as dissolved. Harduin, marquis of Ivrea, was elected king, and crowned at Pavia, whereupon Milan, the enemy of Pavia, declared for Henry II. (in Italy, I.) of Germany. A civil war ensued, in which every city, relying on its walls, took a greater or less part. Henry was chosen king of Italy by the nobles assembled in Pavia; but disturbances arose in which a part of the city was destroyed by fire (1004 A.D.). Not till after Harduin's death (1015) was Henry recognized as king by all Lombardy. He was succeeded by Conrad II. (in Italy, I.). When Henry III. (in Italy, II.), the son of Conrad, whom he succeeded in 1039, entered Italy (1046), he found three papal claimants in Rome, whom he deposed, appointing in their stead Clement II., and ever after filled the papal chair, by his own authority, with virtuous German ecclesiastics. Henry died in 1056. During the long minority of his son Henry IV. (in Italy, III.) the policy of the popes, directed by the monk Hildebrand (afterward Gregory VII.), succeeded in creating an opposition which soon became formidable to the secular power. (See POPES.) The Normans also contributed to this result. As early as 1016 warriors from Normandy had established themselves in Calabria and Apulia. Allies sometimes of the Lombards, sometimes of the republics, sometimes of the Greeks against each other and against the Saracens, they constantly became more powerful by petty wars. The great preparations of Leo IX. for their expulsion terminated in his defeat and capture (1053). Nicholas II. united with the Norman princes, and, in 1059, invested Robert Guiscard with all the territories conquered by him in Lower Italy. From that time the Pope, in his conflicts with the imperial power, relied on the support of his faithful vassal, the duke of Apulia and Calabria, to which Sicily was soon added. While the small states of the south were thus united into one large kingdom, that in the north was dissolving into smaller states. The Lombard cities were laying the foundation of their future importance. Venice, Genoa, and Pisa were already powerful. The Pisanese, who, in 980, had given to Otho II. efficient aid against the Greeks in Lower Italy, and in 1005 boldly attacked the Saracens there, ventured, in connection with the Genoese (no less warlike and skilled in navigation), to assail the infidels in their own territory, and twice conquered Sardinia (1017 and 1050), which they divided into several large fiefs, and distributed them among their principal citizens.

Gregory VII. humbled Henry VII. in 1077. Urban II. instigated the emperor's own sons against their father. Conrad, the eldest, was crowned king of Italy in 1093, after whose death (1101) Henry, the second son, succeeded in deposing his father from the imperial throne. Henry V., the creature of the Pope, soon became his opponent; but after a severe conflict concluded with Calixtus II. the concordat of Worms (1122). A main issue which remained unsettled gave rise to new difficulties in the 12th and 13th centuries — Matilda, countess of Tuscany, who died in 1115, by a will, the validity of which was disputed by the emperor, bequeathed all her property to the Papal See. Meanwhile, in the south, the Norman state, under Roger II., was formed into a kingdom, from the ruins of republican liberty and of the Greek and Lombard dominion (1130). In the small republics of the north of Italy the government was in most cases divided between the consuls, the lesser council (*credenza*), the great council, and the popular assembly (*parlamento*). Petty feuds developed their youthful energies. Such were those that terminated with the destruction of Lodi by Milan (1111), and the 10 years' siege of Como by the forces of the same city, allied with those of nearly all the Lombard cities (1118–27). The subjugation of this city rendered Milan the first power in Lombardy, and most of the neighboring cities maintained an alliance with her. Others formed a counter-alliance with her antagonist, Pavia. In Rome the love of liberty, restrained by Gregory VII., rose in proportion as his successors ruled with less energy. The schisms between Gelasius II. and the antipope Gregory VIII., Innocent II. and the antipope Anacletus II., renewed the hopes of the Romans. Arnold of Brescia (q.v.), formerly proscribed (1139) for his violent attacks against the luxury of the clergy in that country, was their leader (1146). After eight years Adrian IV. succeeded in effecting his execution. Frederick I. of Hohenstaufen (called Barbarossa) crossed the Alps six times, in order to defend his possessions in Italy against the republicanism of the Lombard cities. Embracing the cause of the Pavian union as the weaker, he devastated (1154) the territory of Milan, destroyed Tortona, and was crowned in Pavia and Rome. In 1158 he reduced Milan, demolished the fortifications of Piacenza, and in a diet at Roncaglia extended the imperial prerogatives conformably with the Justinian code, gave the cities chief magistrates (podestà), and proclaimed a general peace. His rigor having excited a new rebellion, he reduced Crema to ashes (1160), compelled Milan to submission, and demolished the fortifications (1162). Nothing, however, but the terror of his arms upheld his power. When the emperor entered Italy (1163) without an army, the cities concluded a union for maintaining their freedom, which in 1167 was converted into the Lombard Confederacy. In 1176 he suffered a severe defeat at Legnano, and was obliged to conclude a concordat with Alexander III., and a truce with the cities at Venice. Some years afterward a peace, which secured their independence, was signed at Constance (1183). The republics instead of strengthening their league into a permanent confederacy were soon split into new factions, most cities being internally divided into Guelfs and Ghibellines (q.v.). After Frederick II. returned from his crusade (1229), for undertaking which contrary to the will of the pope he was excommunicated, he waged war, with varying success, against the cities and against Gregory IX., heedless of the excommunication. The plan of Gregory IX. to depose Frederick, was followed by Innocent IV., in the Council of Lyons (1245), whither the Pope had fled to be out of the power of Frederick. This greatly weakened the Ghibelline party: the hitherto faithful Parma revolted; and the war between

Guelfs and Ghibellines raged with greater fury than ever. In 1250 Frederick died, and his sons Conrad IV. and Manfred, endeavored to maintain themselves in the possession of their hereditary dominions in Lower Italy; but Innocent IV., who now returned to Italy, excommunicated them, and his successor, Urban IV., offered the crown of Naples to Charles of Anjou, brother of Louis IX. of France, who accepted the offer and landed at the mouth of the Tiber in 1265.

With Charles I. of Anjou, king of Naples, senator of Rome, and Papal vicar in Tuscany, the names of Guelfs and Ghibellines acquired a new signification. The former denoted the friends, the latter the enemies, of the French. Although with the fall of Hohenstaufen the power of the German emperors in Italy was practically at an end for the time, yet in Lombardy, and to some extent also in Tuscany, their supremacy was still at least nominally recognized; many Ghibellines still looked forward to a restoration of the Holy Roman Empire in Italy as the only means of reestablishing order, and others wishing to gratify their own schemes of ambition, often sought to obtain a legal authority for their usurpations by purchasing from the empire the title of imperial vicars. In Sicily, by the so-called Sicilian Vespers (1282), the French were driven out, and the crown of the island was bestowed upon Peter of Aragon, the son-in-law of Manfred, with whose help the inhabitants successfully resisted all the attempts of Charles of Anjou to recover the island, which remained separate from Naples for nearly 150 years. Thus the house of Aragon came to be the natural allies of the Ghibellines, as the house of Anjou were the allies of the Guelfs. To the factions of Guelfs and Ghibellines were added in the republics the parties of the nobility and the people. Everywhere in Middle and Upper Italy there was anarchy and civil war. The noble exertions of Gregory X. (who died 1276) to establish peace were of no avail; those of Nicholas III. (1277–81), who feared the preponderance of Charles, were more efficacious; but Martin IV. (1281–5), servilely devoted to Charles, destroyed everything which had been effected, and persecuted the Ghibellines with new animosity. A different interest — that of trade and navigation — impelled the maritime republics to mutual wars. The Genoese assisted Michael Palæologus (1261) to recover Constantinople from the Venetians; at Meloria, they annihilated (1284) the navy of the Pisans, and completed their dominion of the sea by a victory over the Venetians at Curzola (1298). In Tuscany the party of the Guelfs formed themselves under the leadership of Florence and the influence of the Church into a league for the maintenance of national freedom against imperial power. Only Pisa and Arezzo remained attached to the Ghibelline cause. In Lombardy many towns, such as Novara, Lodi, Vercelli, Asti, Cremona, and above all Milan, formed themselves into a Guelf confederacy; but there was on the one hand an equally strong Ghibelline confederacy, consisting of the cities of Verona, Mantua, Treviso, Parma, Piacenza, Reggio, Modena, and Brescia. Freedom seemed to have expired, when the people, weary of the everlasting feuds of their tyrants, rose in most of the cities, and expelled them (1302–6), including the Visconti, who had supplanted the Della Torre (1277) in the government of Milan.

Henry VII., the first emperor who had appeared in Italy for 60 years (1310), restored the princes to their cities. Florence alone undertook the glorious part which she so nobly sustained for two centuries, as the guardian of Italian freedom, chose Robert of Naples, the enemy of Henry, her protector for five years (1313), and remained free while Italy swarmed with tyrants. Robert also held the dignity of Papal vicar in the States of the Church during the pontificates of John XXII. and Benedict XII., the popes then residing at Avignon under the influence of France in what is known as the second Babylonian captivity. In the other cities a rule of tyranny existed, frequently changing from family to family, and therefore more oppressive. These petty princes, especially Della Scala, Matteo Visconti, and Castruccio, were a counterpoise to the ambitious views of Robert of Naples, son of Charles II. of Naples.

About 1334 Martino della Scala, master of half Lombardy and of Lucca, began to menace the freedom of Lombardy. Florence led the opposition against him, and excited a war of the league, in which it gained nothing but the security of its liberty. After the baffled Martino had sold Lucca to the Florentines the Pisans arose and conquered it for themselves (1342). In Rome, still torn by the feuds of the nobles, Cola di Rienzi (1347) sought to restore order and tranquillity; he was appointed tribune of the people, but was forced, after seven months, to yield to the nobility.

In 1348 the emperor Charles IV. made an expedition into Italy from which may be dated the gradual extinction of the political parties of Guelfs and Ghibellines. Charles had himself crowned king of Lombardy at Milan, and emperor at Rome, but he saw that neither of the Italian parties really desired foreign domination, and that the Ghibellines merely gave the empire their support for their own party purposes, and he therefore did not seek to strengthen himself by attaching himself to either party, but was content to add to his resources for the government of the empire in Germany by selling to the towns and princes the imperial rights in Italy. In 1425 the Venetians in alliance with the Florentines conquered all the territory of northeastern Italy as far as the Adda, which they retained in the Peace of Ferrara in 1428. Milan, Venice (which possessed half of Lombardy), Florence (wisely managed by Lorenzo Medici), the States of the Church (for the most part restored to the Holy See), and Naples (which was incapable of employing its forces in direct attacks on other states), constituted, in the 15th century, the political balance of Italy, which, during the manifold feuds of these states, permitted no one to become dangerous to the independence of the rest, till 1494, when Charles VIII. of France entered Italy to conquer Naples as the inheritance of the house of Anjou. After an unresisted march through Italy Charles took possession of Naples; but a league was formed against him by the leading Italian states, who were joined by Ferdinand of Aragon, and he was compelled hastily to retreat, leaving only a small body of troops to protect his new conquest. In 1496 the whole of Naples was reconquered from the French and the Aragonese dynasty restored. Louis XII., the successor of

Charles VIII., resumed the plans of the latter, and with Ferdinand of Spain as ally, having conquered Naples, fell to disputing as to the division of their conquest. War was declared between them, the result of which was that Ferdinand managed to retain the whole conquest for himself, which was thus reunited to Sicily and Aragon (1501–4). Louis was more successful against Milan, which he subjected in 1500. The attempts of Cesare Borgia, the son of Pope Alexander VI., to acquire the sovereignty of Italy were frustrated by the death of his father (1503), when the war-like Pope Julius II. completed the subjugation of the States of the Church. He concluded with Maximilian I., Ferdinand the Catholic, and Louis XII. the league of Cambray (1508) against the ambitious policy of the Venetians, who artfully succeeded in dissolving the league, which threatened them with destruction. The Pope then formed the so-called Holy League with the Venetians themselves, Spain and the Swiss, for the purpose of driving the French from Italy. Maximilian Sforza, who had reacquired Milan (1512), relinquished it without reserve to Francis I. (1515) after the battle of Marignano, but the Emperor Charles V. assumed it as a reverted fief of the empire, and conferred it on Francesco Sforza, brother of Maximilian (1520). This was the cause of violent wars, in which the efforts of Francis were always unsuccessful. He was taken prisoner at Pavia (1525), and, with his other claims, was compelled to renounce those on Milan. In 1530 Florence, which through inner demoralization had lost its ancient love of freedom, was converted into a regular principality under Alessandro de' Medici, who was imposed on the Florentines by Charles V. Genoa, subject to the French since 1499, found a deliverer in Andrea Doria (1528). In 1553, beside Milan Charles V. conferred Naples on his son Philip II., and for a century and a half the Austro-Spanish influence was predominant in Italy. In the second half of the 16th century the prosperity of Italy was increased by a long peace, as much as the loss of its commerce allowed. Misfortunes in Germany compelled Ferdinand II. to confer both countries as a fief on Charles of Nevers, the *protégé* of France, whose family remained in possession till the war of the Spanish Succession. The peace of Italy was not interrupted during the second half of the 17th century, except by the attempts of Louis XIV. on Savoy and Piedmont, and appeared to be secured for a long time by the treaty of neutrality at Turin (1696), when the war of the Spanish Succession broke out. Austria conquered Milan, Mantua, and Montferrat (1706), retained the two first (Mantua was forfeited by the felony of the duke), and gave the last to Savoy. In the Peace of Rastatt (1714) Austria obtained, moreover, Sardinia and Naples; Savoy obtained Sicily, which it exchanged with Austria for Sardinia, from which it assumed the royal title. The house of Farnese becoming extinct in 1731, the Spanish Infant Charles, son of Elizabeth Farnese, daughter of the eldest brother of Antonio, the last duke of the Farnese family, obtained Parma and Piacenza. In the war for the Polish throne, of 1733, Charles Emmanuel of Savoy, in alliance with France and Spain, conquered the Milanese territory, and received therefrom, in the Peace of Vienna (1738), Novara and Tortona. Charles, infant of Spain, became king of the Two Sicilies, and ceded Parma and Piacenza to Austria. The Medici of Florence, entitled, since 1575, grand-dukes of Tuscany, became extinct in 1737; and Francis Stephan, duke of Lorraine, then received Tuscany by the preliminaries of Vienna, and, becoming emperor in 1745, made it the appanage of the younger line of the Austro-Lorraine house. In the war of the Austrian Succession the Spaniards conquered Milan (1745), but were expelled thence by Charles Emmanuel, to whom Maria Theresa ceded in reward some Milanese districts. Massa and Carrara fell to Modena in 1743 by right of inheritance. The Spanish Infant, Don Philip, conquered Parma and Piacenza in his own name, lost them, and obtained them again as a hereditary duchy by the Peace of Aix-la-Chapelle (1748). Thus in the 18th century the houses of Lorraine, Bourbon, and Savoy possessed all Italy with the exception of the ecclesiastical territories, Modena, and the republics, which beheld with apathy operations in which they had no share. A quiet of 40 years ushered in their downfall.

The French revolution had a great influence on the history of Italy. From 1792 to 1797 Italy was overrun by the victorious French troops under Bonaparte and in the latter year the Pope purchased peace by the cession of Bologna, Ferrara, and Romagna in Italy, and Avignon in France; the payment of a money indemnity, and the surrender of art treasures. Bonaparte then advanced into Austrian Germany, and a rising having taken place among the Venetians in his rear, he made this a pretext for overthrowing the Venetian state. In October 1797 the Peace of Campo Formio was concluded, by which the Cisalpine Republic (q.v.) was formed out of the Italian territories which had been surrendered by Austria and the Pope, together with some sections taken from other powers. Austria received in compensation Venetia and Dalmatia. A few days later Sardinia concluded a treaty of alliance with France. The French then advanced toward Rome, overthrew the ecclesiastical government, and erected a Roman republic (1798). In Genoa, in the same year, Bonaparte occasioned a revolution by which a democratic republic was formed after the model of the French, under the name of the Ligurian Republic; and Lucca also was obliged to accept a republican form of government. In 1798 the second coalition against France was formed, and the king of Naples, instigated by his wife, a daughter of Maria Theresa, sent a Neapolitan army to attack the French at Rome. The French were at first driven out, but soon returned, and repulsed the Neapolitan army, forcing it to retreat into its own territory, where they followed it, and having taken the capital after an obstinate resistance, erected Naples into the Parthenopean Republic. The French directory also compelled the king of Sardinia to surrender his territories on the continent, and Piedmont and Tuscany received a military administration. In consequence of the victories of the coalition, the French were again driven out of Rome, Naples, and the rest of Italy except Genoa, and the king of Sardinia and the Pope returned to their capitals; but in the brilliant campaign of 1800 Napoleon destroyed all the advantages gained by the allies in Upper Italy, the most of which he reconquered. By the Peace

of Lunéville the possession of Venice was confirmed to Austria. The Duke of Parma received Tuscany, and afterward from Bonaparte the title of King of Etruria. Parma was united with France. The Cisalpine and Ligurian Republics were guaranteed by Austria and France, and with the Ligurian territories were united the imperial fiefs included within their limits. The king of Naples, who had occupied the States of the Church, was obliged to conclude peace at Florence. By Russian mediation he escaped with the cession of Piombino, the Stato degli Presidj, and his half of the Island of Elba, together with the promise of closing his harbors against the British. The other half of Elba Tuscany had already relinquished to France; but the whole island was obstinately defended by the British and Corsicans, with the armed inhabitants, and not evacuated till autumn. In January 1802, the Cisalpine Republic was transformed into an Italian republic, formed on the model of the new French constitution, and Bonaparte became president. Genoa also received a new constitution, and Girolamo Durazzo for doge. Piedmont, however, was united with France. After Bonaparte had become emperor in 1804 he attached (17 March 1805) the royal crown of Italy to the new imperial crown; he promised, however, never to unite the new monarchy with France, and even to give it a king of its own. The new constitution was similar to that of the French Empire. Napoleon founded the order of the Iron Crown, and having placed the crown on his own head at Milan 26 May, appointed his stepson Eugène Beauharnais viceroy of Italy. No European power recognized expressly the Italian kingdom of Napoleon. The emperor continued to strengthen his power against the active enemies of the new order of things. He seized Dalmatia, and annexed it to the kingdom of Italy. Guastalla, the Ligurian Republic, Parma and Piacenza were made French provinces. The Pope was obliged to sanction the imperial coronation by his presence. Naples was occupied by the French, and Napoleon gave it as a kingdom to his brother Joseph; and afterwards, in 1808, when Joseph was nominated to the throne of Spain, to Joseph Murat, grand-duke of Berg; while the English secured the rightful king Ferdinand in the possession of Sicily. In 1808 Etruria was annexed to France, and in 1809 Tuscany was given to Napoleon's sister Elise as a grand-duchy. In the same year (1809) the States of the Church were entirely united to France. After the Peace of Venice, Istria and Dalmatia were separated from the kingdom of Italy, and incorporated with the newly-created kingdom of Illyria. Bavaria was obliged to cede to Italy the circle of the Etsch (Adige) in the Tyrol, a part of the circle of Eisack, and the district of Clausen.

The power of the French emperor was, to all appearance, as firmly established in Italy as in all Europe, but after the fatal retreat from Russia, Murat, whom Napoleon had personally offended, deserted the cause of France, and joined Austria, whose army penetrated into Italy under Bellegarde. After the truce of 21 April 1814, the French troops evacuated Italy, and most of the provinces were restored to their legitimate sovereigns. But before the Congress of Vienna had organized the political relations of Europe, Napoleon escaped from Elba and effected his return to France, 1 March 1815. At the same time Murat, king of Naples, abandoned his former ambiguous attitude, and took up arms, as he pretended, for the independence of Italy. But his appeal to the Italians was answered by a declaration of war by Austria. Driven from Bologna by the Austrian forces, and totally defeated by Bianchi at Tolentino, he lost the kingdom of Naples, seven weeks after the opening of the campaign. Ferdinand IV. returned from Palermo, and Murat's family found an asylum in Austria. Murat himself made a descent in Calabria from Corsica, in order to recover his lost kingdom, but was taken prisoner at Pizzo, brought before a court-martial, and shot 14 Oct. 1815.

Meanwhile the Congress of Vienna had arranged the affairs of Italy, so that Austrian predominance was again more firmly established than ever in Italy.

The result was to leave the country in the same divided condition and among the people. The spirit of Carbonarism (see CARBONARI), having for its object the union of Italy under one government, threatened to subvert the political institutions. In Naples and Sicily, in 1820 Ferdinand I. (IV.) was compelled to promise a constitution similar to that granted to Spain in 1812; and in Sardinia, Victor Emmanuel abdicated in 1821 in favor of his brother Charles Felix. But Austria, as the power most nearly concerned, undertook, with the approbation of the other powers assembled at the Congress of Laibach, to restore despotism in Naples and Sicily as well as in Sardinia. The system of repression was carried out with the utmost rigor, and great cruelties were practised in Naples and Sicily, even on those who were only the objects of political suspicion.

The arbitrary proscriptions and imprisonments aroused a deep hatred of the government, and when, in 1830, in consequence of the French revolution, a general spirit of revolt spread itself throughout Europe, the Italians considered the state of events a favorable conjuncture for striking a blow for national and political freedom. But the hopes of the patriots were soon quenched. The risings in Modena, Parma, and Bologna were suppressed by Austrian troops, and the reigning princes who had been driven out of the first two states returned to their dominions. In the States of the Church the papal troops, recruited from banditti and criminals, were employed to put down the uprisen provinces, and they behaved with so much violence that Austrian forces were necessary to defend the government and country from their own soldiers. In order not to allow all the power in Italy to fall into the hands of the Austrians the French suddenly occupied Ancona in February 1832, and retained it for several years. In 1834 an invasion of Savoy from Switzerland by a band of Italian and Polish exiles under the Genoese Ramorino, undertaken with the purpose of overthrowing the Sardinian throne, and then in conjunction with the Italian patriots, headed by Mazzini, who gave themselves the name of "Young Italy," bringing about a revolution throughout the whole country, ended in a miserable failure.

But the unwearied activity of the secret societies, more especially of Mazzini's "Young Italy," with its republican tendencies, diffused itself over a great part of the peninsula. In 1838 Ancona was evacuated by the French; and

at the same time the Austrian troops quitted the Papal States, while the amnesty, proclaimed a short time previously in Venice and Lombardy, appeared to produce a lasting conciliatory effect on the minds of the people. Pope Gregory XVI. died in June 1846, and the election of Cardinal Mastai Ferretti to the papacy under the name of Pius IX. seemed to mark an epoch in the history of Italy, for the spirit of reform which he introduced into the government of the Papal States soon spread to Tuscany and Sardinia. But Naples and Austria strongly opposed the new system of politics. Naples suppressed the violent attempts made in the summer of 1847, without putting a stop, however, to the increasing ferment. In Lombardy, Austria maintained the old system, and by the investment of Ferrara in August 1847 made an unmistakable declaration against the papal policy. Throughout the whole of Italy a hatred of the Austrian sway was systematically cherished, and to the whole movement a hostile direction was gradually given against Austria. In January 1848 the inhabitants of the island of Sicily were in rebellion, demanding a constitution and ultimately the complete severance of the island from the continental government.

At this juncture occurred the French Revolution of 1848, and the reserve which had hitherto prevailed in Upper Italy was thrown aside, and the overwhelming intelligence of the insurrection in Vienna soon completed the universal eruption. The insurrection at Milan, on 22 March, followed by similar commotions throughout almost the whole of north Italy, compelled the Austrian army, under Field-marshal Radetzky, to evacuate the capital and retreat to Verona; while, at the same time, Venice, by the hasty capitulation of the authorities, recovered its independence, and the reign of despotism came to an end in Parma and Modena. Charles Albert, king of Sardinia, with the hope of making himself master of the Lombardo-Venetian kingdom, and carrying out his idea of a national Italian confederacy, declared war with Austria, and, supported by numerous Italian free companies during the first period of enthusiasm and surprise, drove back the enemy's troops to the northern frontier of Italy. But on 6 May Radetzky (then in his 82d year) successfully withstood the attacks of the Italians at Santa Lucia, not far from Verona, and on 25 July gained at Custozza a second bloody victory, which resulted in the reconquest of Milan and the whole of Lombardy. The king of Sardinia made his escape by night into his own territories, and then concluded an armistice with the victors. Pushed on by the democrats, Charles Albert renewed his attempts in the following year (1849), but in a campaign of five days (20–24 March) the old field-marshal put a speedy termination to the enterprise, and frustrated the hopes of the Italian patriots. Charles Albert, despairing of his fortunes, abdicated in favor of his son, Victor Emmanuel, and fled from his dominions. The young king then concluded a disadvantageous peace with Austria. Venice, favored by its position, resisted for some months longer the besieging army of the Austrians, but was at last obliged to surrender (25 Aug. 1849). In other parts of Italy events had meanwhile taken a similar course. In Rome, where Pope Pius IX., alarmed at the sudden outburst of revolutionary projects, checked himself in his career of reform, the excitement grew to such a pitch that he lost all control of his subjects. In vain he promised a constitution and summoned an assembly of the states to the capital. His minister Rossi was assassinated in November 1848, whereupon the democrats took all the power into their own hands. The Pope fled in terror to Gaeta, leaving his capital in the hands of the populace and the insurgent volunteers, who proclaimed a Roman republic, and even laid hands on the Church property (February 1849). Mazzini, the active head of "Young Italy," and Garibaldi, the leader of the volunteers, ruled in Rome. The Pope appealed to the protecting states for help, and a French army under Gen. Oudinot marched up to the walls of Rome and demanded the restoration of the old order of things. When this was refused the French proceeded to lay siege to the city, but met with so determined an opposition that it was only after frequent bloody contests, extending over several weeks, that the city fell into their hands (July 1849). The republicans sought safety in flight, a French garrison was permanently posted in Rome, and under the protection of French bayonets the old condition of affairs was gradually restored. The insurgent Sicilians had no better success than the Lombards, Venetians, and Romans, being gradually subdued by the Neapolitan arms. In Tuscany, as in Rome, the democrats for a short period obtained the upper hand and compelled the grand-duke to flee, but the republican form of government lasted only a few weeks. Sardinia, therefore, remained the only state which preserved the constitutional benefits resulting from 1848, and strenuously withstood all requisitions to act otherwise. The Lombardo-Venetian kingdom entered the states of the Austrian union, whilst, notwithstanding some isolated conciliatory measures, such as the reestablishment of a free port at Venice, the system of military dictatorship was still maintained. In Rome, which the Pope again entered in April 1850, the new organization of the state restored the spiritual rule, with a silent abrogation of the constitution of 1848. In Naples the last miserable shadow of freedom was abolished, and against the originators and promoters of the insurrection of 1848 there was opened an array of legal proceedings, the tyrannies of which engaged deeply the attention of foreign countries. In Tuscany, which was occupied by Austrian troops and wholly bound to Austria by a military convention, despotism and priestly power returned in in all their force. In Modena and Parma the returned princes, relying on the protection of Austria, pursued a policy of revenge and repression against the adherents of a free political life. In such circumstances the condition of Italy, harassed and unsettled, presented a most melancholy picture; nor could some important non-political improvements, including the formation of railways, the accession to the Austrian postal union, and the freedom of the navigation of the Po, effect any satisfactory amelioration. In Naples the cruelties exercised on political prisoners led to a cessation of intercourse between that state and Great Britain, and Austrian oppression in Lombardo-Venetia, the misgovernment of the Papal States and of the duchies, abetted by Austria, led to the war of 1859, when France, siding with Sardinia, defeated the Austrians at Magenta (4 June) and Solferino (24 June), and drove them out of Lombardy,

after which Francis Joseph, emperor of Austria, in a personal interview with Napoleon III., emperor of the French, at Villafranca, agreed to the preliminaries of a peace, stipulating for the surrender of Lombardy, as far as the line of Peschiera and Mantua, by Austria to France, the formation of a confederacy of Italian states under the presidency of the Pope, and the return of the princes who had been expelled in the course of the war from their dominions by their subjects, provided that their return was not effected by foreign intervention, but only by the will of their subjects. Of these three preliminaries only the first was ultimately ratified by the Treaty of Zürich (10 Nov. 1859). Lombardy was ceded to France, who gave it up to the king of Sardinia, in return for which the latter ceded to France, some time later, Savoy, the ancestral domain of his family, and Nice. The other two stipulations of the preliminaries of Villafranca were not carried out. So far from inviting back their banished rulers, the inhabitants of the duchies hastened to summon assemblies to pronounce their deposition, and to annex themselves to Sardinia. Even Bologna withdrew from the papal rule, and put itself under the protection of Victor Emmanuel. In March 1860, popular votes were taken in Savoy, Nice, Tuscany, Parma, Modena, and the four northern papal legations constituting Romagna, in virtue of which the cession of the first two to France was carried into effect, and the remainder were incorporated in the kingdom of Sardinia. Neither the protests of Switzerland against the surrender of the districts on the south of the Lake of Geneva, nor the ban of excommunication pronounced by the Pope on the chief actors in these events, could prevent them from taking their course. Meanwhile the victorious career of Garibaldi in Sicily and lower Italy had led to the dethronement of the king of Naples, and the detachment of the provinces of Umbria, Urbino, and the Marshes, with Benevento and Pontecorvo, enclosed by the kingdom of Naples, from the states of the Church; and Sardinia intervening to complete the revolution, the whole of Italy and Sicily, except Rome and its vicinity and Venetia, was combined in a united realm, which, in 1861, was proclaimed as the kingdom of Italy, with Victor Emmanuel as its sovereign, the temporal power of the Pope being secured by French troops stationed in Rome. In the war which broke out in the spring of 1866 between Prussia and Italy combined on the one side, and Austria on the other, the Italian invasion of Venetia was repulsed in the battle of Custozza 24 June; but the Austrians, suffering heavy reverses from the Prussians, ceded Venetia to the emperor of France, by whom its destiny was put to the vote of its inhabitants. Their vote being in favor of union with Italy, the province was accordingly joined to it. There was still one part of the Italian territory not included in the kingdom of Italy, namely, the Papal States, where the Pope continued to maintain his temporal authority under the protection of French troops. According to a convention concluded between France and Italy, 15 Sept. 1864, these troops were to be withdrawn in the course of the year 1866. This was, indeed, actually done, but their place was taken by a corps levied in France and commanded by the French general Dumont, whom Napoleon sent in July 1867 for the purpose. The protestations of the Italian government were of no avail, but on the outbreak of the Franco-German war the French troops were withdrawn, and after the fall of the empire in consequence of the defeat at Sedan, the Italian government could no longer resist the demands of the press and of popular feeling, and occupied the Papal States (September 1870), soon after which they were annexed to the kingdom of Italy. While the Pope was deprived of his temporal dominions, his spiritual independence was guaranteed. In 1871 the seat of government was removed to Rome from Florence (having until 1865 been at Turin). In 1878 Victor Emmanuel, the first king of united Italy, died, and was succeeded by his son Humbert. The acquisition of territory in Africa was pursued with vigor from 1880 until 1896, when a conflict with Abyssinia and a severe defeat of the Italian troops at Adowa checked colonial enterprise. Humbert was assassinated in 1900 and was succeeded by his son Victor Emmanuel III. Italy, with Germany and Austria-Hungary, form the Triple Alliance, having in view the preservation of the peace of Europe.

Language.—Ancient Italy is supposed to have had a common language of many dialects. That which is common in all these dialects is the heirloom of the Indo-European stem; while that in which they differ either belongs to other stems of languages, or is of later irigin. Leonardo Bruni (15th century), Cardinal Bembo ('Prose, nelle quali si ragiona della volgar lingua,' Venice, 1525), Saverio Quadrio, etc., assert that it is as ancient as the Latin; that both were used in Rome, the Latin in public speeches, in legal documents, and by the learned, while the *Romana rustica* was spoken by the people and in private conversation. The Latin, having been Grecized, became, so to speak, stereotyped and sterile, and died away with the aristocracy; whereas the vulgar speech, carelessly spoken, and poor in grammatical forms, continued to live. Ciampi traces the use of the language to the 5th century. Gonzo (about 960) attests its use among the better educated portion of the inhabitants; and Wittekind mentions that the emperor Otho I. (936–73) spoke both the *lingua Romana* and the *lingua Slavonica*. Pope Gregory V. (996) instructed the people in the same. The opinion, therefore, that the Italian was formed as late as the 11th century, is groundless. In the 13th century the Italian improved rapidly in pliability, elegance, and soon also in regularity, so that in grammar and lexicology it approached in the 14th very much the form it has now. With the exception of the Icelandic, all other modern European languages were yet in their infancy. Dante did most of all toward developing and consolidating the native elements, in legitimizing the exotic accessions, and in polishing the whole language, which he calls *illustre*. Petrarch (died 1374) and Boccaccio (1375) rendered Dante's idiom more mellow and popular; the former by imparting to it the polished suppleness of the Provençal, the latter by emboldening it to express all shades of thought.

Little was done in promoting the language in the 15th century, but the 16th endowed it with choice terms of art, in consequence of antiquarian researches. Nicolo Macchiavelli (1469–1527) was

the father of Italian prose. Pietro Bembo (died 1547), Giovanni Rucellai (1526), Jacopo Sannazaro (1530), G. G. Trissino (1550), Ariosto, Tasso, Guarini, etc., raised it above all other European languages. Aug. Beolco di Ruzzante (Venice, 1505) wrote six comedies, in which each person speaks his native dialect; a method analogous to the use of Prakrit in Indian dramas. Benedetto Varchi ('L'Ercolano,' etc., Florence, 1570) reformed the orthography and established the grammar. Grazzini with Leonardo Salviati founded, in the *accademia della crusca* at Florence, a tribunal of the language (1582). The influence of French on European languages during the 17th century began to be exerted on the Italian, especially on its syntax. Algarotti was the chief fosterer of this influence. But Monti ('Correzioni al vocabolario della crusca,' and in other works) and Perticari strenuously and successfully resisted this denationalization, and restored to their cherished tongue the glorious direction imparted to it in the 14th century. The area of the Italian language comprehends the whole peninsula and the islands of Sicily, Sardinia, Corsica, etc.: the Swiss canton of Ticino, and parts of the Grisons and Valais; South Tyrol, some cities of Istria and of Dalmatia, and partly the Ionian islands. A rough idiom of Mediterranean navigators, and a jargon known as the *lingua franca*, are spoken in the Levant. Dante's *parlare illustre* (also *cardinale, aulico, cortigiano*) is common to all well educated Italians. Many of the dialects differ as much from it as it differs from Spanish, and some even more. This is owing to the ancient local varieties of the *Romana rustica* and of others, as well as to the tongues of foreign invaders. Dante ('De Vulgari Eloquio') speaks of 14 dialects, one class on the west, the other on the east of the Apennines. Those on the north approach the Provençal language.

Literature.— The Italian language molded into a peculiar shape, different from the Latin, and free from most of the rough and uncouth words and phrases which the invading hordes of northern barbarians had introduced into it, the Emperor Frederic II., who resided in Palermo till the commencement of his reign in 1212, made the language of his court. He gathered there many men who delighted in composing verses, and founded the university of Naples, and schools in Palermo and other Sicilian cities. More celebrated as a poet than either himself or his two sons, Enzio and Manfred, was his secretary Pietro delle Vigne, who was wont to go about singing his songs in the newly formed language, some of which have been preserved and are deserving of praise. From Sicily the taste for literature seems to have spread to other parts of Italy. Foremost among the succeeding authors were the Bolognese Guido Giuncelli (died in 1762), mentioned most honorably by Dante in many of his works, Guido Ghislieri, Fabricio, and Onesto. In Tuscany also appeared Guittone d'Arezzo (died in 1294), Bonagiunta da Lucca, Gallo Pisano, Mino Macato Sanese, Brunetto Fiorentino, and others. Several sonnets and songs of Fra Guittone are preserved, and also 40 letters to a friend, the oldest specimen of the epistolary style in Italian. Dante criticises his compositions as languid and unimpassioned. Brunetto Latini (about 1260) was the teacher of Dante and the author of 'Il Tesoro,' written first in French and afterward translated into Italian, in which he aimed to give a cyclopædic view of the state of knowledge at that time. He also wrote the 'Tesoretto,' consisting of moral sentences in seven-syllabled rhyming couplets. Guido Cavalcanti (died in 1300), one of the best friends of Dante, was styled by Benvenuto da Imola the second eye of Italian literature, of which Dante was the first. He was a philosophic poet, and his verses gave him a reputation for learning, and show that he had a deep knowledge of human heart and was accustomed to moral reflections. The first book in Italian prose was the 'Chronica' by Matteo Spinnelo, a Neapolitan, relating the history of events from 1247–68. The honor of writing history in a neat style belongs also to Ricordano Malespini, a Florentine, who died about 1281. The 'Agricoltura' and other scientific works of Pietro Crescenzi, a Bolognese, show in several respects a thorough knowledge; but in attempting to explain vegetation and other natural phenomena after the theories of Aristotle, he fell into the errors prevalent in his age. In the 13th century began the glorious literary era of Dante, Petrarch, and Boccaccio. Dante (1265–1321) rose like a sun, and shone on Italy with an unparalleled splendor, giving to that nation almost a new life. He raised the language from comparative rudeness to the highest refinement, conceived a poem which is admitted to be one of the sublimest creations of the human mind, and charmed a people yet groping in ignorance and barbarism by the sweetness, beauty, and grandeur of his delineations, compelled them to listen to the dictates of morality and Christianity, and proclaimed the principles from which alone they could hope for rest from the desolation of civil wars. Involved in the intestine discords between the Guelfs and Ghibellines and the parties *dei bianchi* and *dei neri*, his works bear the impress not only of the ideas but of the conflicts of his time. His masterpiece is the 'Divina Commedia,' incomparably the greatest of Italian epics. It was so called because he conceived that there were three kinds of style, the sublime, the middle or comic, and the lowest of all, which he called the elegiac, and he selected the second of these for his poem. Even in this finest product of his genius he supported the emperor and the Ghibelline party against their enemies the Guelfs. He depicted an inferno in which were placed those petty tyrants and chieftains who had filled Italy with the horrors of civil war. He described a purgatory in which those men were punished who with too little heroism and firmness had maintained the cause of justice and their country. He finally pictured a paradise in which those were rewarded who had devoted themselves only to virtue, and had labored for the commonwealth with strong hearts and magnanimous deeds. There he imagined a throne to be raised, and a crown upon it, as a reward for that Henry who, he hoped, would restore Italy to her ancient power and splendor. This political aim of the 'Divina Commedia' was only incidental to its moral and religious meanings. The work displays an immense amount of theological as well as philosophical and historical knowledge, and contains some ingenious scientific

views, which were fully developed and understood only after several centuries. It is for these that Redi, Magalotti, and other scientific writers quoted from him in preference to any other poet. The unfinished 'Convito' of Dante is called by Monti the first sound and sober prose writing that Italian literature can boast, and the first on moral philosophy. Dante abandoned the Latin language, in which he had begun to write, for the Italian, the perfection and embellishment of which he deemed would be of great advantage toward uniting Italy. In his Latin treatise 'De Vulgari Eloquio' he maintained that no one of the Italian dialects merited the name of the Italian language, which was rather the language spoken in all the cities, without belonging to any one in particular. Francesco Stabile, called also Cecco d'Ascoli (burned for heresy at Florence in 1327), wrote the 'Acerba,' a witty poem, directed against Dante and Guido Cavalcanti, and treating of natural and philosophical subjects with little wisdom or eloquence. It is in strophes of eight verses, the last two rhyming, and some have therefore ascribed to him the honor of inventing the *ottava rima*. More highly esteemed was Fazio Bonifazio degli Uberti (about 1367), who wrote in *terza rima* the long allegorical poem of 'Dittamondo' (*Dicta Mundi*). Cino da Pistoja (1270–1336) excelled both in jurisprudence and poetry. His songs were in praise of Selvaggia, a lady of whom he was enamored, but his legal work 'Il comento' is of greater importance, and displayed an erudition which gained him invitations to lecture in many universities. Dante commended him as an improver of the language, and Petrarch lamented his death in touching verses. Petrarch (1304–74) had seen Laura de Sade at Avignon, who was the inspiration of the charming verses to which he owes his immortality, and had produced his Latin poem of 'Africa,' on which by a strange misjudgment he chiefly prided himself, when in 1341 he received the laureate crown in Rome. The noble delicacy and tenderness of affection which make him so distinctively the poet of love were hardly his principal merits. All men who honor and cherish learning and patriotism, revere his name, who left as an heritage the precept and example of seeking to end the intestine discords of his country by elevating it to a worthier life. His principal philosophical treatises and poems, in Latin, demonstrate his erudition, justness of philosophical thought and sentiment, and exquisite skill in Latin composition. He has a greater celebrity as the father of Italian lyric poetry. In this department he surpassed all his predecessors, and has been equaled by none of his numerous successors and imitators. A less versatile author was Giovanni Boccaccio (1313–75), who abandoned successively commerce and law for literature, studied with ardor the 'Divina Commedia,' and cherished the friendship of Petrarch. He wrote several works in Latin, and made an expensive collection of Greek manuscripts, but is chiefly known as the author of the 'Decameron,' and thereby as the father of Italian prose. The 'Decamerone' (ten days) is so called because each of the 10 persons introduced into it, seven ladies and three young men, relates 10 stories per day, 100 stories being thus told in 10 days. The scene is a villa in the vicinity of Florence, whither they had fled from the plague (1348), and the description of that pestilence with which the work opens is admired as a masterpiece of eloquence. Its real object seems to have been to present a picture of the whole human family, and to encourage virtue by commendation and to correct vice by ridicule. Its beauty of composition is, however, sometimes expended on the most indelicate subjects. The 'Cento novelle antiche' are for the most part written from those of Boccaccio, but some are of earlier date. They relate short adventures in a graceful and simple style, free from indelicacy. Franco Sacchetti of Florence left 300 tales, of which 258 are preserved, written carelessly but with great purity. The 'Pecorone' of the Florentine Ser Giovanni, an imitation of the 'Decamerone,' contains about 50 tales. This was the age of chroniclers as well as novelists. Dino Compagni chronicled the history of Florence from 1270 to 1312 with truthfulness and elegance. More celebrated is the work of Giovanni Villani, containing the history of the city from its foundation till a few years before his own death by the plague in 1348. His work was continued with greater prolixity by his brother Matteo to 1363, when he also fell a victim to the plague; and to 1364 by Filippo the son of the latter, who also wrote a series of biographies of illustrious Florentines. The 'Specchio della vera penitenza' of Giacopo Passavanti (died in 1357) is the first example of an ascetic work in the vulgar tongue, and its style is comparable for excellence with that of Boccaccio. Various similar treatises were written by Domenico Cavalca of Pisa; the 'Ammaestramenti degli antichi,' by Bartolommeo da S. Concordio, merits particular praise; and the 'Trattato del governo della famiglia,' by Agnolo Pandolfini (1365–1446), is equally esteemed for its happy and useful choice of materials, and for its natural and graceful style, adorned with all the skill which the writers of his age may boast. Most of the men who flourished in the 14th and 15th centuries were not distinguished like Dante and Petrarch for creative genius, but delighted rather in reproducing and commenting on the authors of antiquity. The printing-press, invented in Germany, was most usefully employed in Venice, Bologna, and Rome, in multiplying copies of the ancient authors, corrected by learned scholars. To the passion for discovering and publishing new manuscripts was joined that of finding and interpreting ancient monuments, medals, inscriptions, and sculptures. Only the first steps toward a new civilization had been taken by Petrarch and Boccaccio. The introduction of the mariner's needle by Flavio Gioja had opened the ocean to the Europeans; the travels of Marco Polo had awakened that curiosity concerning the way to the East Indies which led Columbus to the discovery of the new world; the Arabic numerals had been substituted in Italy for the Roman; academies were established to nurture the love of letters, and courts became an asylum for the most distinguished men; and the popes in Rome, the Medici in Florence, the houses of the Visconti and the Sforzas in Milan, and of the Gonzagas and Estes in Mantua and Ferrara, became protectors of literature and the arts. Pope Nicholas V. is especially distinguished for the encouragement which he gave to every branch of learning, and for the generous sacrifices which he made in col-

lecting books. It was under his liberal protection that Francesco Filelfo translated the 'Iliad' and the 'Odyssey' into Latin verse. His example was followed by numerous courts in Italy. Lodovico invited to his court in Lombardy many learned men, painters, and architects, among whom were Leonardo da Vinci and Bramante, founded the university of Pavia, granting it many privileges, and opened schools in Milan, to which most renowned professors gave distinction. But the most illustrious of the patrons of letters was Cosmo de' Medici. He founded one library in Venice and three in Florence, and established the first academy for the study and promulgation of the Platonic philosophy. Pico della Mirandola and Cristoforo Landino exercised the happiest influence in advancing and creating a popular esteem for knowledge, and especially in exciting the Florentine youth to an enthusiasm for it. The former was almost unrivaled in erudition, and seemed to possess a miraculous memory, being profoundly and prematurely versed in numerous languages, in metaphysics, and in mathematics. Lorenzo de' Medici (died in 1498) greatly and variously increased the glory which his uncle had acquired in the culture of learning. But it is lamentable, after the three great masters of the Italian tongue which the preceding age had presented, that the taste of the learned returned to the Latin language. To such a degree was Italian neglected, that it was hardly used at all in writing; it was even disdained for legal documents, and its development was arrested by a boundless reverence for antiquity. But Lorenzo the Magnificent may be considered the reviver of Italian literature, and was even called its father. Most esteemed for his virtues and manners, he enriched libraries, reopened the university of Pisa, collected numerous remains of antiquity, promoted the study of the popular poetry, and wrote himself many admired pieces for the improvement of the public taste. His 'Nencia da Barberino' is the first example of Italian rustic poetry, and his 'Compagnia del Mantellaccio' seems to have given the first idea of Italian satire in *terza rima*. Under him Florence became a new Athens. Angelo Poliziano (1454–94) enjoyed the friendship of Lorenzo, attained to great erudition, and was an elegant writer both in Italian and Latin. His most celebrated works are the 'Stanze,' which were imitated even by Ariosto and Tasso, and the 'Orfeo,' the first regular and consistent Italian drama. Contemporary poets of less note were Burchiello, Girolamo Benivieni, and Giusto de' Conti. To the various kinds of composition which have thus far appeared must now be added some epics. Of the brothers Bernardo, Luca, and Luigi Pulci, only the last (1431–87) achieved lasting eminence in poetry. His 'Morgante Maggiore,' burlesque and fantastic, opens the brilliant Italian series of romantic poems of chivalry. It belongs to the circle of legends concerning Charlemagne and his paladins, but degrades the primitive simple faith in them by persiflage. The 'Mambriano' of Cieco da Ferrara deserves to be mentioned and compared with the 'Morgante.' The best of the romantic poems of the 15th century is the 'Orlando innamorato' of Boiardo, which introduced materials so beautiful and so vast as to induce Ariosto to follow in the same path. To sustain the marvels of his subject, he employed magicians and fairies in connection with the classic divinities, and beneath the veil of poetry he represented the most useful truths of philosophy. The 'Orlando innamorato' was left incomplete, and the original has become rare even in Italy, on account of its rude and antique diction. Its tone is much modified in the elegant elaboration of it by Berni, which has enjoyed the most general favor. The prose literature was enriched by the writings of two artists: Leon Battista Alberti, the author of a dialogue 'Della famiglia,' containing philosophical precepts for domestic life and the education of children, and of treatises on painting and architecture which gained him the name of the Italian Vitruvius; and the renowned Leonardo da Vinci (1452–1519), at once painter, sculptor, architect, mathematician, musician, the best extemporaneous poet of his time, and the author of a 'Trattato della pittura,' which reveals both his scientific and artistic knowledge, and is a classical authority on the use of terms pertaining to the arts and sciences. Numerous historians, also, belong to this age. Pandolfo Collenuccio was the first to write an esteemed history of the kingdom of Naples, revived and corrected the taste for comedy, founded the first museum of natural history in Europe, and wrote dialogues after the manner of Lucian, and the solemn poem of 'Inno alla morte.' Historians of travels were the Genoese Giorgio Interiano and the Venetian Cadamosto, who give the oldest narratives of the Portuguese discoveries, and the Florentine Amerigo Vespucci. Aldo Manuzio (Aldus Manutius) rendered signal services to letters, and gained a European repute by the care and taste with which he published the classics. The 16th century, in respect of Italian art and literature, is surpassed by none in modern history, and rivals the ages of Pericles and Augustus in antiquity. A family of great names occurs, each of which might form an epoch. Leo X. was the most illustrious of a series of papal patrons, bestowing liberal rewards not only on authors but on Raphael and Michelangelo. After the extinction of Florentine liberty, literature was again protected by various reigning families. Cosmo de' Medici commanded Varchi to write his history without any regard to persons, and we therefore owe to him a narrative of the crimes by which his own family attained the sovereignty. Under his son Francesco the learned institutions already in existence were advanced, and the academy *della crusca* was founded. The court of the Estes in Ferrara entertained Ariosto and Tasso; most of the other courts, great and small, as those of the Gonzagas in Mantua, of the dukes of Urbino, and of Manuel Philibert of Savoy, were hospitable to scholars and poets; and numerous literary academies with capricious names, as those *dei sonnacchiosi, degli storditi,* and *dei selvaggi,* were instituted. Pre-eminent among the poets of the age rose Ariosto (1474–1533), called the Ferrarese Homer, who aimed to celebrate in a great poem the origin of the house of Este. The loves and exploits of Bradamante and Ruggiero, imaginary ancestors of that house, form the basis of his romantic epic, the 'Orlando furioso,' the subject of which is the war of the Saracens against Charlemagne. The courtesies and hero-

isms of knights, the loves of ladies, and the madness of Orlando give occasion for most various and always natural pictures, all the passions being delineated in appropriate colors, so that Tasso affirmed the excellence of Ariosto not only in versatility of invention but in propriety of treatment. Many of his similes are unsurpassed in simplicity and grace. Beside his masterpiece, he wrote satires on the politics and the rulers of his time, and his 'Negromante' and 'Zanotti' almost entitle him to be called the father of Italian comedy. Bernardo Tasso, the father of Torquato, was the author of the 'Amadigi' and other esteemed poems. His more renowned son (1544–95) strictly followed Virgil and Homer in the form of his 'Gerusalemme liberata,' but its finest ornaments belong to the romantic spirit of his age. To the classical mythology it adds the marvels of enchantment and magic. The greater merits of the 'Gerusalemme' have caused his 'Rinaldo' and his pastoral drama of 'Aminta' to fall into undeserved neglect. Some of his sonnets also, and other minor pieces, possess a rare beauty; and his prose letters and moral dialogues are remarkable for their eloquence and philosophical tone. Inferior to the epics of these great masters are the 'Girone il cortese,' treating the legends of King Arthur, and the 'Avarchide,' describing the siege of Bourges, by Alamanni, who also wrote the 'Coltivazione,' a specimen of monotonous harmony. Rucellai is the author of a short and carefully finished didactic poem, entitled 'Le api.' Valvagone wrote in the 'Angeleide' a description of the battle between the good and rebel angels, from which Milton is supposed to have derived materials. The 'Italia liberata dei Goti,' by Trissino, is in every respect a wretched imitation of Homer; but his 'Sofonisba' is the first Italian tragedy of high merit. Leo X. himself witnessed the production of the 'Rosmunda' and the 'Oreste' of Rucellai. Better tragedies are the 'Tullia' of Martelli, the 'Canace' of Sperone Speroni, the 'Torrismondo' of Torquato Tasso, and the 'Epido' of Andrea dell' Anguillara, all of which display a too servile imitation of the Greek authors. The Latin comedy, meantime, was made too strictly the model of the Italian. The learned comedy (*commedia erudita*) was cultivated at almost the same time by Cardinal Bibbiena, Ariosto, and Macchiavelli. The best examples are the 'Cassaria' and 'Suppositi' of Ariosto, the 'Calandra' of Bibbiena, and the 'Madragola and 'Clizia' of Macchiavelli, the last especially remarkable for their knowledge of men. The 'Pastor fido' of Guarini deserves especial mention as one of the pastoral poems with which Italy abounded, inferior at furthest only to the 'Aminta' of Tasso. At this period a new and brilliant step was taken by the Italians in the dramatic art, by the union of music with poetry. The invention of the opera belongs to the Florentines, the first having been the 'Daphne,' the words of which were by Rinuccini and the music by Peri, and which was represented in 1597. Orazio Vecchio of Modena produced melodramas, which Muratori regards as the beginning of the modern opera. The attraction of this new style was so great that authors and musicians immediately devoted themselves to it in Italy, and it was soon introduced into Germany and France. Every variety of poetry seems to have been tried in this age with success. Berni was the head of a school of burlesque poetry, called from him the Bernesca rhyme. The best of his pieces, the 'Orlando innamorato,' possesses grace, elegance, and originality. One of his imitators was Agnolo Firenzuola, who is more esteemed for the amenity of his prose writings. To Ariosto belongs the first place among the satirical as well as romantic poets of his age. Scarcely comparable with him are the satirists Ercole Bentivoglio, Nelli, and Luigi Alamanni. Pietro Aretino (1492–1557), the most indelicate of Italian writers, evinced a versatile and brilliant genius in almost every style of composition. The monk Folengo (died in 1544), better known under the name of Merlino Coccajo, was either the inventor or one of the first and happiest improvers of macaronic poetry. Superior to a crowd of rhymers, imitators of the ancients or of Petrarch, was the sculptor Michelangelo, whose style was influenced by the study of Dante. Pietro Bembo (died in 1547) was the restorer of elegance and correctness to the native language, and revived its popularity among the learned. Francesco Maria Molza excelled in thoughtful and humorous poetry. The 'Galateo' and other writings in prose and verse of Giovanni dalla Casa are still esteemed for vigor of thought and beauty of expression. The translations of many of the classics into Italian by Annibale Caro (1507–66) are accounted by some critics superior in style even to the compositions of Petrarch. His versions have an air of originality, and it was said that Virgil would hesitate whether to give the palm to his own work or to that of his translator. His original writings obtained the highest praise for elegance. The sonnets of Angelo di Costanzo have been said to combine every merit of which the sonnet is capable. He wrote also a history of Naples. The most eminent poetess of this age was Vittoria Colonna, highly applauded by Ariosto. The 'Arcadia' of Sannazaro holds the first rank among the bucolics, written in alternate prose and verse in a vigorous, correct, but constrained style. The eclogues of Baldi are philosophical maxims versified. An important place in the literature is held by political writers, foremost among whom was Macchiavelli (1469–1527). A dramatist and historian of Florence, he is chiefly known as a profound and philosophical statesman by his discourses on Livy, his dialogues on the art of war, and especially by his 'Principe,' a manual of government, which was constantly in the hands of such sovereigns as Charles V. and Sixtus V., and the real intent and character of which has been long in dispute. His style is marked by simplicity, strength, thought, and a rare but felicitous use of ornament. Other political writings were the 'Ragione di stato' of Botero, and the 'Republica Fiorentina' of Giannotti. Nearer to Macchiavelli in merit was Paruta (1540–98), the author of 'Discorsi politici,' and of a treatise 'Della perfezione della vita civile.' The most renowned of Italian historians is Guicciardini (1482–1540), whose work embraces the period from 1494 to 1534. It is esteemed for impartiality and for its moral and political reflections, but is so diffuse and tedious that it is hard to read. Paolo Giovio wrote in Latin a partisan history of his own time. Historians of Florence were Nardi, Varchi, Nerli, Segni, Capponi, and Scip-

ione Ammirato; the 'Storie Fiorentine' of the last includes the events from the foundation of the city to 1574. Historians of Venice were Bembo, Paruta, and Contarini; of Genoa, Giustiniani, Bonfadio, and Foglietta; of Ferrara, Cinzio and Falletti; and of Naples, Costanzo, Porzio ('La congiuro dei baroni,' etc.), and Summonte. General histories were written by Giambullari and Adriani. Davanzati translated Tacitus to prove the conciseness and energy of the Italian language, and made his version shorter than the original. He also wrote a history of the reformation in England. The splendor of the fine arts in this century gave occasion for historians of art, the principal of whom was Vasari (1512–74), whose lives of the most excellent painters, sculptors, and architects of Italy are written with naturalness and grace, and contain interesting notices of prominent Italian works of art. The autobiography of the Florentine goldsmith Benvenuto Cellini, one of the liveliest books in the literature, not only recounts his own fortunes, but gives curious notices of the courts of Rome, Florence, and France. He wrote also valuable treatises on jewelry and sculpture. Works on painting were written by Bernardino Campi of Cremona, Lomazzi of Milan, and Armenino of Faenza. Vignola and Palladio gained distinction as writers on architecture, and Marchi by a treatise on military architecture. Philosophy now began to assume an independence of the scholastic and ecclesiastical systems, and Girolamo Cardan and Giordano Bruno ventured upon the boldest speculations. The mathematics were cultivated by Tartaglia, Cardan, and others. The 'Instituzione di tutta la vita dell' uomo' of Alessandro Piccolomini treats of education, marriage, the government of a family, and the chief end of man. The 'Cortigiano' of Castiglione has rare literary merits, making courtesy the theme of many learned and weighty reflections. Numerous novelists now flourished, among whom Bandello holds the first rank, his *novelle* being chiefly founded on real and common events. The novels of the monk Firenzuola and the 'Cene' of Lasca are both elegant and indelicate. Vettori and Salviati commented on the older poets, and the latter was engaged in compiling the 'Vocabolario della Crusca,' then the most important philological work in the language. All words not used by the great Forentine authors were excluded from it; even Tasso was not admitted as an authority. In the 17th century the natural sciences especially flourished. Under able patrons, the principal of whom was Duke Ferdinand of Tuscany, the Italian universities attained unprecedented celebrity. Scientific academies were founded in Rome, Florence, Bologna, and Naples; the Florentine *accademia del cimento* embraced the most illustrious savants of the time, and published important accounts of its researches. Preeminent among philosophers was Galileo (1564–1642), who was denounced as an innovator, and maintained the Copernican system only at his peril. His 'Dialoghi' and other works are written with elegance, his style and taste having been formed by reading Ariosto. His most noted pupils were Viviani, Torricelli, and Castelli, and contemporary physicists were Borelli, Malpighi, Bellini, and Francesco Redi. The learned and philosophical jurisconsult Vincenzo Gravina attracted scholars from all parts of Europe to his lectures in Rome on public law, contained in his 'L'origine de diritto civile,' and other publications. The greatest historians were Sarpi, Davila, Bentivoglio, and Pallavicini. Sarpi (died in 1623), the defender of the republic of Venice in its contest with the Holy See, wrote an anti-papal and spirited history of the Council of Trent, which was replied to by Pallavicini in a work on the same subject. Davila, after 16 years' residence in France, narrated the civil wars of that country in a work esteemed for its truthfulness, and in respect of style one of the best Italian histories. Bentivoglio, the papal nuncio in Flanders, wrote of the Flemish wars of his time, many of the heroes of which he knew personally. Baldinucci, Dati, and Scamozzi were historians of the fine arts, and Cinelli and Boccalini of literature, while Bianchi treated important historical problems as to migrations, colonies, voyages, and the origin of monarchies and republics. Montecucculi, the military antagonist of Turenne, acquired distinction as an author by his aphorisms on the art of war. The Jesuit Bartoli wrote the history of his Society, and the sermons of the Jesuit Segneri were unrivaled in eloquence. The first Italian literary journal, the 'Giornale de' letterati,' was established in Rome in 1668. A want of naturalness and truthfulness marked the poetry of the age. External delineations, trifling details, conceits, and plays upon words were the leading objects of the poets. At their head was Marini of Naples (died in 1625), who was admired not only in Italy but in France and Spain, and originated the poetical school of the Marinists, by which only his faults were imitated. Among his contemporaries and successors were Chiabrera, Guidi, Tassoni, and Marchetti. The foundation of the academy of Arcadians in Rome in 1690 by Crescimbeni and Gravina introduced an affectation of pastoral sentiments and habits in place of Marinism. Menzini, Zappi, Maggi, De Lemene, Salvator Rosa, and Bracciolini wrote satirical, erotic, and facetious verses. Throughout the 17th and 18th centuries the opera was the favorite Italian exhibition. It had long been produced with theatrical and musical splendor, when Zeni of Venice (died in 1750), and especially Metastasio (died in 1782), wrote operatic plays having remarkable poetical merits. When near the beginning of the 18th century the war of the Spanish Succession raged in Italy, and the kingdom of Naples fell beneath the sceptre of the infante Don Carlos, and afterward of Ferdinand III., literature and the sciences were cultivated with renewed vigor. Naples produced Giannone, distinguished in the department of history, Capasso in literature, Cirillo in medicine, Mazocchi in archæology, Genovesi in political economy, one Gagliani in architecture, and another in domestic economy and philology. Filangieri rivaled Montesquieu in the philosophy of legislation; Pagano wrote on the criminal law; Poli distinguished himself in the positive sciences; Maffei and Calsabigi devoted themselves to poetry. The university of Bologna was now in its splendor, its academy of sciences taking the name of "The Institute." Marsigli, Stratico, Cesarotti, Foscarini, the brothers Gozzi, Morelli, Maffei, Pompei, Lorenzi, Mazzuchelli, and Serassi made the city of Venice illustrious; but political jealousy prevented the culture of the

economical and legislative sciences there, which under Beccaria and others were making great progress in other parts of Italy. In Tuscany, the famous French Encyclopædia was republished. In the cities of Lombardy flourished Scopoli, Fontana, Frank, Tissot, Spallanzani, Bertola, Villa, Natali, Volta, Scarpa, Tamburini, Parini, Beccaria, Verri, Landriani, Agnesi, Carli, and others devoted to literature, art, science, and the development of political and ethical principles. Bodoni raised the art of typography to an admirable elegance. Prominent among the patrons of literature was Victor Amadeus II. of Savoy. The Italian drama had as yet attained to excellence only in the opera, and lacked superior tragedies and comedies. It received an impulse in the 17th century from the French theatre, Martelli of Bologna (died in 1727) being the first who attempted to naturalize not only the French tragedy but the Alexandrine verse. The 'Merope' of Maffei was the best tragedy produced in the early part of the century. A greater influence was exerted upon his age and upon literature by Alfieri (1749–1803), the head of an important school of tragedy. He was the poet of energetic action and profound thought and feeling, as Metastasio was of love. Abandoning the customs of the court of Louis XIV., he revived the simple sublimity of the Greek stage, which had been the object of his favorite studies, and which was removed alike from French effeminacy and Spanish extravagance. A reformation in the Italian comedy was meantime effected by Goldoni (1707–93), the only genuine comic poet that Italy can boast, who sought in imitation of Molière to substitute for the *commedia dell' orte* a natural comedy of manners. In his efforts to give to the stage a more human and real character by ridding it of the traditional masks of the harlequin, pantaloon, and other stock characters, he had to contend especially against Chiari and Carlo Gozzi. The example of Kotzebue and Iffland gave rise to a lachrymose school of dramatic composition, maintained by Avelloni, Gualzetti, Greppi, and especially by Federici. The most illustrious historians were Muratori (died in 1750), Maffei, Denina, Mazzucchelli, Tiraboschi, and Lanzi (died in 1810). The 'Annali d'Italia,' 'Verona illustrata,' 'Revoluzioni d'Italia,' 'Scrittori d'Italia,' 'Storia della letteratura d'Italia,' and the 'Storia pittorica d'Italia' were respectively their best works. The writings of Muratori and Tiraboschi still maintain their reputation both for erudition and criticism. In archæology, the names of Fabretti, Gori, Mazzocchi, Martorelli, Passeri, and Carli were distinguished. Campanella continued the philosophical movement of Bruno in opposition to scholasticism, and Vico (1670–1744) founded the new science of the philosophy of history. His 'Scienza nuova' is a view of general history, founded on the idea of Divine Providence and the essential elements of the common nature of man. Algarotti, Bettinelli, Buonafede, Vanetti, Tartarotti, and Alessandro Verri also added to the glory of the literature by abandoning the pedantic style that had been in vogue and introducing an acquaintance with foreign ideas and productions. Baretti contributed to the revival of good taste by ridiculing the Arcadians. Parini (1729-99) excelled in satirical poetry, his 'Giorno' being as remarkable for elegance as for severity upon the effeminate life of the wealthy Milanese nobles. Among the works of Cesarotti was a translation of Ossian, esteemed in many respects among the happiest productions in the language, and which Alfieri confessed had been of service to him in the composition of his tragedies. The political and military movements in Europe of the last decade of the 18th century occasioned a regeneration not only of the literature but of the national spirit of the Italians. The early part of the 19th century rivals the age of Leo X., presenting Canova, Longhi, Cicognara, Appiani, and Beltrami in the fine arts; Monti, Foscolo, Pindemonte (partially contemporary with whom was Alfieri) in literature; and Volta, Melchiore Gioja, Romagnosi, Scarpa, Spallanzani, and Oriani in the sciences. The author who doubtless exerted the greatest influence on the regeneration of poetry was Vincenzo Monti (1754–1828), who in the contest between the classic and the romantic tendencies favored the former, and in the contest between the Gallicists, or imitators of the French literature and idioms, and the Purists, who made Petrarch, Dante, and the other old Italian masters their models, sided with the latter. His poems, as 'Basvilliana' and 'Feroniade,' his tragedies, as 'Galeotto Manfredi,' his elegy 'Mascheroniana,' the 'Proposta,' in which he disputed the restrictions which the Della Cruscans had fastened upon the language, and his translation of the 'Iliad' alike display an admirable and nervous style. Pindemonte also made a light and graceful version of the 'Odyssey,' and in his original poems especially lamented the desolation of his country. Ugo Foscolo (1777–1827) belongs to the school of Alfieri. His 'Ultime lettere di Jacopo Ortis,' a political and passionate romance in imitation of Goethe's 'Werther,' is supposed to describe his own troubled life. He wrote the lyric 'I sepolcri,' and other works in prose and verse, remarkable both for power and beauty. Mezzanotte celebrated in verse the struggle of the modern Greeks for liberty, regarding it not only as a political but as a religious conflict between Christianity and Islamism. The lyrical poems of Leopardi are highly esteemed. Among the epic and didactic poets were Botta, Ricci, Bagnoli, Arici, Grossi, Sestini, Pananti, and Lorenzi. Antonio Cesari (died in 1828) was the chief of the Trecentists, a school which carried its love of the Italian authors of the 14th century to affectation. Stratico published a dictionary containing only the words used by the Marinist authors. Mameli had exhibited the greatest promise in his ode to Venice, before he fell in the conflict at Rome in 1848–9. Prati, Aleardi, and the versatile priest, dramatist and journalist, Dall' Ongaro, were among the best lyric poets of Italy of the last half-century, and among contemporary lyric poets are Graf and Ada Negri. For the revival of pure and unaffected writing Italy was much indebted to the example of Carlo Botta, called by his countrymen the modern Thucydides. He wrote histories of the war of American independence and of Italy during the last three centuries. Vacani was a historian of the Peninsular war. Pietro Colletta wrote the history of Naples from its conquest by Charles III. of Spain in 1734. Amari wrote the history of the Arabs in Sicily and of the Sicilian Vespers, illustrating obscure periods in an age of national

glory. Both were reflective or philosophical historians. Cesare Cantu wrote an immense universal history, a work of critical and artistic merit, which has been translated into several languages. He has also written novels, poems, critical essays, and other histories, one of the most important of which is 'La Storia di cento anni' (1851). Bianchi Giovini, a prominent and anti-Catholic journalist, wrote a history of the popes, a biography of Fra Paolo Sarpi, a history of the Hebrews, and a work on the supposititious Pope Joan. The political writings of Mazzini consist chiefly of articles in journals. Cesare Balbo wrote historical meditations, a life of Dante, and a summary of the history of Italy. Franscini wrote an accurate and authoritative statistical work on Switzerland (1847–51). La Farina is the author of a history of Italy from the most ancient to recent times; Federico Sclopis, of a history of Italian legislation (completed in 1857); Luigi Zeni, of an excellent compendium of Italian history; Romanin, of a learned history of Venice, written in opposition to that of Daru, and of a work on the Venetian inquisitors; Carlo Gemelli, of a history of the Belgian revolution of 1830; Giuseppe Rubini, of a history of Russia from 862 to 1725; Canette, of a history of Amadeus II. of Savoy; Canale, of a history of the Crimean war of 1854–5; Gallenga, of a history of Piedmont; Angelo Brofferio, of a history of Piedmont from 1814 to 1849, and of other works interesting from their patriotic spirit as well as literary merit; Anelli, of a history of Italy from 1814 to 1850; Carlo Catteneo, of a history of the insurrection at Milan in 1848 (he was a member of the committee that directed the operations against the Austrian militia, and a participant in the struggle); he also compiled the 'Archivio triennale,' an elaborate and most careful and valuable collection of authentic documents relative to the events that occurred in Italy from 1848 to 1850; Federico Torre, of a history of the French expedition to Rome in 1849; Ferrari, in a work on republican federation, treated the question under what form of government Italy ought to be reorganized; L. C. Farini wrote a history of the Papal States from 1814 to 1850; Gualterio, of the last Italian revolutions (1852); Vecchio, of the events in Italy in 1848–9; among more recent historians were Giudici (1812–72), Settembrini (1813–76), and De Sanctis (1818–83). A taste for illustrating the national antiquities also arose and Inghirami published 'Monumenti Etruschi,' Delfico his 'Origini Italiche,' Fanucci his 'Storia dei Veneziani,' 'Genovesi e Pisani,' Manno his 'Storia di Sardegna,' Bres 'Malta illustrata,' and Pompeo Litta his learned 'Famiglie celebri d'Italia,' containing interesting studies on every period of the national history. Visconti (1751–1818) was distinguished in classical archæology, and Sestini was unrivaled in numismatics, making medals illustrate geographical questions. The natural sciences were advanced by four illustrious savants, who were nearly contemporary, Volta, Galvani, Scarpa, and Spallanzani. The discussions of Galvani and Volta concerning their new discoveries in electricity divided the scientific men of Europe into two factions, and the poets followed their example. Scarpa, a learned disciple of Morgagni, reduced anatomy to a positive science. Spallanzani wrote on physics and physiology in a style worthy of one who declared philosophy itself imperfect unless its principles were elegantly expressed. Gioja and Romagnosi treated philosophical questions and the economical and political sciences, the 'Filosofia della statistica' being the principal work of the former, and the 'Genesi del diritto penale' of the latter. Manzoni produced new models of lyric verse, and examples of historical dramas and novels in his 'Adelchi,' 'Il conte di Carmagnola,' and 'I promessi sposi.' To the modified classical school of Monti belong the dramas of Silvio Pellico, chiefly known by his 'Francesco da Rimini' and 'Le mie prigioni,' and those of Nicolini, often founded on the history of his country, and strongly marked by patriotic feeling. The example of Sir Walter Scott in the production of historical romances had many followers in Italy. 'I promessi sposi' of Manzoni (1825) was succeeded by the 'Monaca di Monza,' 'Luisa Strozzi,' and 'Il conte Ugolino della Gerardesca' of Rosini; the 'Margherita Pusterla' of Cesare Cantu; the 'Marco Visconti' of Grossi; the 'Ettore Fieramosca' of Azeglio; and the 'Battaglia di Benevento,' 'Assedio di Firenze,' 'Isabella Orsini,' and 'Beatrice Cenci' of Guerrazzi. Italy received with enthusiasm these romantic delineations from her ancient history. The romance entitled 'Famiglia' (1850), by Bersezio, is one of the best late Italian novels. The 'Dr. Antonio' of Ruffini is esteemed for its pictures of Italian scenery. Accomplished women have taken a considerable part in recent Italian literature. The 'Morte di Adone' of Teresa Bandellini was followed by the learned philosophical and religious poems of Diodata Saluzzo, with which she intermingled slight lyrical pieces. Cecilia de Luna Folliero wrote on the education of girls and the moral influence of music. Giustina Rinier Michiel celebrated in song the festive days and commemorated events of Venice. Isabella Teotochi Albrizzi wrote a graceful and truthful biography of Canova. The work of the Signora Ferucci on the education of girls received the encomiums of Gioberti and other distinguished thinkers. Other female authors are Lucrezia Marinella, Sabina Rasori, Silvia Curtoni Verza, Costanza Moscheni, and Leonora Fonseca Pimentel. In philosophy, the names of Gioja and Romagnosi were succeeded by that of Pasquale Borelli (Lallebasche), the author of an introduction to philosophy, and of works on the nature and genesis of thought, in which he opposed the empiricism of Romagnosi. Pasquale Galuppi (1770–1846), in elaborate works, combated the philosophical tendencies of the 18th century by doctrines founded on the philosophy of the Fathers of the Church. He was a student of the German philosophers, and one of his most interesting works was on the changes of modern philosophy from Descartes to Kant. Mamiani (born in 1802) published his 'Rinnovamento dell' antica filosofia Italiana' with the design of restoring the philosophical method of the Church Fathers, which he regarded as the national philosophy of the Italians, and of reconciling the extreme conclusions of speculative philosophy with the dictates of common sense. Rosmini (1787–1855) and Gioberti (1801–52) developed ideal Catholic theories, and founded a school in which, according to Rosmini, the only necessary and innate idea is that of the possibility of being. Gioberti, a more brilliant and learned

author, denounced psychology, and made the formula *L'ente crea le esistenze* the ontological basis of philosophy. Among contemporary literary celebrities are Annunzio, poet, dramatist and novelist; Carducci and Rapisard, poets and critics; Cossa, Ferrari, Giacometti, Pulle ("Castelnuovo"), dramatists; De Amicis, Barrili, E. Castelnuovo, Farina, Matilde Seras, and Verga, novelists. Among modern scientific authors and critics are D'Ancona, Ascoli, Comparetti, De Gubernatis, Lombroso, Rajna, and Villari.

Art.—For *Italian Architecture* see ARCHITECTURE.

Painting and Engraving.—The 12th century is generally taken as the period of the beginning of the history of painting in Italy, but before that time it had been the scene of the labors of Greek and Byzantine artists. During the pontificate of Leo the Great (440–461) a large picture in mosaic was executed in the Basilica of St. Paul, on the road to Ostia, and the portraits of the first 42 bishops, which are seen in the same church, date their origin from the same time. Mosaic and encaustic painting was then the prevalent mode. Painting in distemper was afterward introduced. About the end of the 6th century there were many paintings which were not believed to be the work of mortal hands, but were attributed to angels or blessed spirits. To this class, called *Acheiropoieta* (not made with hands) belongs one of the most famous representations of the Savior, in wood, at Rome, of which a sight can be obtained only with difficulty, in the *sanctum sanctorum*. In the 8th century painting on glass, mosaic on a ground of gold, and painting in enamel, were zealously prosecuted in Italy. There were already many native artists. One of the oldest monuments of art is the celebrated Christ on the Cross, in the Trinity church at Florence, which existed there as early as 1003. About 1200 a Greek artist, Theophanes, founded a school of painting in Venice. The art was first pursued with zeal in Pisa. The only artist of eminence who preceded Cimabue, who was born at Florence in 1240, was Guido of Siena, whose most celebrated work is a madonna, executed in 1221 for the church of San Domenico in his native place, where it is still to be seen. Cimabue, who was regarded as a prodigy by his contemporaries, first introduced more correct proportions, and gave his figures more life and expression. His scholar Giotto (died 1336) excelled him even in these respects, and exhibited a grace hitherto unknown. He was the friend of Dante and Petrarch, and practised with equal success historical painting, mosaic, sculpture, architecture, and portrait and miniature painting. He first attempted foreshortening and a natural disposition of drapery, but his style nevertheless remained dry and stiff. Boniface VIII. invited him to Rome, where he painted the still celebrated Navicella. He was followed by Gaddi, Stefano, Maso, and Simone Martini (Memmi). But Masaccio (properly Tommaso Guidi, born 1402) first dispelled the darkness of the Middle Ages, and a brighter dawn illuminated the art. The Florentine Republic in the beginning of the 15th century had attained the summit of its splendor. Cosmo de' Medici patronized all the arts and sciences; Brunelleschi then built the dome of the cathedral; Lorenzo Ghiberti cast the famous doors of the baptistery in bronze; and Donatello was to statuary what Masaccio was to painting. Paolo Uccelli laid the foundation for the study of perspective. Luca Signorelli, who first studied anatomy, and Domenico Ghirlandaio, who combined noble forms and expression with a knowledge of perspective, and abolished the excessive use of gilding, were distinguished in their profession. Leonardo da Vinci (1452–1519), who was a master in all the arts and sciences, infused so much philosophy and feeling into the art that, by his instrumentality, it quickly reached maturity. From him the Florentine school acquired that grave, contemplative, and almost melancholy character to which it originally leaned, and which it afterward united with the boldness and gigantic energy of Michelangelo. The Roman school already enumerated among its founders the miniature painter Oderigi, who died in 1300. He embellished manuscripts with small figures. Guido Palmerucci, Pietro Cavallini, and Gentile da Fabriano were his most distinguished successors. Almost all the painters of this time were accustomed to annex inscriptions to their pictures: the annunciation to the Virgin Mary was their favorite subject. Perugia was the principal seat of the Roman school. As early as the 13th century there was a society of painters there. Pietro Vanucci, called "Perugino" (1446–1524), first introduced more grace and nobler forms into this school, whose character acquired from him something intellectual, noble, simply pious, and natural, which always remained peculiar to the Roman school. Perugino's great scholar Raphael soon surpassed all former masters, and banished their poverty, stiffness, and dryness of style. Taste came into Venice from the East. Andrea Murano and Vittore Carpaccio are among the earliest artists of that city. Giovanni and Gentile Bellino are the most distinguished painters of the earlier Venetian school. The latter labored some time in Constantinople under the reign of Mohammed II. They introduced the glowing colors of the East; their style was simple and pure, without rising to the ideal. Andrea Mantegna (died 1506) was the first to study the ancient models. Padua was the principal seat of the Venetian school. Mantegna afterward transferred it to Mantua, and his style formed the transition to the Lombard school. Schools of painting flourished in Verona, Bassano, and Brescia. Giovanni da Udine (who was so distinguished by his faithful imitation of nature in secondary things that he painted for Raphael the garlands around his pictures in the Fernesina), Pellegrino, and Pordenone were the most able predecessors of the two great masters of the Venetian school, Giorgione and Titian. No capital city served as the central point of the Lombard school. Bologna subsequently became the centre. Imola, Conto, Ferrara, Modena, Reggio, Parma, Mantua, and Milan were afterward considered the seats of this school. Galasio (who lived about 1220), Alighieri, Alghisi, Cosimo Tura, Ercole Grandi, and especially Dosso Dossi (died 1560), were the principal painters of Ferrara. The last, a friend of Ariosto, possesses a remarkable grandeur of style, united with a richness of coloring which may bear comparison with that of Titian. Bramante (died 1514), who was likewise a great architect; Lippo Dalmasi; and especially Francesco Raibolini (died 1517), called "Francesco Francia," were

highly distinguished among the Bolognese masters. Here also belongs the charming Innocenzo da Imola.

We now come to the greatest masters of any age, called "Cinquecentisti," from the century in which they flourished. After Leonardo da Vinci, in the Florentine school, had settled the proportions of figures, and the rules of perspective and of light and shade, and his scholars, Luini, Salaino, and Melzo, besides the admirable Baccio della Porta ("Fra Bartolommeo," d. 1517), Andrea del Sarto (d. 1530), the gifted Baldassare Peruzzi and the gay Razzi had made this school distinguished, there arose the most extraordinary of all masters, Michelangelo Buonarotti (1474–1564). His gigantic mind grasped, with equal power, statuary, architecture, and painting. His fire of composition, his knowledge of anatomy, the boldness of his attitudes and foreshortenings, leave him without a rival; but, as a model, he was detrimental to the art, because his imitators necessarily fell into exaggeration and contempt of a simple style. In grandeur his fresco painting, the 'Last Judgment,' in the Sistine chapel at Rome, is inimitable. Beauty was never so much his object as power and sublimity, especially since, in the former, he could never equal Raphael, but in the latter stood alone. Dante was his favorite poet. In his later years the erection of St. Peter's church almost entirely engrossed his thoughts. Rosso de' Rossi, Daniele da Volterra, Salviati, Angelo Bronzino, Alessandro Allori, and many others were his scholars and imitators. If we turn our attention to the Roman school we find at its head the first of artists, Raphael Sanzio da Urbino (1483–1520). His genius showed itself as elevated in his fresco paintings, in the *stanze* and *loggie* of the Vatican (the former of which contain the 'School of Athens,' the 'Parnassus,' and the 'Conflagration of the Borgo,' while the latter contain Scriptural scenes from the creation through the whole Old Testament), as it appears lovely, spiritual, and original in the frescoes of the Farnesina (representing the life of Psyche). No less superior are his oil paintings, of which we shall only mention his madonnas, celebrated throughout the world, especially the 'Madonna del Sisto' (in the Dresden gallery), the 'Madonna della Sedia' (in Florence), 'Madonna della Pesce' (in Madrid), 'Maria Giardiniera' (in Paris), 'Madonna di Foligno' (in Rome), his 'St. Cecilia' (in Bologna), and his last work, the 'Transfiguration of Christ.' His scholars and successors — the bold Giulio Romano (d. 1546), the more gloomy Gianfrancesco Penni, called "il Fattore" (d. 1528), the lofty Bartolommeo Ramenghi, surnamed "Bagnacavallo," Pierino del Vaga (properly Buonaccorsi), Polidoro da Caravaggio, Gemigniani, Benvenuto Tisio da Garofalo, and many others — were skilful masters; but they forsook the path of their great pattern, and degenerated into mannerism. Federico Baroccio (d. 1612) endeavored to counteract this tendency. In spirit he belonged to the Lombard school, as he aimed at, and in part attained, the grace of Correggio. With his scholars Francesco Vanni and the brothers Zucchero he infused a new life into the Roman school, though the latter produced pleasing rather than great works, and fell into mannerism. Muziano was distinguished in landscape-painting, and Nogari and Facchetti in portrait-painting. At the head of the Venetian school we find the two excellent colorists Giorgione Barbarelli di Castelfranco (d. 1511) and Tiziano Vecelli (d. 1576). The portraits of the former are celebrated for their warmth and truth. The latter was great in all the departments of art, inimitable in his carnation, or painting of flesh tints, excellent as an historical and portrait painter, and the first great landscape-painter. Even in extreme old age his powers were unimpaired. Ariosto and Aretino were friends of the gay, happy Titian. Some of his most famous works are the altar-piece of St. Pietro Martire, his pictures of 'Venus,' his 'Bacchanal,' and his 'Children Playing,' in Madrid, his 'Cristo della Moneta,' etc. He first understood the art of painting with transparent colors. In groups, he selected the form of a bunch of grapes for a model. His successors — Sebastiano del Piombo, Palma Vecchio, Lorenzo Lotto, Paris Bordone, Pordenone — are distinguished especially in coloring. Schiavone, whose *chiaroscuro* and richness of color are truly remarkable; Giacomo da Ponto, called "Bassano," who imitated reality, even in common things, to deception, and who was the head of a whole family of painters; the ardent, inspired Robusti, called "Il Tintoretto" (d. 1594), and the fantastic, splendid Paul Veronese, properly Paolo Cagliari (d. 1588), who painted boldly and brilliantly with a free pencil, but neglected all propriety of costume, and frequently mingled masks in historical paintings, were ornaments of the Venetian school. It likewise degenerated, and its mannerists were worse than those of the other schools, because they did not study the antiques and the ideal. At the head of the Lombard school we find the charming Antonio Allegri da Correggio (d. 1534), whose works are distinguished for harmony of colors as well as for expression and grace. His successors and scholars were Francesco Rondani, Gatti, Lelio Orsi, and especially Francesco Mazzola, called "Il Parmegianino" (d. 1540). This artist possessed much ease, fire, and a peculiar grace, which frequently borders on mannerism. Gaudenzio Ferrari and many others are the ornaments of the Milanese school. In Bologna we find Bagnacavallo (d. 1542), a distinguished artist of this period, whom we have already mentioned as one of Raphael's scholars. Francesco Primaticcio (d. 1570), Niccolò dell' Abbate, Pellegrino Tibaldi, Passarotti, and Fontana were also celebrated Bolognese artists.

They were followed by the three Carracci, who endeavored to restore a pure style, and, by the combined study of the ancient masters of nature and science, to give a new splendor to the degraded art. Their influence was powerful, and Italian art became divided between the followers of the Carracci, who were called eclectics, and the followers of Michelangelo da Caravaggio, called naturalists. Lodovico Carracci (1555–1619) was, according to some accounts, the uncle, according to others the cousin of the two brothers Agostino (1558–1601) and Annibale (1560–1609). In 1589 all three united in establishing at Bologna an academy for painting, which was called accademia degli incamminati, and soon became so famous that all other schools for painting in the city were closed from want of attendance. The scholars of the Carracci are numberless. The most famous endeavored to unite the grace of

Correggio with the grandeur of the Roman masters. Cesare Aretusi was distinguished for the most faithful copies of Correggio and Guido Reni (d. 1642), especially for the ideal beauty of his heads, the loveliness of his infant figures and the uncommon facility of his pencil. The Bolognese Francesco Albani (d. 1660) lived in constant rivalry with Guido. He produced many large church paintings, but was most celebrated for the indescribable charm with which he represented, on a smaller scale, lovely subjects from mythology, and especially groups of Cupids. His paintings in the Verospi gallery, and his 'Four Elements,' which he painted for the Borghese family, gained him universal reputation. The background of his landscapes is excellent. All his works breathe serenity, pleasure, and grace. The third great contemporary of those already mentioned, Domenico Zampieri, called "Domenichino" (d. 1641), was at first little esteemed by them, on account of his great modesty and timidity. Thrice were prizes awarded by Lodovico to drawings, the author of which no one could discover. At last Agostino made inquiries, and the young Domenichino timidly confessed that the drawings were his. His industry and perseverance rendered him the favorite of his master. His works evince the most thorough knowledge, and are rich in expression of character, in force, and truth. His 'Communion of St. Jerome,' his 'Martyrdom of St. Agnes,' and his fresco in the Grotta Ferrata, are immortal masterpieces. Giovanni Lanfranco (d. 1647) was especially distinguished for the effect of his light. Bartol. Schidone is one of the best colorists of this school. The Bibienas, the Molas, Al. Tierini, Pietro da Cortona, Ciro Ferri, also deserve mention. At the head of the naturalists, who, with a bold and often rash pencil, imitated nature, without selection, stands Michelangelo Merighi, or Amerighi da Caravaggio (d. 1609). The chief of those who in a later age took him as a model was Salvator Rosa (d. 1673), to whose name may be added those of Preti "il Calabrese" and Giuseppe Crespi, called "Spagnuolo." His chief opponent in Rome was D'Arpino, who stood at the head of the idealists, or rather of the mannerists. Caravaggio and his successors, Manfredi, Leonello Spada, Guercino da Cento, etc., often took common nature for a model, which they servilely imitated, thus profaning the genuine dignity of the art, though they cannot be denied strength and genius. About this time, the beginning of the 17th century, the *bambocciate* were introduced. (See LAAR, PETER.) Many artists, especially Michelangelo Crequozzi, surnamed "delle battaglie" and "delle bambocciate," followed this degenerate taste. Andrea Sacchi made great efforts to oppose him. His drawing was correct and grand; Raphael was his model.

Italian art, already in the 17th century very far sunk below the purity of style and the nobility of composition which distinguished it in the time of Raphael, during the 18th century fell into a complete decay. Three or four names of this epoch, those of the Neapolitan Solimena, the Venetians Tiepolo and Canaletto, and the Luccese Pompeo Battoni, alone deserve to be saved from oblivion. During the first half of the 19th century the artists of Italy still confined themselves to dull imitations of the ancient masters and to academical commonplaces. The Milanese Andrea Appiani is the only one that need be separately distinguished among the crowd. The other more tolerable painters of this period are Francesco Hayez, Vincenzo Camuccini, Pietro Benvenuti, and Giuseppe Bezzuoli. At the present day an improvement is discernible in the position of Italian art, and serious efforts are being made to rise above the standard of academic conventionality. Among the chief artists are Ussi of Florence, Andrea Gastaldi of Turin, Federigo Faruffini of Sesto, Domenico Morelli, Francesco Castiglione, Camillo Miola, and others belonging to Naples, Pompeo Molmenti of Venice, etc.

In the art of engraving the Italians acquired great eminence. Tommaso Finiguerra, who flourished 1460, was the first celebrated master of this art, which he taught to Baccio Bandini. They were succeeded by Mantegna; but Marco Antonio Raimondi, of Bologna, who lived in 1500, was the first to introduce greater freedom into his engravings. His copies of Raphael have always been highly valued, on account of their correctness. His manner was imitated by Bonasone, Marco da Ravenna, Ghisi, and others. Agostino Carracci, Parmegiano, Carlo Maratti, and Pietro Testa etched some excellent works. Stefano della Bella was distinguished for his small, spirited, and elegant pieces. Among the moderns, Bartolozzi deserves mention in stippled engraving. Cunego, Volpato, and Bettelini are also distinguished; but, above all, Giuseppe Longhi (d. 1831) and the Florentine Raphael Morghen (d. 1833), who carried the art of engraving to a degree of perfection never before anticipated. Among the most celebrated Italian engravers subsequent to these two are Faustino, Pietro Anderloni, Domenico Marchetti, L. Calamatta, Giuseppe Bianchi, Pietro Fontane, Cremonesi, Michele Bisi, Filippo Caporali, Locatelli, and Faruffini.

Sculpture.— Although Italy has possessed some eminent sculptors, this branch of art (apart from some great works of Michelangelo) never attained so high a position in that country as painting. Nothing need be said of the sculptures which decorate the monuments erected during the Romano-Byzantine period of Italian art. For the most part they merely reproduce conventional types, and they are uniformly very roughly executed. To Niccolò da Pisa in the 13th century belongs the honor of having first broken loose from the barbarous manner of the early carvers in stone, and to have taken as models the masterpieces of ancient art. His numerous works (among others the pulpit in the baptistery of Pisa and the tomb of Saint Dominic at Bologna) clearly reveal the new source of inspiration. Niccolò had a worthy successor in his son (according to other accounts brother), Giovanni da Pisa, who in his turn trained up a school of sculptors in the true principles of the art. The most famous of these are the brothers Agnolo and Agostino da Siena and Andrea da Pisa. The influence of Giovanni da Pisa may also be traced in the magnificent works of Masuccio, Pietro, Stefanoni, and others, all of whom were distinguished in architecture as well as in sculpture, for it must not be forgotten that at that time, and even as late as the 15th century, sculpture and even painting were rather regarded as handmaids of architecture, than as separate arts regulated by laws of their own. Hence it was necessary for the archi-

tect to possess a thorough knowledge of all the three arts, and thus we find that several masters, such as Giotto, Andrea, Orcagna, Leonardo da Vinci, Michelangelo, and Raphael were at once architects, painters, and sculptors, that others were architects and painters, and still more architects and sculptors. During the 15th century the sculptors of Florence, then the metropolis of the arts, excelled all their rivals, as much as her painters and architects did theirs. At their head stand Lorenzo Ghiberti (d. 1455), and Donatello (d. 1466), both of whom instead of contenting themselves with a mere imitation of the works of antiquity, only looked to them for lessons as to the manner in which nature was to be understood and interpreted, while in other respects they followed an independent path. Among the other great artists of the period were Filippo Brunelleschi, Giacomo della Quercia, and Niccolò d'Arezzo, all of whom besides Donatello were competitors with Ghiberti in the case of the famous bronze doors of the baptistery of the church of San Giovanni at Florence. (See GHIBERTI.) Giacomo della Quercia afterwards rendered himself celebrated by executing the central door of the cathedral of Bologna. Brunelleschi was so much devoted to architecture that he has left behind him but a small number of sculptures. Luca della Robbia was also eminent among the masters of that time, but his works are chiefly in enameled earthenware, the secret of making which he discovered. The best pupils of Donatello were Desiderio da Settignano (d. 1485), and Andrea Verrochio, a jeweler, sculptor, engraver, painter, and musician, celebrated as the sculptor of one of the most admirable equestrian statues in bronze anywhere to be seen, that of Colleone at Venice, and no less so as the teacher of Leonardo da Vinci and Michelangelo. The other chief sculptors of the 15th century are Matteo Civitali, Benedetto da Rovezzano, and Lorenzo di Pietro (called "Il Vecchietta"), the last also celebrated as a painter and an architect. In Michelangelo the Italian renaissance in statuary reached its highest point. That great artist gave to the human form a character of force and majesty, and in action a fulness and vehemence which he did not always keep within the limits of reality, but which constitute the sublime and truly original aspect of his works. His great misfortune was to be followed by a crowd of imitators, who exaggerated the majesty of his style to a ridiculous extreme. The two most illustrious of his pupils were Montorsoli and Baccio da Montelupo. Sansovino (d. 1570) was able to preserve himself from a servile imitation, and became the founder of a school at Venice, from which proceeded Cattaneo, Pietro da Salo, Jacopo Colonna, and others. Besides these the 16th century numbers among its celebrated masters of the chisel Benvenuto Cellini, more famous as a designer in metal than as a sculptor in marble, Tribolo, Vincenzio Danti, Giovanni Merliano da Nola, called the Michelangelo of Naples, etc. With Bernini in the 17th century statuary underwent a complete decline similar to that which befell the other arts as well as literature during the same period, from which condition it did not rise again till about the end of the 18th and the beginning of the 19th century, when a renewed lustre was shed on the Italian school of sculpture by Antonio Canova (d. 1822), who acquired an immense reputation, partly justified by the grace of his figures and the delicacy of the execution. After him Lorenzo Bartolini (d. 1850) acquired distinction by the excellence of his works. The chief defects of this artist and of the Italian sculptors of the present age generally is the want of originality of conception and breadth of execution.

Music.— In Italy the imperfect forms of ancient music were first lost in the modern. Here we first find the proper choral song, the foundation of modern church music, which was at first sung in unison, chiefly in melodies derived from the old Græco-Roman music, and adapted to Christian hymns and psalms. (See MUSIC.) It seems to have had its origin when Bishop Ambrosius, in the 4th century, introduced into the Western Church songs and hymns adapted to the four authentic modes of the Greeks, and appointed psalmists or precentors. Gregory the Great, in the 6th century, enlarged the choral song by the plagal modes. From this time singing-schools were multiplied, and much was written upon music. The most important inventions for the improvement of music generally we owe to the 11th century, and particularly to the Benedictine Guido of Arezzo, who, if he did not invent the mode of writing musical notes and the use of the clef, improved and developed them, determined the exact relations of the tones, named six of the tones of the scale, and divided the scale into hexachords. In the 13th century the invention of music in measure was spread in Italy, dependent upon which was that of counterpoint and figured music. Instruments were multiplied and improved in the 14th and 15th centuries. Many popes favored music, particularly vocal, and consecrated it by their briefs; yet the ecclesiastical ordinances restrained the independent development of music. Much instruction was given in singing in the 15th century, and not entirely by monks. Music acquired the rank of a science, and vocal music in counterpoint was developed. In the 16th century we discover distinguished composers and musicians — Palestrina (chapel-master to Pope Julius III.), whose works possess great dignity and scientific modulation; his successor, Felice Anerio; the celebrated contrapuntist and singer, Gregorio Allegri; and the writer upon harmony, Giuseppe Zarlino, chapel-master at Venice. Music was cultivated at Rome and Venice with the greatest zeal. Hence it spread to Naples and Genoa; and all Italy, Schubert says, was soon a loud-sounding concert-hall, to which all Europe resorted to hear genuine music, particularly beautiful singing. About the end of the 16th century we first meet with the opera. The first operatic composer was Jacopo Peri. The taste for this new kind of composition spread so quickly, that composers were soon unable to supply the demands of the people, and from 40 to 50 new operas appeared yearly in Italy. This caused great competition among the Italian musicians. Thus the peculiar character of the Italian music, not to be changed by foreign influence, was developed the more quickly, because this species was cultivated independently, and unrestrained by the church. Already, in the middle of the 17th century, when the music of the theatre was continually advancing, simplicity began to give place to pomp and luxuriance, and the church style to decline. Music (says Schubert) united the profane air of the drama with the fervor of the church style, and

this was the first cause of the decline of the latter. Let us now consider the principal periods of the former. Vocal music must have been first; it was regulated by the discovery and improvement of instruments; thence arose the simple, grand church music of the 15th and 16th centuries; with it various forms of national song were developed. On the stage the higher style of music flourished independently. Here the Italian, without much attention to the poetical part of the performance, which was, as a rule, only the hasty work of a moment, though an exception must be made in favor of the operatic texts of Metastasio, followed his inclination for melody and sweet sounds, which appears even in his language. All the southern nations show a great sensibility, and melody is to them as necessary as harmony to the inhabitants of the north; but to no nation so much as to the Italians, whose beautiful climate and happy organization for song (Italy produces the most beautiful alto and tenor voices — few bass) made melody their chief aim in their music. On the other hand, the simplicity of melody degenerated into effeminacy and luxuriance, from the time when vocal music developed itself independently, and the voice, but little supported by the instrumental music, began to be cultivated like an instrument; when, instead of poetical expression and truth, mere gratification of the ears, not deep emotion, but a momentary excitement, and a rapid change of tones, with the avoidance of all dissonance, were principally desired: when music began to predominate over poetry, which first took place on the stage and thus the musical part of the performance obstructed the improvement of the dramatic and poetic. This taste spread over other countries so much the more easily as Italian music had advanced by rapid strides far before that of the rest of Europe, as appears even from the predominance of Italian terms in the language of music. Among the best composers of the 17th century are Girolamo Frescobaldi, Francesco Foggia, Bapt. Lully, and the celebrated violinist and composer Arcangelo Corelii. To the singers, of whom the most were also composers, belong Antimo Liberati, Matteo Simonelli, both singers in the chapel of the Pope. In the beginning of the 18th century Ant. Caldara was distinguished. He increased the effect of the singing by the addition of instruments, but his style partook much of the theatrical. In the middle of this century Italian music, especially theatrical, flourished, particularly at Naples, Lisbon, and also in Berlin. This has been declared by some the most brilliant period of Italian music. There were some distinguished instrumentalists in Italy, as the organists Scarlatti and Martinelli, the violinist Tartini, Domenico Ferrari, Geminiani, Ant. Lolli, Nardini, and Clementi. Among the composers of the 18th century may be mentioned Traelta, who, through his refinements, injured the simplicity of composition; Galuppi, distinguished by simple and pleasing song, rich invention, and good harmony; Niccolo Jomelli, who gave greater importance to instrumental music; Nic. Porpora, distinguished for his *solfeggios* in church music; Pergolesi, whose music is always delightful from its simple beauty (for example, his Stabat Mater); Pater Martini, at Bologna; the sweet Piccini, rival of Gluck; the agreeable Sacchini Sarti. Of a later date are Paesiello, Cimarosa, the ornament of the *opera buffa*, and Zingarelli (Romeo and Juliet), Nasolini, Paganini, Niccolini, Cherubini, Rossini, Bellini, Donizetti, Verdi, Mascagni, and Perosi.

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Italy, Free Church in, a reformed religious sect founded by Alessandro Gavazzi in 1870 (see GAVAZZI, ALESSANDRO). In 1874 a confession of faith was formulated, an ecclesiastical constitution framed under a General Assembly; and the title of "Free Church in Italy" assumed. The confession scarcely does more than echo those of the Protestant Churches, and the constitution is based on the government by elders, like that of the Presbyterians, though the several congregations are practically uncentralized, as with the Independents. In 1891 by royal decree, the title "Chiesa Evangelica Italiana" was given to this body. The English sympathizers of Gavazzi bought and presented to the Free Church in Italy the old Church of San Jacopo in Florence, which city is the headquarters of the sect, and the meeting place of the General Assembly, and the present seat of the theological seminary which was originally established at Rome (1875), but transferred in 1891. Gavazzi, a remarkably eloquent man, was appointed professor of dogmatics, apologetics and polemics, as well as of pulpit oratory, a position he held till his death. The schools of the church in Florence are partially supported by the state. According to statistics for 1901 the General Assembly legislates for 30 congregations represented in it, of which there are 14 ordained ministers and 1,831 communicants.

Itasca Lake, farthest source of the Mississippi, in northern Minnesota. (The name is declared by Rev. W. T. Boutwell, a companion of H. R. Schoolcraft in his exploration, to have been barbarously formed in his presence from syllables of Latin *veritas*, truth and *caput*, head, as the "true head" of the Mississippi; but on Schoolcraft's first map it appears as Itasco, a neighboring stream being named Itasca, and Schoolcraft was a college-bred man hardly capable of such a solecism.) An extremely irregular body of water occupying a glacier-made bowl-shaped depression, surrounded by heights covered with dense forests, interspersed on the slopes with streams, springs, and small lakes often with no apparent outlet. The ground has a substratum of sand and gravel, mingled with large boulders; the surface is spongy and swampy. This basin has been made a national

park of about 7 by 5 miles, containing 19,701.69 acres (30.78 square miles). In the centre, fed by sources so permanent and with a flood plain so small that it has actually risen in dry seasons (though it receded some feet during the 19th century), lies Itasca, a giant among the small ponds around it, but having an area of only 1,130 acres, or 1¾ square miles. It is composed of a centre running east and west about a mile, whence extend north and south an east and a west arm about 1½ miles long each, and another northward about a mile, the width varying from ⅛ to ¾ of a mile. It has a shore line of 23,000 yards (over 13 miles). Depth, 4 to 50 and 60 feet; average, 20 to 35. The Mississippi flows from its north arm; a strong brook called by Nicollet the "Infant Mississippi" flows into the west arm. See MISSISSIPPI RIVER.

Ita'ta Case, 1891, an important international imbroglio, resulting from the *coup d'état* of Balmaceda (q.v.) and the revolt of the constitutional party in Chile. The latter through an agent had bought a quantity of arms and ammunition in New York, which were shipped to San Francisco and then sent by a schooner to the southern coast, where it was met by the insurgents' vessel, the Itata, and the cargo transferred. The vessel had a few soldiers and a little artillery on board. The attorney-general issued a writ of detention on the ground that she was violating our neutrality laws; and this failing, our cruiser Charleston was sent in pursuit, overhauled and captured her, and placed her on trial before the United States district court at San Diego. The courts discharged her as not having been guilty of such violation. The real interest of the case was political. It was notorious that our government and many of its civil and naval representatives sympathized with Balmaceda against the insurgents, and it was charged with going out of its way in order to cripple the latter; while the other party were ready to make war on the Chilean constitutionalists for defying our authority.

Itch, a contagious disease of the skin (scabies) due to its invasion by the itch-mite (*Sarcoptes scabici*), now rather rare in civilization. Even the adult mite is so small as to be barely visible, the female being about one sixteenth of an inch long and not quite as wide, while the male is still smaller. It has eight legs, two on each side of the head, to which suckers are attached, and four behind. (See MITE.) The female burrows into the skin and deposits her eggs, about 50 in number, and dies after a period of six weeks. After the eggs hatch out, the young make their way to the surface, and the impregnated females again burrow into the skin, so keeping up the process. The most frequent sites selected by the bugs for their burrows are the web between the fingers, the front of the wrists, the umbilicus, the genitals in men, and the under side of the breasts in women. The first sign of the disease is itching, which forces the patient to scratch, particularly at night, as the warmth of the bed increases the itch. The skin soon becomes inflamed from scratching, and the discomfort is increased. Close examination may show the tiny burrow like a reddened pin-scratch about half an inch long. Many remedies are used with success, but sulphur in the form of an ointment is the most common. As the bugs cannot be killed while still in the skin, a good plan is to take a hot bath with brisk rubbing, apply the ointment night and morning for three days, continuing to wear the same clothing and sleep in the same bed-clothes; at the end of that time another bath is to be taken, all clothing and bed-clothes changed, and another series of rubbings started. This must be continued as long as fresh burrows are found. Great care must be taken in washing the clothing of an affected person, thorough boiling or baking being necessary to kill the mites. Transmission from one individual to another on close contact is readily effected.

Itch due to varieties of this mite affects all the domestic animals and some wild ones, as the lion, wolf, wombat, etc.; and in Europe, where it occurs more often than in America, epidemics of it sometimes run their course through the dogs, cats, horses, etc., of a town or district, often causing the death of the smaller animals. An application of sulphur ointment is recommended. The itch-mite of fowls is a different species.

Ith'aca, Mich., village and county-seat of Gratiot County, on the Ann Arbor railroad, 40 miles northeast of Lansing. It has a courthouse erected at a cost of $75,000, high school and other public buildings; and manufactures of flour, lumber, wind-mills and agricultural machinery, and several large potteries and iron works. It is the centre of an important agricultural district. Pop. (1890) 1,627; (1900) 2,020.

Ithaca, N. Y., city and county-seat of Tompkins County, on Cayuga Lake, and on the Lackawanna and the Lehigh Valley R.R.'s; 70 miles southeast of Rochester. It derives water power from Fall Creek and has manufactories of autophones, glass, typewriters, drop forgings, calendar clocks, firearms, salt, wall paper, agricultural implements, iron castings, machinery, etc. The city is best known as the seat of Cornell University (q.v.) and the Cascadilla Preparatory School; and also as a popular summer resort. There are two national banks, trolley connection with East Ithaca, large farming trade with Tompkins, Tioga, Cortland, and Seneca counties; and an assessed property valuation exceeding $7,000,000. In the immediate vicinity are numerous gorges and waterfalls, the most noted of the falls being Triphammer, Ithaca, Taughhannock, and Buttermilk. The Taughannock is 215 feet in height and is the highest waterfall east of the Rocky Mountains. There is here the Cornell Free Library containing 21,000 volumes, the Ithaca Conservatory of Music and Renwick Park. Under the charter of 1888, the government is vested in a mayor and city council elected every two years. Ithaca was first settled in 1787 and was called at different periods, "Sodom," "The Flats," and "the city," until 1806, when Simeon Dewitt gave it the name it bears. It was incorporated as a village in 1821. Pop. (1890) 11,097; (1900) 13,136.

Ito, Hirobumi, hē-rō-boo'mē ē'tō, **Marquis,** Japanese statesman: b. in Choshiu province, 1840. When the officer of the deck of the United States S. S. Mississippi, at midnight on 25 April 1854, heard the cry "American, Amer-

ican!" he found two Japanese gentlemen who had blistered their hands in rowing a fisherman's boat from the shore to get on board the American warship, hoping to be taken to America. Their clothing was stuffed full of writing paper and materials on which they expected to note down what they saw in foreign countries. One of these was Yoshida Shoin, who had long believed in breaking up the hermit policy of Japan and opening his country to human intercourse. Against his own sympathies, and despite their piteous appeal, Commodore Perry, keeping his word of honor, put the two men ashore. Seized as a prisoner, Yoshida was kept in domiciliary confinement in Choshui for five years, finally suffering decapitation and political martyrdom in Yedo, 31 Jan. 1859. He had for his pupils Ito Hirobumi and Inouye Kaoru. Thus early instructed, Ito determined to see the great world. Getting secretly on board a foreign ship, he reached Shanghai. While his other companions went to Europe by steamer, he and Inouye worked their way before the mast. In London he saw and learned much amid varied experiences, meanwhile making up his mind that Japan must change her entire civilization, cease being Oriental and become modern, or else go the way of India and the conquered Asiatic nations. Hearing that his feudal lord, having erected batteries commanding the straits of Shiminoséki, was about to defy the combined fleets of Great Britain, France, Holland, and the United States, he hastily left for Japan, but at home his efforts did not prevent that bombardment of 5 Sept. 1864 which so enlightened the eyes of the Choshui men, leading them to sink their clan feuds and join with Satsuma, Tosa, Echizen, and others for the restoration of the emperor's power and the unity of all Japan. Active as one of the younger men in the revolution of 1868, he saw the necessity of a uniform coinage. Visiting the United States, he studied American financial history, and on his return the decimal system of money and a mint at Osaka were established. He was one of the first to propose the abolition of feudalism, and in 1872–3 went round the world in the embassy to obtain from the Powers revision of the treaties. As minister of public works he established a college of engineering and secured the building of the railway from Yokohama to Tokyo. After serving as head of the Home Office he visited Europe in 1876 to study the constitutions of the various countries with the idea of forming a written constitution, in fulfilment of the emperor's oath of 1868 to create representative government. He became an intense admirer of the Bismarckian methods and system, and on his return inaugurated a radical plan for altering social customs. As minister president of state, he reconstructed the government, eliminating men of the older traditions and putting in men of modern training. He carried out drastic reforms in economy, besides reconstructing law and codes which, departing widely from those hitherto built on Chinese models, were made in harmony with the jurisprudence of Western countries. In 1888 there was a conservative reaction, and Ito retired to prepare, with three others, the constitution, which was finally promulgated 11 Feb. 1889. Though astonishingly liberal in matters of conscience and personal liberty, it follows the Prussian model in making the ministers responsible not to the Diet but to the emperor, against which provision the Liberals, eager to follow American and English precedents, have made unceasing protest. This struggle is the key to Japanese politics. Ito wrote a volume of commentaries on the constitution, translated into English by Ito Myoji. Again called to the premiership, he averted a political crisis at home and directed the diplomacy of the Chino-Japanese war of 1894–5. Resigning the premiership, he traveled in Europe, and on his return was again called by the emperor to form a government, and besides working for the Anglo-Japanese alliance, sent 21,000 fully equipped soldiers to join the allies and relieve the legations at Peking. In 1901, after the fall of his "coalition cabinet," he was succeeded by Katsura and went abroad for travel. In the United States for health, he received at Yale University the degree of LL.D. In 1904 he was the emperor's special envoy in Korea to consummate the alliance of the two countries. Enjoying the full confidence of his sovereign, he is, despite his opportunist proclivities, probably the best all-round statesman in Japan's modern history, incarnating, as he does, her past, present, and future.

WILLIAM ELLIOT GRIFFIS,
Author of 'The Mikado's Empire.'

Iturbide, ē-toor-bē'dā, **Augustin de**, emperor of Mexico: b. Valladolid de Michoacan (now Morelia), Mexico, 27 Sept. 1783; d. Padilla, State of Tamaulipas, 19 July 1824. In 1810 he was lieutenant in the provincial regiment of his native city, but on the breaking out of the troubles in Mexico joined the royalist party, and in this cause displayed such valor and ability that in 1816 he rose to the command of what was called the northern army, which occupied the provinces of Guanaxuato and Valladolid. In 1820 the imprudent acts of the Spanish cortes produced so much exasperation among the clergy and the partisans of absolutism in Mexico, that these persons united to effect the independence of their country, selecting Iturbide as their agent, and appointing him commander of the army in the south. He quickly bore down all opposition, and became so popular that he had himself proclaimed Emperor of Mexico, in July 1822, under the name of Augustin I. The Congress declared the throne hereditary in his family, and voted him a yearly allowance of $1,500,000. His troubled reign came to an end in less than a year, by his abdication in March 1823. Congress granted him on his abdication a yearly pension of $25,000 on condition of his leaving the country, making sufficient provision for his family in case of his death. He resided in Leghorn for about a year, when he was induced to make an attempt to recover his lost crown. He landed with but a single attendant at Soto la Marina, and was arrested and shot. His family settled in Philadelphia, where his widow died in 1861. Several of his sons subsequently held positions under the Mexican government, the eldest, Prince Angel, dying in the City of Mexico in 1872, the youngest, Prince Augustin, dying in Paris in 1873. Prince Angel's son, Augustin, b. 1864, was adopted by the Emperor Maximilian as his heir, Maximilian himself being childless. The collapse of the second empire, however, destroyed his chances of a throne.

MARQUIS HIROBUMI ITO,
Ex-Premier of Japan.

Iuka, Miss., a small village on the Memphis & Charleston railroad, in the northern part of the State, about 115 miles east of Memphis, was the scene of a severe engagement during the Civil War. Early in September, 1862, it was occupied by a small Union regiment as an outpost. On the morning of 13 September Gen. Sterling Price, moving north from Tupelo with a force of 14,000 men, to prevent Grant from sending reinforcements to Gen. Buell in Kentucky, drove the Union regiment from the village and occupied it, and on the 19th was about moving to Rienzi on the Mobile & Ohio Railroad to form a junction with Earl Van Dorn's army preparatory to an attack upon Corinth. Gen. Grant had been closely watching the movements of Price and Van Dorn, and when he heard that Price had occupied Iuka he determined to attack and cut him off before he could effect a junction with Van Dorn. Gen. Rosecrans, who was near Corinth with 9,000 men, was ordered to move south to Rienzi and Jacinto, then eastward, and, marching on the roads from Jacinto and Fulton, to attack Iuka from the south. Gen. Ord, with 6,500 men, was to move along the Memphis & Charleston Railroad to Burnsville, thence by roads north of the railroad, and to attack on the north and west of Iuka. Grant accompanied Ord, who reached Burnsville on the 18th, and encamped within six miles of Iuka, which he proposed to attack early in the morning; but Grant, hearing that Rosecrans had been delayed in his movements and would not probably be up in time to attack next day, instructed Ord not to move to the attack until the sound of Rosecrans' guns was heard south of Iuka. Rosecrans, with the two divisions of Hamilton and Stanley, moved from Jacinto at 5 o'clock in the morning of the 19th and, after a march of 18 miles, at 4 P.M. his advance division (Hamilton's), about two miles south of Iuka, encountered Little's division of Price's command, Maury's division remaining in the north of Iuka, to confront Ord. Little had about 4,000 men, with which he attacked Hamilton vigorously before the latter could complete his lines. After a very severe fight, Hamilton was driven back some 600 yards, abandoning nine guns; but, receiving three regiments of Stanley's division as a reinforcement, he rallied and regained part of his lost ground, when darkness ended the fighting. Gen. Price reports: "The fight began, and was waged with a severity I have never seen surpassed." Price prepared to renew the battle in the morning; but, convinced by his subordinates of the critical position he was in with Rosecrans in his front and Ord in rear, retreated southward by the Fulton road, which Rosecrans had failed to close as was intended. Ord did not hear the sounds of battle on the 19th, but, advancing on the morning of the 20th, found that Price had escaped. Price retreated southward and reached Baldwyn 23 September. Rosecrans and Ord returned to Corinth. Rosecrans reported a loss of 144 killed, 598 wounded, and 40 missing. Price reported a loss of 86 killed and 408 wounded; Union estimates placing it much higher. Consult: 'Official Records,' Vol. XVII.; Greene, 'The Mississippi'; the Century Company's 'Battles and Leaders of the Civil War,' Vol. II.

E. A. Carman.

Ivan, ē-vän', the name of several rulers distinguished in Russian history. The most celebrated are the Grand Dukes Ivan III. and Ivan IV., who laid the foundations of the Russian Empire, the latter (b. 1529; d. 1584) being commonly known as Ivan the Terrible. (See Russia.) Ivan VI. was son of the Grand-princess Anna and of Antony Ulrich, duke of Brunswick-Wolfenbüttel. The Empress Anna, 1740, declared him her successor, and her favorite Biron was to be his guardian and regent. Biron caused the oath of allegiance to be taken to the prince, and when he was banished the parents of the child assumed the reins of government until the daughter of Peter I., Elizabeth, ascended the throne. The young Ivan was taken from his cradle by soldiers, and shared the fate of his banished and imprisoned parents.

I'vanhoe, the title of one of Sir Walter Scott's most famous novels, written and published in 1819. The manuscript is now at Abbotsford. Immediately after its appearance, 'Ivanhoe' became a favorite, and now ranks among the most brilliant and stirring of romantic tales. The scene of the tale is England in the reign of Richard I.

Ives, īvz, **Brayton**, American financier: b Farmington, Conn., 1840. He was graduated from Yale in 1861, served in the Union army in the Civil War, attaining the rank of colonel, 5th Connecticut infantry, and brevet brigadier-general, in 1867–89 was a broker of New York, and in 1878–9 president of the New York Stock Exchange. At one time president of the Northern Pacific railway, he later was chosen to the presidency of the Metropolitan Trust Company of New York.

Ives, Frederic Eugene, American inventor: b. Litchfield, Conn., 17 Feb. 1856. He received a public school education; was director of the photographic laboratory at Cornell University in 1874–8, and has lectured before scientific societies in this country and in England. Among his inventions are the process of half-tone photo-engraving (1878); and the three-color printing process in the typographic press. He has published: 'Isochromatic Photography with Chlorophyll' (1866); 'A New Principle in Heliochromy' (1889); etc.

I'vory, properly the substance of which the tusks of the elephant consist, though the similar substance constituting the tusks of the hippopotamus and the horn of the narwhal is also so called. There is also a wholly different substance known as vegetable ivory (q.v.). Ivory is prized for its beautiful color, the fineness of its grain, and the high polish it is capable of receiving. That of the African elephant is most esteemed by the manufacturer for its density and whiteness. It is used as a material for knife-handles, pianoforte keys, combs, the backs of brushes, billiard balls, chess-men, carved figures, and ornamental articles of various kinds. Thin plates of ivory are used as panels for miniature paintings, and etchings are sometimes executed on such plates. The ivory of the hippopotamus is preferred by the dentist. The shavings and sawdust of ivory, by burning in a crucible, are converted into a black powder, from which is prepared a pigment known as ivory black. Ivory may be stained or dyed. The use of ivory was well known in very early

ages. The ancients were acquainted with the art of sculpturing in ivory, of dyeing and inlaying it, and they often employed it in statuary. Some of the most famous Grecian statues were chryselephantine, that is, were overlaid with plates of gold and ivory in conjunction. To provide the world's supply of ivory it is estimated that 9,000 to 12,000 elephants are killed annually. The medium weight of a tusk is about 60 pounds, but some are found weighing as much as 170 pounds.

Ivory-bill, the great black-and-white, scarlet-crested woodpecker (*Campephilus principalis*), formerly numerous and greatly admired throughout the Southern States, but now surviving only in a few of the most secluded cypress swamps of the Gulf coast. Its extermination was begun by the Indians, who valued highly its splendid head-feathers as an ornament for warriors; and completed by sportsmen and plume-hunters. The books of Wilson, Audubon and early writers on American animals give many interesting facts as to its habits.

Ivory Palm, a South American palm-tree yielding corozo-nuts,—large white seeds called "vegetable ivory" (q.v.).

Ivory, Vegetable. See VEGETABLE IVORY.

Ivy, a popular name for various climbing, creeping, and drooping herbs and shrubs, the most widely known of which are the following: Common or English ivy (*Hedera helix*) is a tall climbing evergreen shrub of the order *Araliaceæ,* widely planted in Europe (where, as in Northern Africa and Eastern Asia, it is native), and in the warmer parts of the United States, its ornamental, abundant foliage being highly valued for covering walls, rocks, and trellises. Its small and inconspicuous greenish, perfect flowers appear late in the autumn and the small black fruits (three to five seeded berries) ripen the succeeding year. The fruits, which are devoured by birds, are bitter and pungent, and were formerly in medicinal repute, The gummy juice obtained from the stem, as also the fruit, contains the bitter principle hederin and the hederic acid characteristic of the plant. It has been used in making varnish. Contrary to popular opinion, ivy is not parasitic upon such trees as support it. It merely clings to them by its numerous hold-fast roots produced along the entire length of its stems. Such trees as it injures are killed by constriction. The other popular notion that it makes the walls and houses upon which it climbs damp and unhealthy is also erroneous; in reality it dries them, the roots abstracting such water as reaches the wall through the dense foliage; yet exceptional cases of damage occur. It has numerous horticultural varieties which differ mainly in the form, color and markings of the leaves. These succeed best in rather moist, rich soils and shady positions and are not usually found to be hardy much farther north than New York unless well protected from the winter sun, as upon the north side of buildings, etc. As a cool greenhouse and a house plant it is very popular. Ivy leaves and ivy berries were formerly administered for various medicinal purposes, but they have been long out of use. The leaf and habit of the common ivy are so characteristic that reference is often made to them in the specific names of other plants, "ivy-leaved" being common as a designation. The plant takes a prominent place in mythology and folk-lore.

Japanese or Boston ivy (*Ampelopsis tricuspidata*) and its near relative Virginia creeper (*A. quinquefolia*) of the order *Vitaceæ,* are probably the next best known species to which this name is applied. The former is the more graceful, and is gradually gaining in general favor over the latter, which demands more attention to keep it looking presentable. Both climb by means of tendrils, but the Boston ivy clings better to walls. It has three-lobed leaves; its rival, five-lobed. Both have brilliant autumnal colors in the north, where the Virginia creeper is the more hardy.

Among the herbaceous ivies Kenilworth ivy (*Linaria cymbalaria*), German ivy (*Senecio mikanoides*) and ground ivy (*Nepeta glechoma*) are best known in America. They are all popular greenhouse plants and are frequently planted in hanging-baskets because of their graceful habits. Poison-ivy or poison-oak is a climbing sumach whose leaflets somewhat resemble those of Virginia creeper, but are in threes instead of fives (see POISON-IVY).

Iwakura, Tomomi, Japanese reformer and statesman: b. in Kioto in 1825 of illustrious ancestry, one of the Kuge or court nobility, chamberlain of the imperial household, and at first in favor of the expulsion of foreigners. He never saw a foreigner until he was 43 years old. Becoming a Progressive, he was banished into exile and shaved his head, but his real aim was to restore the lustre of the imperial throne by the overthrow of the Yedo Shogunate. Entering into communication with the leaders of the confederation of southern daimios, he became the link between court nobility and the progressive samurai or gentry, and took a prominent part in the Restoration of 1868. He was one of the first to send his three sons to be educated under Verbeck and to America. He received high office and salary, and in 1870, as envoy of the mikado to the recalcitrant Satsuma leaders, led in the movement to abolish feudalism, and was prominent in securing the formation of a new national army. As minister of foreign affairs and junior premier, he was visited by his sovereign. He went to Europe and America as head of the great embassy of 1872. He admired greatly the government at Washington. He left a powerful impress on the nation and the sovereign, and received the highest honors due to a subject. Escaping all attempts at assassination, he died quietly in his bed 20 July 1883. Of his children, a son, Prince Iwakura Tomosada, of the House of Peers, is special attendant upon the emperor, and the other, a daughter, is at the head of the Red Cross work in Japan.

WILLIAM ELLIOT GRIFFIS,
Author of 'The Mikado's Empire.

Ixion, ĭks-ī'ŏn, in Greek mythology, king of the Lapithæ in Thessaly, son of Phlegyas. He married Dia, daughter of Deioneus. He became enamored of Hera, and attempted to seduce her. Zeus made a cloud in the shape of Hera, and carried it to the place where Ixion had appointed to meet her. Ixion was caught in the snare, and from his embrace with the cloud were born the Centaurs. (See CENTAURS.) Zeus banished him from heaven;

struck him with his thunder, and ordered Hermes to tie him to a winged or fiery wheel in Hades.

Iyar, the eighth month of the Jewish year, corresponding, at the earliest, with April; but it may be as late as May; it has only 29 days.

Iz'ard, George, American general: b. Richmond, Surrey, England, 1777; d. Little Rock, Ark., 22 Nov. 1828. He was a son of Ralph Izard (q.v.). He was graduated from the College of Pennsylvania in 1792, and after a tour in Europe was appointed in 1794 a lieutenant in the regiment of artillerists and engineers in the United States army. Upon the breaking out of the War of 1812 with Great Britain he served as colonel of the 2d artillery, and was successively promoted to be brigadier-general and major-general. At one period of the war he held chief command of the northwest frontier. In 1825 he became governor of Arkansas Territory, in which office he died.

Izard, Ralph, American statesman: b. near Charleston, S. C., 1742; d. South Bay, near Charleston, 30 May 1804. He was educated at Christ's College, Cambridge, England, and, inheriting an ample fortune, established himself in 1771 with his family in London, whence the troubled condition of American politics induced him in 1774 to retire to the continent. He subsequently endeavored to impress upon the British ministry the ill-advised nature of the course they were pursuing, but without effect. In 1780 he returned to the United States, and found occasion to serve the country in various ways, having been instrumental in procuring the appointment of General Greene to the command of the southern army, and having once pledged his whole estate as security for funds needed in the purchase of ships of war in Europe. In 1781 he entered the Continental Congress, of which he remained a member until the peace; and upon the adoption of the Federal constitution he was elected a United States senator from South Carolina. As a legislator he was able and eloquent and in the senate possessed the confidence of all parties. The 'Correspondence of Ralph Izard from 1774 to 1804, with a Short Memoir,' was published by his daughter (1844).

Izard, the chamois (q.v.); so called in the Pyrenees.

J

J the tenth letter of the English alphabet, was unknown to the ancient Latins and Greeks as an alphabetic character and representative of a vocal sound.

Till the 16th century the Latin and other alphabets of western Europe had only the letter i to represent both the vowel sound i and the consonant sound now represented by j: at least in fonts of type of that century, and till the end of that century or later, the character i served to represent both the vowel and the consonant, though a distinction was made between them in manuscripts of the previous century by continuing the stroke of the i a little below the line when it stood for the consonant. This letter j from the first represented in English the sound of dzh, in French that of zh; in German and other languages its value is that of the consonant y; for example, Julius, pronounced yulius, jacio, pronounced yacio.

For speakers of the modern European languages the j in Latin has usually the same value as in their native tongues. But though for Spaniards j in Latin is equal to y, in their own speech j is a strong guttural aspirate that might be represented in English by kh. The sound of j in English is always represented in Italian by g: the French and English journal is in Italian *giornale,* the Latin *judex,* English judge is in Italian *giudice.*

The sound of dzh is represented in English not only by its proper letter j, but also by g and by dg: jest, gem, edge.

Jabiru, jab'ĭ-roo, a large species of stork (*Mycteria americana*), somewhat resembling the adjutant, found nearly throughout South America and northward into Mexico and Texas. It is about five feet high, with stilt-like legs, and massive, slightly upcurved beak; the plumage is white and the naked head and neck black. In habits it resembles the other storks (q.v.). Several related Oriental species have received the same name.

Jaborandi, a Brazilian shrub (*Pilocarpus pennatifolius*) of the order *Rutaceæ,* which yields a volatile oil from which is derived a principle (pilocarpin) in the form of an amorphous white powder having properties similar to atropine. It is the basis of the drug jaborandi, which is diaphoretic and sialagogic in its effects. Other "jaborandis" are obtained from species of *Serronia, Aubletia* and *Piper.*

Jac'amars, a group of small, gaudy, South American birds of the family *Galbulidae,* and related to the puff-birds and woodpeckers. Their plumage is highly colored, reds and bronzy greens and blues predominating. They live mostly along the outskirts of forests, and feed upon large insects caught in flight. White eggs are laid in holes in earthen banks; and a whistling song is given during the breeding season.

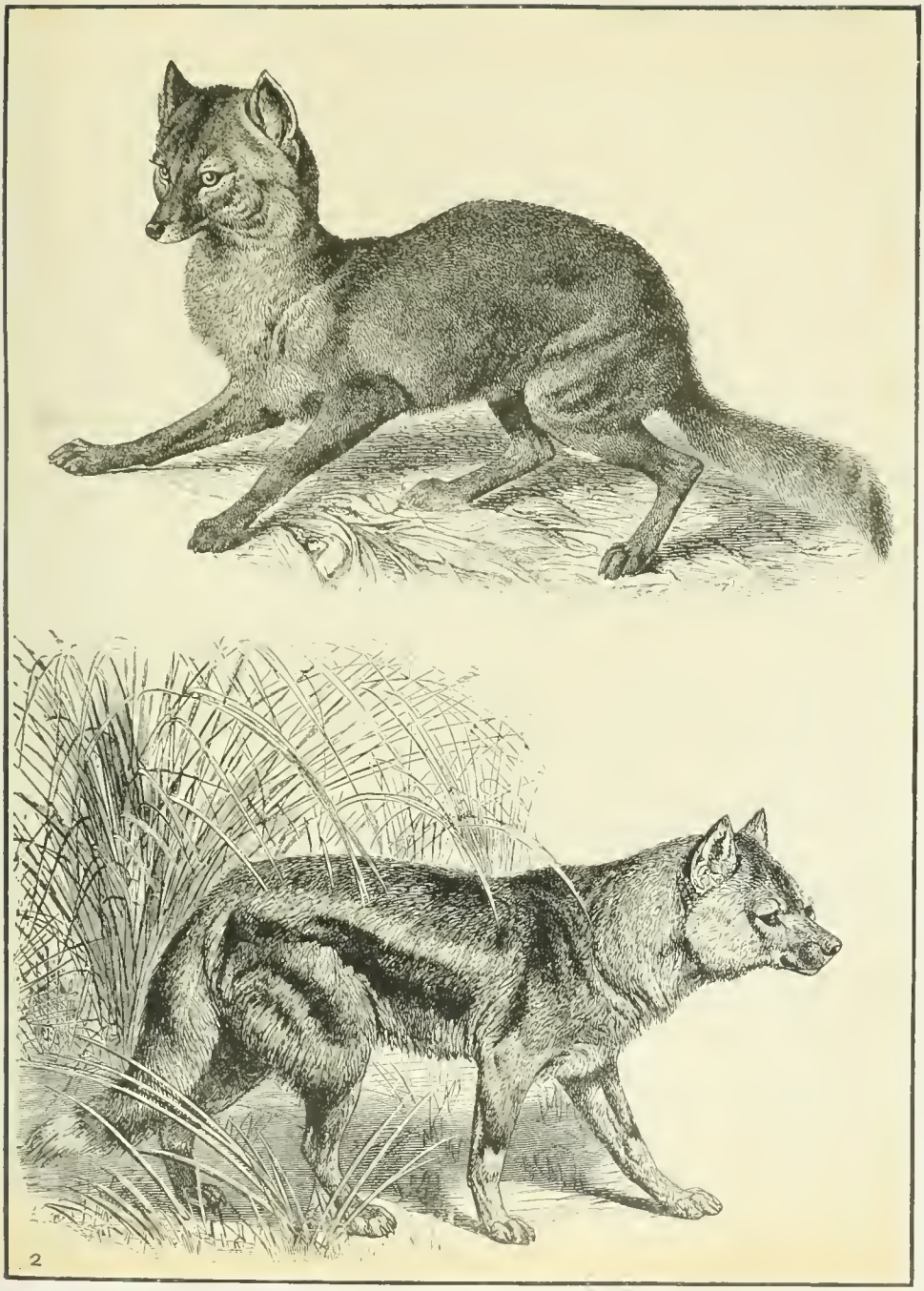
Jaçanas, zhä-sä'nä or jä-kä'nạ, a group of birds (*Parridæ*) related to the rails, and remarkable for the extraordinary length of the toes, which are further extended, especially the hallux, by long, slender claws. There are four genera and about a dozen species, most of which inhabit the Old World—Africa, India, and Australia. The genus *Parra* is American, and one Mexican species (*Parra spinosa*) enters Texas. The beak is plover-like and the bend of the wing bears a stout and acute horny spur; the plumage is of a rich purplish brown with the wings green and black. The great spread of the toes enables these birds to walk with ease on the floating leaves of water lilies and similar plants, otherwise their habits are much like those of rails (q.v.).

Jacaran'da, a genus of tropical American trees of the Bignonia (q.v.) family. One (*B. brasiliana*) yields the wood called jacaranda wood, or blue ebony, which is very hard and capable of receiving a fine polish. The name is carelessly applied to several other South American woods used in cabinet-work.

Jacaré, zhä-kä-rā' or jăk'ạ-rĕ, a South American name for an alligator of the genus *Caiman,* of which the large black species (*C. niger*) reaches a length of 20 feet and is called on the upper Amazon jacaré-nassu, while the jacaré-tinga (*C. trigonatus*) is only six feet long, and has a slender muzzle and black-banded tail. See CAYMAN.

Jack, a pike; in the United States, the common eastern pickerel (q.v.) is most usually meant. The wall-eyed pike (q.v.) is called "jack salmon" in some parts of the West. Several marine fishes are known as jack fish, amber jacks, etc., especially among the lively sea-bass, groupers, amber-fish and the like. The term, as in other cases, implies a quality in the animal exciting friendly interest and admiration.

Jack, or **Jack-tree** (native name *Jaca*), a tree (*Artocarpus integrifolia*), related to the bread-fruit (q.v.), a native of India and south-eastern Asia. The fruit grows to a larger size than the bread-fruit of the Southern Pacific islands, often weighing more than 30 pounds, and containing from 200 to 300 seeds, each of them four times as large as an almond. The seeds or nuts are eaten after being roasted or boiled, and the sweet fleshy pulp of the fruit is also eaten. When the tree is young the fruit



1. Common Jackal.

2. Side-striped Jackal.

grows from the twigs; in middle age it grows from the trunk; and when the tree gets old, from the roots. It forms a great part of the food of the natives in some portions of India, Ceylon, etc. The yellowish timber is used for almost every purpose, being strong and ornamental, and yields a yellow dye.

Jack and the Beanstalk, an English nursery tale relating to the heroism of a boy. Its analogue occurs in many national folk-lore legends. It is supposed to represent in a figure the restoration to the earth of those fertilizing and elemental activities, which are necessary to human life. The harp is the wind, which drives the ships and turns the mills to grind the wheat. The bags of treasure are the raindrops that scatter wealth and plenty. The red hen is the sun that brings life to birth by its fostering heat.

Jack and Jill, the first words of an old nursery rhyme, of considerable folk-lore interest. Jill is a corruption of the French Julienne, once common in England under the form Gillian. It also appears in the legend of St. Kilian, where Geilana vindictively causes the good bishop's death. This incident of Jack and Jill is probably based on one of the moon myths of Scandinavia. The Norse peasant sees in the spots on the moon the two children rescued by the moon from their father, who had forced them to draw water all the day.

Jack the Giant Killer, the hero of an English nursery story, which reflects triumph of skill over strength and bulk such as makes the point of the story in David and Goliath, Ulysses and Polyphemus, etc. The English form is based upon the legend that St. Michael's Mount, in Cornwall, was once the fortress or castle of a giant, who was dislodged by the valor of an English knight. In adapting the story so as to claim the sympathies of children the knight is made to take the shape of a child.

Jack Horner, the first words of an old nursery rhyme. The rhyme is said to be based on a historic fact. Horner was the messenger whom the abbot of Glastonbury sent to Henry VIII. with the deeds of certain manors involved in the dissolution of monasteries. Horner obsequiously handed the parcel to the royal spoliator, but first of all managed to abstract the deeds of the manor of Wells, a "plum" indeed, and the abbot was afterward punished on the charge that he had withheld them.

Jack-in-the-Pulpit, or **Indian Turnip,** a perennial herb (*Anisæma triphyllum*) of the arum family (see *Araceæ*). Its name is derived from its spadix, which is upright, with the spathe surrounding and arching over it, suggesting a preacher in an old-fashioned pulpit with a sounding-board. It is common in the United States, east of the great plains, in damp, shady woods and in moist garden soil; and when the spathe falls away in early summer, the red berries are prominently shown in the form of a dense ovoid head. Its acrid tuber or corm is valued for its medicinal properties, and may be made edible by boiling.

Jack-snipe, a gunner's term for a shore-bird, also called grass or meadow snipe, which is in reality a sandpiper, named in books the pectoral sandpiper (*Tringa maculata*). The perversion of names is due to its somewhat game-like habits of lying to a dog and flushing correctly from the grass, like a true snipe which render it an attractive object of pursuit; beside which, in the fall it becomes very fat, and it is then excellent eating. Unlike most sandpipers, it does not flock, at least to any extent, being oftenest found scattered singly or in pairs. In the United States it is chiefly, if not wholly, a bird of passage, breeding in Canada and wintering in the tropics. It is nine inches long, clay-colored, striped with blackish above; breast ashy and sharply streaked; belly white. Consult authorities mentioned under shore-birds.

The English "jack-snipe" is a true snipe (*Gallinago gallinula*) of very small size, and therefore also known as "half-snipe."

Jack'al, a small active wild dog or wolf of the warmer regions of the Old World, found in southeast Europe, Africa, Syria and southern Asia. The common jackal averages about 2 or 2½ feet in length, and about 14 inches in height, with a bushy tail about 8 inches long. The eyes are small, and the pupil is round. The general color of the body is a dirty yellow or brown, lighter on the throat and belly. Jackals inhabit holes and burrows whence they come forth in the evening to hunt in packs. Their cry consists of a series of prolonged howls, followed by shorter yelps, much like that of the American coyote. The jackal subsists largely upon carrion, often that left after the repast of the fiercer and larger carnivora; but it also kills prey for itself, a pack hunting down antelopes, deer, or other animals, besides getting much small fare, as mice, lizards, insects and the like. They also eat certain kinds of vegetable food, and sometimes they do considerable damage to sugar and other plantations. The jackal is susceptible of being tamed, but its odor makes it by no means a desirable domestic animal. It is believed to be exceedingly cunning, and in many Eastern tales, especially among the people of India, plays exactly the same part as the fox does in those of Europe. It is probable that jackals have contributed frequently to the commingled stock represented in our domestic dogs, some of which betray very jackal-like points. They inter-breed with domestic races.

The common jackal (*Canis aureus*) is the most widely distributed species; but another species, found mostly in southern Africa, is the blackbacked jackal (*C. mesomelas*). This latter form has the back and end of the tail black, the other parts mostly red or yellowish-red. A third species of jackal found in South Africa is the canduc (*C. adustus*), marked by a light stripe on the sides. Consult: Mivart, 'Dogs, Jackals, Wolves and Foxes' (London 1890).

Jackass Kingfisher, or **Laughing Jackass,** the name of a large inland kingfisher (*Dacelo gigas*) of Australia, given by the colonists in allusion to its loud, hoarse cry. It is about 17 inches long, brown in general color, does not frequent water or catch fish, but lives on insects, small reptiles, etc., and lays its eggs in a hole in a tree.

Jack'daw, a small, black European crow (*Corvus monedula*), with black legs and feet

and grayish neck. They inhabit towers, spires, and like elevated situations, and even in towns and populous cities are present and breed freely. The nests and eggs are like those of other crows (q.v.) which they resemble in general habits. Jackdaws are easily tamed, learn to pronounce many human words, and are most amusing pets, but are mischievous and thieving, like magpies.

Jack'man, Wilbur Samuel, American educator: b. Mechanicstown, Ohio, 12 Jan. 1855. He studied at Allegheny College (Meadville, Pa., 1880–2), was graduated from Harvard in 1884, and later became dean of the school of education in the University of Chicago, and head of the natural science department of the school. In 1899–1900 he visited Holland, France, and Germany for the study of educational methods. In addition to many articles on pedagogical topics, he has published: 'Nature Study for the Common Schools' (1891); 'Number Work in Nature Study' (1893); 'Field Work in Nature Study' (1894); 'Nature Study Record' (1895); 'Nature Study and Related Subjects' (1898); and 'Nature Study for the Grammar Grades' (1898).

Jackrabbit. See HARES.

Jack'son, Abraham Valentine William, American Indo-Iranian scholar: b. New York 9 Feb. 1862. Graduated from Columbia in 1883, he was Fellow in letters there (1883–6), instructor in Anglo-Saxon and the Iranian languages (1887–90), and, after study at Halle (1887–9), adjunct professor of English language and literature (1891–5). In 1895 he was appointed professor of Indo-Iranian languages at Columbia. By way of recognition of the instruction given by him in their ancient books, the Parsees made to the Columbia library the gift of an important manuscript collection of Zoroastrian works. He appeared also as a public lecturer, became one of the directors of the American Oriental Society, and in addition to numerous contributions to the 'Journal' of that society and other learned periodicals, wrote: 'A Hymn of Zoroaster, Yasna XXXI.' (1888); 'An Avestan Grammar' (1892); 'An Avestan Reader' (1893); 'Zoroaster, the Prophet of Ancient Iran' (1899).

Jackson, Abraham Willard, American Unitarian clergyman and author: b. Portland, Maine, 7 April 1843. He was graduated from Colby University (Waterville, Maine), entered the Union army as private in the 8th Maine volunteers, became captain in the 33d United States colored troops, in 1872 became pastor of the Unitarian Church at Peterboro, N. H., and subsequently of that at Santa Barbara, Cal. In 1894–5 he was acting professor of philosophy in the Meadville Theological School. Among his writings are: 'The Immanent God' (1889); 'James Martineau: a Biography and Study' (1900); 'Deafness and Cheerfulness' (1901).

Jackson, Andrew, seventh President of the United States: b. Waxhaw settlement, N. C., 15 March 1767; d. near Nashville, Tenn., 8 June 1845. He was of north of Ireland ancestry, his father emigrating to America from Carrick Fergus in 1765. As a boy Jackson was reckless, impetuous, quarrelsome, and passionate in temper; thoroughly disinclined to learning of any sort, his favorite pursuits were racing, gaming, and cock-fighting, but he was possessed of invincible determination, dauntless courage, and excelled in marksmanship and riding, qualities which later served him well. After some desultory law study in Salisbury, S. C., he became in 1788 public prosecutor of the Western District of North Carolina (that is Tennessee). In 1791 he married Rachel Robards, both supposing the latter's husband, Lewis Robards, had secured a divorce by act of the Virginia legislature. This proving not to be the case, they were remarried in 1794. This incident was frequently used against Jackson in his political campaigns, but his only fault was in not ascertaining more surely the exact terms of the Virginia act. A member of the Knoxville convention which drafted a constitution for Tennessee, Jackson was elected the first Federal representative of that State after its admission to the Union, June 1796. Appointed U. S. Senator in 1797 he resigned in April 1798 to become judge of the Tennessee supreme court, holding the position until 1804 when he retired to devote himself to settling his private affairs which had become heavily involved in debt. Between 1806–11 he led the life of a planter, storekeeper and private citizen without noticeable incident. Upon the outbreak of the war of 1812 Jackson, then major-general of Tennessee militia, promptly offered his services with those of 2,500 volunteers. New Orleans being considered a probable objective of the enemy, Jackson was sent there, 7 Jan. 1813, but was soon ordered to dismiss his troops and return. Thoroughly enraged, he hired transportation on his own authority and marched his men home in a body, refusing to disband them without pay or rations, five hundred miles fro home. In June the government reimbursed him for the expenses incurred. It was during this expedition his soldiers bestowed on him the affectionate name of "Old Hickory." On 30 Aug. 1813, the massacre of the garrison and refugees at Fort Mims, at the junction of the Alabama and Tombigbee rivers occurred. Tennessee at once voted men and money to aid in suppressing the Indian outbreak. Jackson, though suffering from a wound received in a tavern brawl, took the field, and in a whirlwind campaign completely crushed the Creeks at Horseshoe Bend, Alabama, 27 March 1814. On 14 March 1814, he ordered John Wood to be shot for insubordination and assaulting an officer, the first of the military severities afterward brought up against Jackson during his Presidential campaigns. On 31 May 1814 he was appointed major-general of the United States army, commanding the department of the South. In November, without orders from Washington he marched against the English at Pensacola, easily stormed the town and compelled their withdrawal. Proceeding to New Orleans he began energetic preparations for its defense, amid the greatest difficulties and wholly lacking in proper means and materials. On 23, 28 Dec. 1814 and 1 Jan. 1815 he gained minor successes against the British. On 8 Jan. 1815, General Pakenham with 10,000 veteran troops delivered a grand assault upon Jackson's works. The result was a complete defeat and rout of the British, they losing over 2,600 in killed, wounded and prisoners, while Jackson's loss was seven killed and six wounded. The treaty of peace

ANDREW JACKSON,

SEVENTH PRESIDENT OF THE UNITED STATES.

had been signed at Ghent 24 Dec. 1814, but Jackson did not learn of it until 6 March 1815. Accordingly he relaxed none of his vigilance, but kept the city under martial law, during which his characteristic highhandedness brought him into sharp conflict with the civil authorities. For disciplinary reasons six soldiers were court-martialed and shot on 21 February. But Jackson's brilliant and unexpected victory, the one great land success of the War of 1812, set the country afire with enthusiasm. From an obscure planter he immediately became the most popular man in the country. Resolutions of thanks and praise poured in on him from State legislatures; Congress voted him its thanks and a gold medal, and his exploit was the political salvation of the tottering administration. During the Seminole war Jackson was ordered to take command in Georgia, December 1817. Within five months he broke the Indian power completely, established peace on the border, and practically conquered Florida. His hasty measures, undertaken on inadequate facts and information, caused considerable anxiety and discussion in the government. His invasion of Florida and capture of St. Marks, a Spanish possession, and his summary execution of Arbuthnot and Ambrister, two British subjects, seemed likely to raise delicate diplomatic situations. Upon the acquisition of Florida Jackson was appointed its first territorial governor, April 1821, with almost the powers of a Spanish captain-general, but, disgusted with the office, he resigned in October. Parton describes his conduct while governor as "arrogant and disgraceful." In 1823 he declined the mission to Mexico, and was an unsuccessful candidate for the presidency in 1824. But in 1828 backed by the powerful influence of Van Buren in New York and his own popularity in Pennsylvania, which thus assured him the support of the two largest eastern states, Jackson was triumphantly elected President, the first representative of the new West and the masses. In 1832 he was re-elected by a larger electoral vote than in 1828. His first cabinet was composed of almost unknown men. For advice and counsel he relied chiefly on a group of personal friends and intimates, among them being Wm. B. Lewis, Amos Kendall, a representative of all that was vicious in American political methods, Duff Green and Isaac Hill, partisan editors, and later Francis P. Blair, who edited the 'Globe' in Jackson's interest. This group formed what came to be known as the "Kitchen Cabinet." In 1830 Jackson endeavored without success to enforce the social recognition of the wife of his secretary of war, John H. Eaton. The chief features of his administrations may be briefly summarized. That to him is due the shackling of the spoils system upon the country may be seen from the fact that between 1789 and 4 March, 1829, there were only 74 removals from office, while during Jackson's first official year there were some 2,000. He vigorously opposed the second bank of the United States, and vetoed the bill renewing its charter, 1832. He put a prompt end to South Carolina's nullification proceedings by his proclamation of 10 December 1832, declaring nullification contrary to the Constitution and incompatible with the existence of the Union, and his active preparations to execute the laws, by force if needful. In 1834, as a result of his action in ordering the secretary of the treasury to cease making deposits of government funds in the Bank of the United States, the Senate censured him for usurpation of powers not conferred by the laws or Constitution. His Specie Circular of 11 July 1836 directing that only gold and silver be taken at the land offices in payment for public lands was an important factor in the causes leading to the financial crash of 1837. His foreign policy was firm and successful. The disputes with Great Britain over the northeast boundary and the trade between the United States and British colonies, and with France over the indemnity for spoliations committed on American commerce early in the century, were dealt with shrewdly and with success.

Opinions will always be divided regarding Jackson's character. For thirty years he was a popular idol and the typical man of the "Fourth of July" period in American history. His countrymen easily forgave his faults and warmly admired his incontestable virtues. Extraordinarily illiterate, irascible in the highest degree, intensely patriotic, absolutely honest, terrible in the inflexibility of his purposes, faithful and devoted in his domestic life, a firm friend and implacable enemy, reckless and unflinching in the performance of what he conceived to be his duty, restless under any restraint calculated to hamper him in the discharge of that duty, an autocrat by nature yet a sincere lover of the common people,— such are some of the qualities which will always make Andrew Jackson one of the most picturesque figures in American history.

Bibliography.— Numerous biographies of Jackson exist. The best is still that by James Parton (3 vols., New York 1861); the life by Prof. W. G. Sumner in the 'American Statesman Series' is a careful study of his career as a public man (Boston 1883); the lives by John H. Eaton (Philadelphia 1817), and by Amos Kendall (New York 1843) have value as being written by men who knew him intimately. An excellent working bibliography for the study of Jackson's life and time will be found at the end of Professor Sumner's work.

W. N. C. Carlton,
Librarian, Trinity College, Hartford.

Jackson, Charles Thomas, American scientist: b. Plymouth, Mass., 21 June 1805; d. Somerville, Mass., 28 Aug. 1880. He was graduated at Harvard Medical College in 1829, and practised for a time in Boston. He claimed to have been the first to indicate, in 1832, the applicability of electricity to telegraphic use, and also claimed, in 1842, to have been the discoverer of the anæsthetic effects of the inhalation of ether. He received the monthly prize of 2,500 francs from the French Academy of Sciences in 1852. He published a 'Manual of Etherization, with a History of its Discovery' (1861), and several 'Reports.'

Jackson, Edward Payson, American educator and author: b. Erzerum, Turkey, 15 March 1840. He was educated at Amherst College; served in the Union army during the Civil War as private of the 45th and lieutenant of the 5th Massachusetts; was principal and superintendent of various educational institutions, and in 1877 was appointed master in the Boston Latin School. His works include:

'Mathematical Geography' (1873); 'A Demigod' (1886), a story published anonymously, and at first attributed to various well-known authors; 'The Earth in Space' (1889); and 'Character Building' (1892), to which was awarded a prize of $1,000, offered by the American Secular Union, jointly with N. P. Gilman's 'The Laws of Daily Conduct,' with which it was also published in the volume, 'Conduct as a Fine Art' (1894). He also became the editor of 'The Bohemian,' a Boston magazine of short fiction.

Jackson, Frederick George, English Arctic explorer: b. Alcester, Warwickshire, 1860. He was educated at Denstone College and the University of Edinburgh, made journeys across the Australian deserts and the Great Tundra of Siberia, in 1894–7 was leader of the Jackson-Harmsworth expedition to Franz Josef Land, and during the second Boer war was in command of a company of mounted infantry. During his stay in Franz Josef Land he mapped the region, which he proved to be a collection of islands, and made valuable magnetic and meteorological observations. He was awarded the gold medal of the Paris Geographical Society in 1899, and wrote: 'The Great Frozen Land' (1895); 'A Thousand Days in the Arctic' (1899).

Jackson, Gabrielle Emilie Snow, American writer for young people: b. New York 13 Oct. 1861. Among her many publications are 'Denise and Ned Toodles (1897); 'The Colburn 'Prize' (1899); 'Pretty Polly Perkins' (1900); 'Laddie and Lassie' (1900); 'Mother and Daughter' (1905).

Jackson, George Anson, American Congregational clergyman: b. North Adams, Mass., 17 March 1846. He was graduated from Yale in 1868, from the Andover Theological Seminary in 1871, was ordained to the Congregational ministry, and in 1872–97 held pastorates successively at Leavenworth, Kan., Southbridge, Mass., and Swampscott, Mass. In 1897 he became librarian of the General Theological Library of Boston. He wrote: 'The Apostolic Fathers' (1879); 'Fathers of the Third Century' (1881); 'Post-Nicene Greek Fathers' (1883); 'Post-Nicene Latin Fathers' (1883); 'The Son of a Prophet' (1894), a historical novel.

Jackson, Helen Maria Fiske Hunt, "H. H.," American novelist and poet: b. Amherst, Mass., 18 Oct. 1831; d. San Francisco, 12 Aug. 1885. At 21 she married Captain Edward Hunt (d. 1863) of the United States army, and began the wandering existence of an army officer's wife. From 1867 to her death, 16 years later, her pen hardly rested. She wrote verses, sketches of travel, essays, children's stories, novels, and tracts for the time, generally over the pen-name "H. H." Her life in the West after her marriage to W. S. Jackson, a banker of Colorado Springs, revealed to her the wrongs of the Indian, which she set herself at once to redress. Newspaper letters, appeals to government officialism, and finally her 'Century of Dishonor' (1881), a sharp arraignment of the nation for perfidy and cruelty towards its helpless wards, were her service to this cause. Her most popular story, 'Ramona,' (1884), a romance whose protagonists are of Indian blood, was also an appeal for justice. This book, however, rose far above its polemic intention; the beauty of its descriptions, its dramatic movement, its admirable characterization, and its imaginative insight entitling it to high rank. Two novels in the 'No Name Series'—'Mercy Philbrick's Choice' (1876) and 'Hetty's Strange History' (1877)—show the qualities that infuse her prose: color, brilliancy of touch, grace of form, certainty of intuition, and occasional admirable humor. She had not the gift of construction, and lacked the power of self-criticism; so that she is singularly uneven. It is no doubt chiefly her poems which have gained for "H. H." a place in literature. They reveal genuine lyrical power, although at times marred by defective technique. Among books of hers not already named are: 'Bits of Travel' (1873); 'Glimpses of Three Coasts'; 'Sonnets and Lyrics.' To her have often been attributed the noted 'Saxe Holm' stories.

Jackson, Henry Rootes, American diplomat and soldier: b. Athens, Ga., 24 June 1820; d. Savannah, Ga., 23 May 1898. He was graduated at Yale in 1839, admitted to the bar in Georgia and for several years was district attorney. He served in the Mexican War, became judge of the superior court, and in 1853 went to Vienna as *chargé d'affaires,* and the following year was made minister resident there. Before the outbreak of the Civil War he seceded from the Charleston Convention and, when his state seceded, joined the Federal army. He eventually resigned, and joined the Confederate forces. Near the close of the war he was made a brigadier-general in Hood's army and was captured with his whole command at Nashville after the battle of Franklin. In 1885 he was appointed United States minister to Mexico. He was the author of 'Tallulah, and Other Poems' (1850).

Jackson, Howell Edmunds, American jurist: b. Paris, Tenn., 8 April 1832; d. West Meade, Tenn., 8 Aug. 1895. He was graduated from the University of Virginia in 1854, from the law department of Cumberland University in 1856, began practice in Jackson, and later in Memphis, and upon the organization of the Confederate government became receiver for property in West Tennessee confiscated to the purposes of the Confederacy. Subsequent to the war he became a member of the court of referees of Tennessee, a tribunal which acted as a provisional supreme court in the hearing of cases that had arisen during the war period. Elected to the State legislature in 1880, he took his seat in the United States Senate in 1881, afterward left the Senate to become United States circuit court judge for the West Tennessee district, and in 1893 was appointed an associate justice in the United States Supreme Court.

Jackson, James, American soldier and statesman: b. Moreton Hampstead, Devonshire, England, 21 Sept. 1757; d. Washington, D. C., 19 March 1806. He emigrated to America with his father in 1772, and studied law in Savannah. In March 1776 he aided in repelling a British attack upon that town, and subsequently was appointed brigade major of the Georgia militia. In 1781 he aided in the capture of the fort at Augusta, and was left in command of

the place, and upon the evacuation of Savannah by the British in 1782 was appointed by General Wayne to receive the keys of the town. In 1789 he was chosen a representative in Congress, and from 1792 to 1795 was a member of the United States Senate. He had the principal share in the framing of the Georgia constitution of 1798, and upon its adoption was elected governor of the State, and held that office until his reelection in 1801 to the United States Senate.

Jackson, James, American physician, brother of Charles Jackson (q.v.): b. Newburyport, Mass., 3 Oct. 1777; d. 1867. He was graduated at Harvard College in 1796; studied medicine in London, and on his return to Boston in 1800 commenced practice there, devoting himself entirely to medical practice, to the exclusion of surgery and other branches. In 1803 he became a member of the Massachusetts Medical Society. In 1810, with Dr. John C. Warren, he brought before the community a proposition for establishing a hospital in the city of Boston. The first result of this was the organization of the asylum for the insane at Somerville, then included in Charlestown, and afterward of the Massachusetts General Hospital in Boston. Dr. Jackson was the first physician, and Dr. Warren the first surgeon, to this institution. In 1810 he was chosen professor of clinical medicine in Harvard, and in 1812 professor of theory and practice, becoming professor emeritus in 1835. His principal publications were: 'On the Brunonian System' (1809); 'Remarks on the Medical Effects of Dentition'; 'Letters to a Young Physician' (1855). Of the last work several editions were printed.

Jackson, Patrick Tracy, American merchant, brother of Charles Jackson (q.v.): b. Newburyport, Mass., 14 Aug. 1780; d. Beverly, Mass., 12 Sept. 1847. At the age of 15 he was apprenticed to a merchant of Newburyport, and subsequently established himself in Boston in the India trade, in which he acquired a handsome fortune. In 1812, at the invitation of his brother-in-law, Francis C. Lowell, who had recently examined the process of the cotton manufacture in England, he engaged in a project to introduce the power loom, then newly invented, and the mode of constructing which was kept secret, into the United States. After repeated failures they succeeded in 1812 in producing a model from which a machine was subsequently constructed by Paul Moody. In 1813 they built their first mill at Waltham, near Boston, the first in the world that combined all the operations for converting the raw cotton into finished cloth. In 1821 Jackson made large purchases of land on the Merrimack River near the Pawtucket canal, on which a number of mills were constructed by the Merrimack Manufacturing Company, a corporation organized under his auspices. This settlement formed the germ of the present city of Lowell. He procured in 1830 a charter for a railroad between Lowell and Boston, the construction of which he directed until its completion in 1835.

Jackson, Samuel Macauley, American church historian: b. New York 19 June 1851. He was graduated from the College of the City of New York in 1870, from the Union Theological Seminary in 1873, and after further study at Leipsic (1873–6), held the pastorate of the Presbyterian Church at Norwood, N. J., in 1876–80. In 1895 he became professor of church history in New York University. He was assistant editor of Schaff's 'Bible Dictionary' in 1878–80, associate and managing editor of the 'Encyclopædia of Religious Knowledge' in 1880–4, and edited 'A Concise Dictionary of Religious Knowledge' (1891). He also prepared the first important bibliography of foreign missions (1891), wrote 'Huldreich Zwingli' (1901), the first original English biography of its subject, and was chosen secretary of the church history section of the American Historical Association.

Jackson, Sheldon, American educator: b. Minaville, N. Y., 18 May 1834. He was graduated at Union College in 1855, at Princeton Theological Seminary in 1858; was ordained to the ministry of the Presbyterian Church in the latter year; and was missionary to Western Wisconsin and Southern Minnesota in 1859–69. In 1869–82 he was superintendent of Presbyterian missions in western Iowa, Nebraska, the Rocky Mountain territories, Wyoming, Colorado, New Mexico, Arizona, Utah, and Montana, and from 1877 in Alaska. In 1885 he became United States general agent of education in Alaska, and in 1887 organized the Alaskan society of natural history and ethnology at Sitka. He aided in founding a Christian college in Utah in 1896, was moderator of the Presbyterian General Assembly in 1897, and wrote: 'Alaska and Missions on the North Pacific Coast' (1880); 'Education in Alaska' (1881); annual reports on 'Education in Alaska' from 1886; and annual reports on the 'Introduction of Domestic Reindeer into Alaska' (1891–1901).

Jackson, Stonewall. See JACKSON, THOMAS JONATHAN.

Jackson, Thomas Graham, English architect: b. Hampstead 21 Dec. 1835. He was educated at Oxford University and became the pupil of Sir George Gilbert Scott (q.v.) (1858–61), making a specialty of the Gothic style. He has designed most of the new buildings in Oxford, Cambridge, Eton, Westminster School, Rugby, Harrow, etc., and has restored Great Malvern Priory and Bath Abbey, besides building many new Gothic churches. He has written: 'Modern Gothic Architecture' (1873); 'Wadham College, Oxford: its History and Buildings' (1893); 'The Church of St. Mary the Virgin, Oxford: its History and Architecture.'

Jackson, Thomas Jonathan, commonly called "STONEWALL JACKSON," American general: b. Clarksburg, Harrison County, W. Va., 21 Jan. 1824; d. near Chancellorsville, Va., 10 May 1863. Lieutenant-General Thomas Jonathan Jackson was one of the most unique, romantic characters of the War between the States, and crowded into the two years in which he served more brilliant achievements which won him wider fame than any other soldier on either side. Descended from Scotch-Irish stock and inheriting many of the qualities of his ancestry, he was left a penniless orphan when three years old, and soon showed "the stuff of which heroes are made," in his manly self-reliant efforts to

support himself. Learning of a vacancy from his Congressional District in the military academy at West Point, he determined to make the journey to Washington and seek the appointment, and set out at once — traveling a part of the way on foot — appearing before the member of Congress from his district in his suit of homespun, and with his leathern saddlebags over his shoulders. The Congressman presented him to the secretary of war, who was so much pleased with the youth's determination that he at once made out his appointment to West Point. He was very badly prepared to enter the academy and barely "squeezed through" on his entrance examination, but by persevering work he gradually rose in his grade until in July 1846 he was graduated No. 17 in a brilliant class containing such men as McClellan, Foster, Reno, Stoneman, Couch, Gibbon, A. P. Hill, Pickett, Maury, D. R. Jones, Wilcox, and others; and one who knew him intimately expressed the confident belief that if the course had been longer "Old Jack" would have graduated at the head of his class. He immediately reported for duty in Mexico, and serving in the artillery won distinction on every field, always seeking the post of danger, being made first lieutenant at the siege of Vera Cruz, brevetted captain at Contreras and Churubusco, and major at Chapultepec, rising to this rank in seven months, and being promoted more rapidly than any other officer of his grade in the Mexican War. He was frequently and honorably mentioned in the official reports, and John B. Magruder, his immediate superior, wrote of him: "If devotion, industry, talent, and gallantry are the highest qualities of a soldier, then he is entitled to the distinction which their possession confers." In the City of Mexico, after its capture and occupation, he had under the influence of that earnest Christian soldier, Colonel Taylor, become deeply concerned on the subject of personal religion and made a profession of faith in the Lord Jesus Christ. At West Point he had adopted as his motto: "You may be whatever you resolve to be," and now he added to this motto the saying of the great Apostle: "I can do all things through Christ which strengtheneth me." These two mottoes were the keynotes of his life and led the penniless orphan boy to become one of the immortals.

On the earnest recommendation of his old comrade, D. H. Hill, whose brother-in-law he afterward became, Jackson was elected, in 1851, professor of natural science and instructor of military tactics in the Virginia Military Institute, Lexington, Va., being elected over McClellan, Reno, Rosecrans, and G. W. Smith, whose names were submitted by the faculty at West Point. He made little reputation as a professor, for while thoroughly acquainted with his subject he lacked that "aptness to teach" so essential to a successful teacher, and the cadets were always playing pranks upon him, and laughing at his eccentricities. But he became one of the most consecrated active members of the Presbyterian Church, and left his impress as a Christian upon the community. From his habit of instructing his own servants in Scripture lessons every Sunday afternoon grew his famous negro Sunday school to which he devoted so much time and thought, to which he contributed so liberally of his moderate means, — sending his pastor checks for it in the midst of his most active campaigns, — and which made such an impress upon the negroes and gave Jackson so warm a place in their affections that the first contribution to his monument was made in 1887 by the negro Baptist Church of Lexington. Jackson was a Union man, opposed to secession as a remedy for Southern wrongs, though thoroughly believing in the abstract right of a State to secede, and greatly deprecated the war which he predicted would follow; but when the news reached the quiet little town of Lexington that Mr. Lincoln had called for 75,000 troops to coerce sovereign States, and that the Union Convention of Virginia had passed an ordinance of secession, Jackson said in a speech before a public meeting: "I have longed to preserve the Union and would have been willing to sacrifice much to that end. But now that the North has chosen to inaugurate war against us, I am in favor of meeting her by drawing the sword and throwing away the scabbard." Governor Letcher, his old neighbor and friend, who had a high estimate of his abilities, commissioned him colonel in the Virginia forces; but his brilliant record in Mexico had been forgotten — he was only thought of as the quiet, eccentric professor, and when his name was presented to the Virginia convention, a prominent member arose and asked: "Who is this Major Jackson, anyway?" and it required all the eloquence of the Rockbridge delegates to secure his confirmation.

Marching the corps of cadets to Richmond where he remained for a brief season assisting in organizing and drilling the raw recruits in the "Camp of Instruction," he was ordered to Harper's Ferry on 3 May, where the skill he showed in reducing the high-spirited rabble who had rushed to the front at the first sound of the bugle to the respectable Army of the Shenandoah, which he turned over to the command of General J. E. Johnston 23 May, showed clearly that he was a soldier. Placed in command of the Virginia brigade which afterward became so famous, he met the advance of General Patterson at Falling Waters on 2 July, gave them a decided check, and captured a number of prisoners. Soon after he received his commission as brigadier-general in the following characteristic letter from General Lee:

> RICHMOND, 3rd July, 1861.
>
> MY DEAR GENERAL:— I have the pleasure of sending you a commission of brigadier-general in the Provisional Army; and to feel you merit it. May your advancement increase your usefulness to the State.
>
> Very truly,
>
> R. E. LEE.

But it was in the battle of first Manassas (Bull Run) that Jackson won his new name and fame, and the ringing words of the gallant Bee: "There stands Jackson like a stone wall," changed the name of "Thomas Jonathan" into the immortal "Stonewall" Jackson. He was wounded in the hand but refused to leave the field, and while the surgeons were dressing his wounds President Davis rode on the field, and Jackson, pushing aside the surgeons, tossed his cadet cap in the air and exclaimed: "Hurrah for the President. Give me ten thousand men and I will be in Washington to-night!" In September he was made major-general, and was sent on 4 October to command the "Valley District" and enter in the early part of 1862

GEN. THOMAS J. ("STONEWALL") JACKSON

on that famous "Valley Campaign," which is now studied in military academies in Europe as illustrative of able strategy, rapid movements, and heroic fighting. In March he fell back before Banks' army of 35,000 men, and Banks reported him "in full retreat from the valley" and started a column to cross the mountains and attack Johnston in flank as he was falling back from Manassas, when Jackson suddenly turned, marched 18 miles in the morning, and with 2,700 men fought at Kernstown, near Winchester, 8,000 of the enemy, and though sustaining the only defeat that ever befell him he accomplished his purpose in recalling the column which was moving on Johnston's flank, quietly moved up the valley and took a strong position in Swift Run Gap from which he could easily defend himself or strike the enemy if he attempted to move on Staunton. Ewell's division coming to take his place, he left this grim soldier to watch Banks, and moved so secretly that neither friend nor foe had divined his plans until he thrilled the Confederacy and sent terror to the North by the following laconic and characteristic despatch:

Valley District, May 9th, 1862.

GEN. S. COOPER:— God blessed our arms with victory at McDowell yesterday.

T. J. JACKSON, Major-General.

He had defeated the advance of Fremont under Milroy and driven it back in great confusion. Then followed in rapid succession the uniting of Ewell's division with his at Luray, the driving in of Banks' flank at Front Royal, the cutting of his retreating column at Middletown, and on 25 May the rout of Banks' army from the heights of Winchester, and driving him pellmell across the Potomac. He was about to cross the Potomac into Maryland in pursuit of Banks when he learned that Fremont from the West, and Shields, the head of McDowell's column, from the East, were marching to form a junction in his rear at Strasburg. He at once put his army in motion and by forced marches (one of his brigades marched 52 miles in one day) he reached the point of danger in time to hold Fremont in check with one hand and Shields with the other until his whole army, prisoners, and immense wagon trains loaded with captured stores passed on in safety. He then moved leisurely up the valley, burning the bridges over the Shenandoah to prevent a juncture between Fremont and Shields — his rear being protected by that chivalrous knight and brave soldier, General Turner Ashby, who filled the valley with the fame of his brilliant achievements, and whose fall in a severe fight near Harrisonburg on 6 June was sadly lamented as a great calamity to the Confederate cause. On 7 June, at Cross Keys, Ewell badly defeated Fremont, and on 8 June, at Port Republic, on the opposite side of the river, Jackson routed Shields, and the armies sent to "crush" him were soon rapidly retreating down the valley, while "Stonewall" — that name will cling to him, but "Thunderbolt," "Tornado," or "Hurricane," would be more expressive of his character,— remained master of the situation. This campaign may be thus summarized: In 32 days Jackson and his "foot cavalry" had marched nearly 400 miles, skirmishing almost daily, fought five battles, defeated three armies, two of which were completely routed, captured 20 pieces of artillery, 4,000 prisoners, and immense quantities of stores of all kinds, and had done all this with a loss of fewer than 1,000 men killed, wounded, and missing, and with a force of only 15,000 men, while there were at least 60,000 men opposed to him. He had spread consternation throughout the North and had neutralized McDowell's 40,000 men at Fredericksburg, who were about to march to the aid of McClellan in investing Richmond. Jackson now rested for a brief season, was reinforced from Lee's army, made the impression on the enemy that he would advance down the valley again, and managed matters so secretly that Banks at Strasburg was busily engaged in fortifying against an expected attack from him at the very time he was thundering on McClellan's flank at Richmond over 200 miles away. The part he bore in the Seven Days around Richmond, the second Manassas campaign, and the Maryland campaign was so conspicuous and so important that it would be, indeed, to write the history of the army to give it in detail. His skill and daring in the Seven Days battles, his defeat of Pope's advance under Banks at Cedar Run, his flank march to Pope's rear, and the pertinacity with which he held him at bay along the Warrenton road until Lee could come up with Longstreet and drive him into the fortifications around Washington, his capture of Harper's Ferry with 11,000 prisoners, 13,000 stand of small arms, 73 pieces of artillery, and large quantities of provisions and stores of every description, and his conduct on the field of Sharpsburg, all added greatly to the fame of Stonewall Jackson and his grand old corps of "Foot Cavalry." It was the privilege of the writer of this sketch to be under Jackson during the whole of his brilliant career, and it may not be amiss to describe him as he appeared at the head of his victorious legions: About 37 years old, six feet high, medium size, gray-blue eyes, light brown hair, a rough mouth, iron jaw, and nostrils as big as a horse's. He wore a plain gray uniform which soon became faded and soiled, cavalry boots, and an old gray cadet cap with its rim tilting on his nose. He rode a raw-boned sorrel horse which the men said "could not run except toward the enemy," but whenever he appeared among the troops they would begin to give the Confederate yell, and he would take off his cap, put spurs to "Little Sorrel" and gallop away from them as rapidly as possible. This was so well understood that, when cheering was heard, some soldier would say: "There comes old Stonewall, or an old hare, one," and it was said that "the appearance of those personages never failed to elicit the genuine old Confederate yell." On 10 Oct. 1862 he was made lieutenant-general, and his corps made to consist of his old division, under W. B. Taliaferro, Early's division, A. P. Hill's division, and D. H. Hill's division, Colonel Brown's regiment of artillery, and numerous light batteries. At Fredericksburg, 13 Dec. 1862, he held the extreme right of Lee's army, and defeated with great slaughter Franklin's attack upon him. The following winter and spring Jackson spent in improving the organization, discipline, and efficiency of his corps, and as, in his judgment, a most important means of accomplishing this, he labored to have chaplains in every regiment and missionaries to visit the army, and did everything in his power to promote the religious welfare of his soldiers. It was largely through

his influence that a chaplains' association was formed, and he had regular prayer-meetings at his headquarters during the weeks and preaching on Sundays. But the end hastened on, Gen. Hooker threw Sedgwick across the river below Fredericksburg the latter days of April 1863, crossed the bulk of his army above and strongly fortified his lines at Chancellorsville in the confident hope that Lee would either retreat on Richmond, or attack him in his strong position, where a crushing defeat would await him. But instead of doing either of these things Lee left Early to watch Sedgwick, moved up to Hooker's front, and sent Jackson with 22,000 men to make a march to Hooker's flank and rear. This was brilliantly executed and Jackson routed that flank of Hooker's army, and was proceeding to cut him off from his line of retreat and take a position where Hooker would have been compelled to attack him, when in returning from one of those bold reconnoissances which he so frequently made, his party was mistaken for the enemy and fired on by his own men and he was very severely wounded. His left arm was amputated, his other wounds dressed, and he was doing well and gave every promise of recovery, when pneumonia, brought on by exposure before the battle, set in and he died at a quarter past three P.M., Sunday, 10 May 1863.

The great soldier had fought his last battle, won his last victory, and gone to wear his glittering "crown of rejoicing." He was buried as he had requested, in "Lexington in the valley of Virginia"; a beautiful bronze statue marks his grave; on the hill at the Virginia Military Institute has been reared the stately "Jackson Memorial Hall," and in the capitol square of his native State stands the noble bronze statue, the gift of English admirers. Lee spoke his fittest eulogy when he wrote him after hearing that he was wounded: "Could I have dictated events I should have chosen for the good of the country to have been disabled in your stead."

J. Wm. Jones, *Author and Lecturer.*

Jackson, William Hicks, American soldier and stockman: b. Paris, Tenn., 7 Oct. 1836; d. Nashville, Tenn., 30 March 1903. He was graduated from West Point in 1856, entered the Confederate army in 1861 as captain of artillery, and rose to be brigadier-general. Subsequent to the war he was proprietor of the Belle Meade stock-farm, near Nashville, Tenn., which sent to the races some of the greatest running horses of the American turf. He was president of the National Agricultural Congress, and high in the councils of the southern Democracy.

Jackson, Mich., city and county-seat of Jackson County; situated on the Grand River, about 37 miles south of Lansing and 76 miles west of Detroit, and on the main line of the Michigan Central Railroad. It is the termini of the Air Line, the Grand River Valley, and Jackson, Lansing & Saginaw railroads, branches of the Michigan Central; of the Toledo and Fort Wayne branches of the Lake Shore & Michigan Southern; the Cincinnati Northern, a branch of the Big Four, and the Michigan Air Line, a branch of the Grand Trunk railroads; and is connected with Detroit, Battle Creek, and Kalamazoo by traction lines.

Manufactures, Industries, etc.—Jackson is situated in a rich agricultural region and carries on an extensive trade in fruits, grains, and vegetables. Its chief manufactures are sewer pipe, flour, soap and starch, automobiles, pianos, oil stoves, corsets and underwear, wheels, engines and motors, locomotives, foundry products and agricultural implements. The car shops of the Michigan Central railroad, employing 1,200 men, are located here. Among the important industries are carriage- and wagon-making, manufacture of textiles, iron and steel, cigar-making, Portland cement, and mining, together employing about 6,000 hands, and with a yearly output of over $10,000,000. Coal and clay, the latter useful for pottery, are found near by.

Banks.—There are four banks, with a combined capital of $450,000, surplus and undivided profits of $275,000, and deposits of over $4,000,000.

Churches and Educational Institutions.—Nearly all denominations are represented and worship in 28 church edifices. The school system is exceptionally fine, there being two high schools and 17 graded public schools. There are also three Catholic schools.

Public Buildings, etc.—Among the prominent buildings are the Michigan State prison, Carnegie Library, the United States government building, Elks Temple, Masonic Temple, courthouse, and City Club. The city also has a hospital and two sanitariums, and Young Men's and Young Women's Associations.

Newspapers.—There are two morning and two evening dailies, with an aggregate circulation of 12,000, two semi-weeklies and three weeklies, one of which is German.

Government, Public Works, etc.—The executive authority is vested in a mayor and a council of 16 members, elected for a term of two years. The city is lighted by gas and electric light, and owns and operates its waterworks. It has a fire department with four well-equipped engine-houses, and an excellent police department. There is also an electric trolley system operating about 10 miles of track.

History.—The first permanent settlement was made by Horace Blackman in 1829, and was first called Jacksonburgh in 1830. In the same year a post-office was established and named Jacksonapolis. In 1831 the township of Jacksonburgh was formed, and remained such until 1838, when the name was changed to Jackson. When the Michigan Central Railroad was constructed through the southern part of the State, in 1841, Jackson grew rapidly, became a village in 1843, and an incorporated city in 1857.

Population.—The inhabitants are mainly native born, though about one third are of foreign descent, Irish, German, Polish, and Italian predominating. Pop. (1890) 20,798; (1900) 25,180; (1905) 28,000.

Thomas A. Wilson.

Jackson, Miss., capital of the State, county-seat of Hinds County; on the Pearl River, and on the Yazoo & M. V., the Illinois C., and the Alabama & V. R. R.'s; about 40 miles east of Vicksburg, on the Mississippi. The first permanent settlement was made in 1828 or 1829, and it was incorporated in 1840. In 1863 it was occupied for some time by Union forces under Gen. Grant, and the ruins of the fortifications erected at the siege are still in existence.

The city was nearly destroyed in 1864, by Gen. Sherman.

Jackson is situated in an agricultural region in which a large amount of cotton is raised. It is the commercial centre for a large section. The good railroad facilities and the advantage of traffic on the Pearl River are stimulating the increase of marketable agricultural and manufactured products. The chief industrial establishments are cottonseed-oil mills, fertilizer factories, sash, door, and blind factories, foundries, brick-yards, a cotton-compress, a plow and harrow factory, a broom factory and cooper shops. Some of the principal public buildings are the State capitol, State charitable institutions for the blind, insane, deaf and dumb, the State library, and the James Observatory. Among the private educational institutions of learning are the Millsaps College, founded in 1892 under the auspices of the Methodist Episcopal Church; and the Bellhaven College for young ladies. Pop. (1890) 5,920; (1900) 7,816; (1903) 12,000.

Jackson, Ohio, city, county-seat of Jackson County; on Salt Creek, and on branches of the Baltimore & O. S. W., the Hocking V., and the Ohio S. W. R.R.'s; about 100 miles east of Cincinnati and 70 miles southeast of Columbus. Jackson is located in the vicinity of the early routes of travel from the Ohio River to the interior of what is now the State of Ohio, and on to the Great Lakes. The first permanent settlement was made in 1795, but it was not incorporated until 1847, several years after the limits of Ohio were decided. It is situated in a coal and iron mining section, but there is a large amount of good farming land in the vicinity. The chief industrial establishments of the city are foundries, machine-shops, furnaces, woolen-mills, a tannery, and lumber-yards. The coal and iron ore-mining of the vicinity contributes largely to the industrial wealth of the city. Pop. (1900) 4,672.

Jackson, Tenn., city and county-seat of Madison County, situated about 80 miles northeast of Memphis, on the South Fork of the Forked Deer River, and on the Illinois C., Mobile & O., and Nashville, C. & St. L. R.R.'s. It is the trade centre of a large and fruitful agricultural region, is an important cotton market, and has manufactures of engines and boilers, cotton goods, lumber, machinery, flour, cottonseed-oil, furniture, trunks, spokes and skewers, plows, carriages, bricks, and other products. Here are located the Southwestern Baptist University, the Memphis Conference Female Institute, and Lane University. Jackson has a fine park, Carnegie Library, and modern municipal improvements, the waterworks and electric-light system being owned by the city. It has five banks with a combined capital of $400,000. The government is by mayor and a council of eight aldermen. Jackson was first settled in 1818. Pop. (1900) 14,511.

During the Civil War Jackson was at times the headquarters of Gen. Grant. It was captured by Union troops 7 June 1862. On 19 Dec. 1862, Gen. Forrest sent detachments of cavalry to destroy the railroad to the north and south, and with 400 men advanced on Jackson and had a running fight with two regiments of Union infantry and detachments of cavalry under Col. Engelmann of the 43d Illinois, who disputed Forrest's advance until the fortifications of the town were reached, when Forrest withdrew and moved on Humboldt and Trenton. On 13 July 1863, a Confederate cavalry force held the town and guarded a large number of conscripts. Col. Edward Hatch with 1,160 men of the 3d Michigan, 2d Iowa, 1st West Tennessee, and 9th Illinois cavalry regiments attacked the Confederates and drove them from the town, releasing about 450 conscripts, and capturing 250 horses and nearly 400 stand of small arms. Hatch's loss was very slight. The Confederates had 38 killed and about 150 wounded. Consult: 'Official Records,' Vol. XXIII.

Jackson (Miss.), Battle of. After the battle of Raymond (q.v.), 12 May 1863, Gen. Grant, having provided for the safety of his rear and left from the direction of Vicksburg, turned McPherson's and Sherman's corps and part of McClernand's on Jackson, 12 miles northeast of Raymond, to capture the place without delay. On the 13th McPherson moved from Raymond to Clinton, and then turned east on Jackson. Sherman moved through Raymond to Mississippi Springs on the 13th, and that night arranged with McPherson that both columns should arrive at Jackson about the same hour next day. McClernand closed up to Raymond and sent one division to Clinton to support McPherson. Gen. J. E. Johnston had arrived at Jackson on the evening of the 13th and, hearing next morning of the Union approach on the Raymond and Clinton roads, ordered Gregg's brigade to take position on the first-named road, and Walker's brigade on the latter, with instructions to each to delay the Union advance as long as possible, to give time for the removal of public property from the city. The combined strength of Gregg and Walker was about 6,000 men. About 9 A.M. of the 14th McPherson's advance on the Clinton road came upon Walker's pickets and drove them back upon the main body, posted in works on the crest of a semicircular ridge 2½ miles west of Jackson, the front covered by a marshy creek lined with dense willows, and artillery commanding the bridge over the creek. At the end of nearly two hours Crocker's division of three brigades was deployed in line, with one brigade of Logan's in reserve. At 11 A.M. the skirmishers advanced to the creek and were checked, upon which the entire division went forward, drove in Walker's skirmishers, and advanced over the open ground beyond the creek, meeting a stout resistance; but Walker's men soon retreated, abandoning seven guns. They were pushed more than a mile by Crocker; but his men fell into some disorder, and were finally brought to a stand by artillery posted in an inner line of works close to the town. While Crocker was reforming, Walker made his escape to the Canton road. Crocker's loss was 265 killed and wounded. On the Raymond road Sherman encountered Gregg and, by a flank movement, compelled him to abandon his entire line and ten guns, with the loss of nearly 200 prisoners and 81 in killed and wounded. Sherman's loss was 32. Johnston retreated northward on the Canton road. McPherson and Sherman entered Jackson between 3 and 4 P.M.; Sherman was left in the city to destroy the railroads, bridges, factories, arsenals, and everything valuable. On the morn-

ing of 15th Grant turned the rest of his army west, defeated Pemberton at the battle of Champion's Hill (q.v.) on the 16th, drove him across the Big Black on the 17th, and began the siege of Vicksburg. The Union loss at Jackson was 42 killed, and 251 wounded. The Confederates make their loss less than 400, but Sherman estimated it at 845 killed, wounded and missing. Consult: 'Official Records,' Vol. XXIV.; Johnston, 'Narrative'; Sherman, 'Memoirs, Vol. I.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III.

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Jackson, Siege of. The battle of Jackson (q.v.), 14 May, 1863, was followed by the movement of Gen. Johnston northwest, with Gregg's and Walker's brigades, to form a junction with Pemberton, who had been directed to join him; but early on the 19th he received word from Pemberton that he had decided to hold Vicksburg instead, upon which Johnston marched his troops to Canton. He was reinforced, and 29 June he marched west to operate in the rear of Grant, who was besieging Vicksburg. He was about to move on the morning of 5 July to the south of the Vicksburg and Jackson Railroad, when he heard that Vicksburg had fallen, whereupon he fell back to Jackson and occupied a line of works covering the town, with both flanks on Pearl River. Gen. Sherman had been held in readiness to move back and drive the Confederates from the State, and when Vicksburg fell he moved promptly with his own corps and those of Gen. Ord and Parke, crossed the Big Black at three different points, and by 11 July was close up to Johnston's works and shelling the city with nearly 100 guns. Ord's Thirteenth corps was on the right, the Fifteenth corps in the centre, and Parke's Ninth corps on the left. On the 12th the fire of the artillery was increased, reaching every part of the town, and Lauman's division of Ords' corps, moving in dense woods, came too close to the Confederate works, was struck in flank and driven back in disorder, losing over 500 men killed, wounded, and captured, together with the colors of three regiments. The siege was prosecuted night and day, and on the morning of the 17th Jackson was found evacuated, Johnston having retreated on the road to Brandon, and thence to Morton, where he arrived on the 20th. Steele's division pursued Johnston as far as Brandon, 14 miles from Jackson; Sherman remained five days at Jackson, destroying much property of every description, and then returned to Vicksburg. The Union loss at Jackson, 11–16 July, was 129 killed, 762 wounded, and 231 missing or captured. The Confederate loss, 5–25 July, was 71 killed, 504 wounded, and 764 captured or missing. Consult: 'Official Records,' Vol. XXIV.; Johnston, 'Narrative'; Grant, 'Memoirs,' Vol. I.; Sherman, 'Memoirs,' Vol. I.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. III.

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Jacksonville, Fla., one of the most important and rapidly growing ports of the southeastern United States; chief city of the State, and seat of Duval County in the northeastern corner; on the west bank of the St. John's, 24 miles from the ocean by water, 14 direct. It is one of the chief southern railroad centres, six important lines converging there, three of them great trunk lines: the Southern, Seaboard Air Line, Atlantic Coast Line, Georgia Southern & Florida, Florida East Coast, and Jacksonville & Southwestern. It is 138 miles south of Savannah, 212 north of Tampa, and 165 east of Tallahassee; and about 1,000 from New York, with train service of 25 to 28 hours. It is also connected with all the Atlantic coast cities by the Clyde, Mallory, and Ocean Steamship lines; and with the picturesque St. John's and its tributaries by six daily and tri-weekly lines of steamers. The fascinating rivers, lakes, Everglades, etc., of Florida, the best hunting and fishing grounds east of the Mississippi, with Jacksonville's mild and healing winter and even summer climate, make it one of the leading tourist resorts in the country, some 50,000 to 60,000 stopping annually at its numerous large and well-equipped hotels.

Jacksonville's position makes it the business key and metropolis of the peninsula, the great shipping point for Florida's exports, and the distributing point for its purchases. Of the former, the chief are lumber, shingles, and ties, mainly yellow pine from the great Florida forests, to nearly $2,000,000 a year; next come naval stores — turpentine, rosin, and rosin oil — of over $1,000,000, and rapidly increasing, a company with $3,000,000 capital having been recently organized for it; cotton has also risen to over $600,000 a year; and an extremely heavy element is the shipping of fruit — oranges, pineapples, and a great diversity of tropic fruits, for which see FLORIDA — and garden vegetables to the North. In a suburb of the city is the largest ostrich farm in the United States, and the only one east of California, whose products form part of the shipments; these also include great quantities of phosphates and fertilizers, and kaolin. As a jobbing centre for interior trade, it has the immense advantage of having practically no competitor in the State, and is rapidly becoming one of the foremost in the South; there are 19 large wholesale grocery houses alone, and the freight entries of grain, hay, and milled products amounted in 1900 to over $12,000,000. Its gross annual trade exceeds $75,000,000. This business implies large banking facilities; and there are now two national and three State banks in the city, besides a savings bank, with over $1,100,000 of capital and undivided profits.

In manufacturing, Jacksonville's chief specialty is lumber and timber products, which in 1900 amounted to nearly a third of the entire output of $2,312,309; there are ten large saw and planing mills. Of the other industries, the most considerable was the manufacture of ice, five establishments producing $87,647 worth; a witness to the needs of thronging tourists in a warm climate. But there were also foundry and other iron products, steam engineering works, brick and tile, paving and roofing materials, wooden ship and boat building, carriages, saddlery, mattresses and palmetto fibre products, pulp, patent medicines, confectionery, cigars, and other articles. There are about 200 different establishments in all.

As a port, it has long been hampered by shoals in the river, and the bar outside the St. Johns. The river is a magnificent estuary, a mile wide for many miles up, and with a channel deep enough for the largest ocean vessels; but it

was not until 1896, by combined government and local efforts, that a channel 19 feet deep was obtained from Jacksonville to the ocean, admitting vessels of 3,800 tons. The National government, at last, in 1901, appropriated $1,300,000 to deepen it to 24 feet all the way, by a permanent system of jetties and dredging. It has over seven miles of water front. The city, 7.6 square miles in area, is handsomely laid out, and its business section is almost entirely new, having been practically obliterated by a fire on 3 May 1901, which destroyed 148 blocks, covering 455 acres and including 2,361 buildings, a property loss of over $15,000,000. With astonishing energy up to 25 Oct. 1903, 3,361 new buildings had been erected, 1,000 more than were destroyed, and greatly improved ones. Among the finest buildings are the Union station, United States post-office and custom-house, Masonic Temple, St. Luke's hospital, National Bank of Jacksonville (which were spared by the fire). Among the public buildings since erected are the Windsor hotel, Seminole, Elks, Woman's and Wheelmen's club-houses, Mercantile Exchange Bank, Board of Trade, and Duval High School. A $50,000 Carnegie free library is being erected. The religious denominations have built a number of fine churches, costing from $25,000 to $100,000 each. Notable among them are the Congregational, Baptist, Christian, McTieire Memorial (M. E. South), Snyder Memorial (M. E.), Presbyterian, St. John's Episcopal, Church of Good Shepherd, Episcopal, and three fine colored churches. There are five parks of 57 acres in all, "Hemming" having a Confederate monument; and 14 miles of shell streets and drives, besides a general macadamizing of paving with vitrified brick. The ocean beaches, 18 to 20 miles off, are among the finest on the Atlantic coast. The sanitation of the city is perfect. After the yellow fever epidemic of 1888 it installed a fine thorough system of sewerage, drained and filled in the swampy tracts around, and replaced the water supply with one almost chemically pure, drawn from artesian wells 500 to 1,000 feet deep. Its death rate has sunk to 10 in 1,000, one of the lowest in the country. There are 20 miles of trolley tracks, and the city owns electric-light works and waterworks; both light and water are extremely cheap. The finances of the city are in the best condition. It has never defaulted its bonds, which are for the waterworks and electric plant, and amount to $1,368,000, payable 15 May 1904 at 5 per cent. There is no floating debt. The assessed valuation is $15,000,000; tax 16.02 mills on the dollar, or 11 mills if beyond the hydrants. Jacksonville was settled in 1816 by Lewis Z. Hogans, whence Hogans' Creek, dividing the city, is named. In 1822 it was laid out and named after Andrew Jackson, the first territorial governor of Florida. It was incorporated in 1833. The Seminole War prevented its development, but it revived in 1842 and has grown steadily since. Its population in 1850 was 1,045, in 1860 2,118, in 1870 6,912, the war having been an immense gain instead of loss; 1880 7,650, 1890 17,201, 1900 28,429, of whom 16,271 or 57 per cent were colored. At present (1903) is over 35,000.

CHAS. H. SMITH,
Secretary Jacksonville Board of Trade.

Jacksonville, Ill., city, county-seat of Morgan County; situated on the Mauvaisterre Creek, a branch of the Illinois River, about 34 miles southwest of Springfield and 88 miles north of St. Louis, Mo.; on branches of the Wabash, the Chicago & A., the Burlington, the Chicago, P. & St. L., and the J. & St. L., the last of which is also a part of the Burlington system. Jacksonville was laid out as early as 1825, about seven years after the admission of the State of Illinois into the Union, established as a town in 1840, and incorporated as a city in 1867. It was made the county-seat of Morgan County in 1825. The origin of the name of the city is somewhat uncertain, but the most probable tradition seems to indicate that it was named in honor of Andrew Jackson, who was a prominent Presidential candidate at the time when the town was founded. Jacksonville is noted for its institutions of learning, its wide, prettily shaded streets, and its handsome residences. It is the seat of Illinois College, the oldest college in the State, founded through the efforts of local residents and a band of students from Yale College. Originally non-sectarian, the college has recently become Presbyterian, has absorbed the Jacksonville Female Academy, and become affiliated with the University of Chicago. Among the other institutions are: the Illinois Woman's College, established in 1847 under the auspices of the Methodist Episcopal Church; the State Central Hospital for the Insane; the State School for the Blind; the State School for the Deaf and Dumb; Our Saviour's Hospital, in charge of the Sisters of the Holy Cross; the Passavant Memorial Hospital; a Carnegie Free Public Library; the Conservatory of Music; and Whipple Academy, a preparatory school. The last two are connected with Illinois College. The city-hall, the court-house, and the high school are the most prominent public buildings. Besides these, there are numerous church edifices, the most attractive of which is the Westminster Presbyterian. The most important industrial establishments of the city are the woolen mills, and the car-shops of the Chicago, Peoria & St. Louis Railroad. Other manufactures include machine-shop products, bricks, candy, paper, and flour. The executive head of the city government is a mayor, who holds office for two years, and a city council composed of 12 members elected for two years by the four wards. The mayor appoints the administrative officials, subject to confirmation by the council. The city owns and operates the electric-light plant and the waterworks. Pop. (1890) 12,935; (1900) 15,078.

C. H. RAMMELKAMP,
Head of Department of History and Political Science, Illinois University.

Jacob (Heb. *Yaqōbh*, the supplanter), the son of Isaac, and the grandson of Abraham, the last of the Jewish patriarchs, and the real ancestor of the Jews. He died at the age of 147 years, about 1860 B.C., and was buried in the tomb of Abraham, before Mamre in Canaan.

Jacob Tome Institute, an institution of secondary education located at Port Deposit, Md. It was founded 1894 by Jacob Tome. When Mr. Tome's gift was made, only five other citizens of the United States — Stephen Girard, Anthony J. Drexel, Johns Hopkins,

Charles Pratt, and John D. Rockefeller — had made greater gifts to educational institutions. The endowment and other property of the school are estimated at more than $3,000,000. The Jacob Tome Institute was incorporated in 1889. The boarding school for boys, founded in 1900, is located on the hills overlooking the historic Susquehanna River. The grounds of the institute include about 160 acres. The principal buildings are Memorial Hall, erected in memory of the founder, two dormitories, gymnasium, the Inn, power plant, and infirmary. The school consists of six classes, each requiring one year. The studies of the last three years are arranged in five groups which prepare students for college, technical schools, or for active business life. The institute confers no degrees, although a certain amount of collegiate work can be and is done in the regular courses: Students must be not less than 10 years of age in order to gain admission. Special scholarships are offered to boys from Maryland. There is also a kindergarten, Junior School, and Senior School for girls.

Jacobi, jạ-kō'bĭ, Abraham, American physician: b. Hartum, Westphalia, 6 May 1830. He was educated at the universities of Greifswald, Göttingen, and Bonn, and was graduated as M.D. from the latter in 1851. Those were years of revolutionary ferment in Germany and Jacobi, becoming identified with the movement, was held in detention for "high treason" at Berlin and Cologne (1851–3). In 1853 he settled in practice in New York, where his abilities soon brought him into notice. He was appointed professor of diseases of children at the New York Medical College (1860–5) and held a similar chair in the medical department of the University of the City of New York (1865–70). Some years later he became professor of the diseases of children at the College of Physicians and Surgeons. He has held many important appointments, and was president of the New York State Medical Society (1882) and of the New York Academy of Medicine (1885–9). In 1900 his 70th birthday was made the occasion of a public demonstration in his honor. Author: 'Dentition and its Derangements'; 'Infant Hygiene'; 'Diphtheria'; 'Therapeutics of Infancy and Childhood'; 'Infant Diet.'

Jacobi, Friedrich Heinrich, German philosopher: b. Düsseldorf 25 Jan. 1743; d. Munich 10 March 1819. He was educated at the University of Geneva, and in 1764 entered upon a commercial career in his native town; after a few years, he retired from business, and in 1770 became a member of the councils for the duchies of Juliers and Berg. From his university days he was actively interested in literature and philosophy, and with Wieland started a journal in which some of his own writings were first published. In 1779 he went to Munich for a short time; and in 1793 left Düsseldorf and settled in Holstein. In 1804 he was called to Munich as a member of the Academy of Sciences then newly established; from 1807 to 1812, he was president of the academy; and in 1812 retired to prepare a collected edition of his works, which, however, was not finished before his death. His writings include two philosophical romances, 'Allwills Brief-Sammlung' (1774), and 'Woldemar' (1779); and the more important philosophical treatises 'Briefe über die Lehre Spinoza's' (1785); 'David Hume über den Glauben oder Idealismus and Realismus' (1785); 'Von den Göttlichen Dingen' (1811). In these treatises he defines his theory that man's thought — or reason — is by its nature partial and limited, and can only connect facts, not explain their existence; and that the higher truths must be understood through another different faculty which he calls "faith" or "belief" ("Glaube"); he does not, therefore, seek to establish a systematic philosophy. His theories involved him in considerable controversy, especially with the adherents of the critical philosophy.

Jacobi, Herman Georg Jakob, German Sanskrit scholar: b. Cologne 11 Feb. 1850. He was educated at Cologne Gymnasium, and later took up a course of studies in Sanskrit and allied languages at the universities of Bonn and Berlin. After spending a year (1872–3) in the Indian office in London on the old Sanskrit manuscripts, he went to India, making a tour of Rajputana. In 1875 he became a docent in Sanskrit at Bonn; from 1876–85 was professor extraordinarius of Sanskrit and Comparative Philology at Münster, Westphalia; in 1885 was made professor ordinarius of Sanskrit at Kiel, Holsatia; and in 1889 was appointed professor of Sanskrit at Bonn. He made a particular study of Jainism and Prâkrit grammar, writing exhaustively on those subjects as well as on the Sanskrit poetical languages. Among the most important of his works are 'The Indian Antiquary' and the 'Epigraphia Indica', published in 1892, in which he gives two sets of tables showing the Hindu dates in inscriptions, a work of much value. His other works include: 'De Astrologiæ Indicæ, Horâ appellatæ originibus' (1872); 'The Kalpasûtra of Bhadrabâhu' (1879); 'The Âyaramgo Sutta of the Çvetâmbra Jains' (1882); 'Gaina Sûtras' (1884); 'Ausgewählte Erzählungen in Mâhârâshtrî. Zur Einführung in das Studium des Prâhrit' (1886); 'The Porisishtaparvan by Hemachandra' (1891); 'Sthavirâvali Charita' (1891); 'Das Râmâyana Geschichte und Inhalt, nebst Concordanz der gedruckten Recensionen' (1893); 'Kompositum und Nebensatz, Studien über die indogermanische Sprachentwicklung' (1897); etc.

Jacobi, Johann Georg, German poet: b. Düsseldorf 1740; d. 1814. He was a brother of the philosopher, Friedrich Heinrich Jacobi (q.v.) He was educated at Göttingen and in 1766 was appointed to the chair of philosophy and oratory at the University at Halle. In 1784 he became professor at Freiburg. He edited 'Iris' with Gleim (1774–6); and published in 1786 his correspondence with Gleim. An edition of his collected works was published at Zürich in 1882 and his 'Ungedruckte Briefe von und an Johann Georg Jacobi' appeared in 1874 edited by Martin.

Jacobi, Karl Gustav Jakob, German mathematician: b Potsdam 10 Dec. 1804; d. Berlin 18 Feb. 1851. He obtained his education at the University of Berlin, where he studied especially mathematics and philosophy, later in 1824 becoming a privat-docent there. In 1825 he became assistant professor of mathematics at Königsberg and in 1827 was appointed professor. He was appointed a member of the Prussian Academy of Sciences in 1836 and from

1842 till his death in 1851 lectured at the University of Berlin. His most important work was on the theory of elliptic functions but he also made some valuable contributions to the theory of numbers and determinants. Only a small portion of his writings and lectures were published during his lifetime and the greater part of these were published in the *Crelles Journal.* Among these are: 'Fundamenta Nova Theoriæ Functionum Ellipticarum' (1829); 'Canon Arithmeticus' (1839); 'De Formatione et Proprietatibus Determinantium' (1841); 'Mathematische Werke' (1846–71). A complete edition of his works 'Gesammette Werke' was published in seven volumes by the Berlin Academy of Sciences (1881–91). His 'Vorlesungen über Dynamik' did not appear till 1866, long after his death, and later in 1895, his essay 'Uber die vierfach periodischen Functionen Zweier Variabeln' was translated into Latin and published.

Jacobi, Mary Putnam, American physician: b. London, England, 31 Aug. 1842. She was graduated from the New York College of Pharmacy in 1862, from the Woman's Medical College of Philadelphia in 1864, and from the Ecole de Médecine of Paris in 1871. She then entered practice in New York, in 1881 was appointed clinical professor of the diseases of children in the New York Post-Graduate Medical School, where she lectured for three years. In 1874 she established an association for the promotion of the medical education of women, and became its president. In 1873 she was married to Abraham Jacobi (q.v.) She became a member of the American Medical Association, and published several works, including: 'The Question of Rest for Women during Menstruation' (1877); 'Acute Fatty Degeneration of New Born' (1878); 'The Value of Life' (1879); 'Cold Pack and Anæmia' (1880); 'The Prophylaxis of Insanity' (1881); 'Common Sense Applied to Woman's Suffrage' (1894).

Jacobi, Moritz Hermann, German physicist: b. Potsdam 1801; d. 1874. He was appointed professor of physics at the University of Dorpat in 1835 and while there did important work in scientific research, especially along the line of physics. He was the inventor of new processes in galvano-plastics and electrotyping, and in 1842 was made a member of the Academy of Sciences at Saint Petersburg. The most remarkable and important of his works was an essay published in 1835, 'Memoire sur l'application de l'électro-magnetisme au mouvement des machines,' which was shortly afterward in 1840 followed by 'Die Galvanoplastik.'

Jacobi, Otto R., Canadian landscape painter: b Königsberg, Prussia, 27 Feb. 1812. After executing several important water-colors for the crowned heads of Europe, he was appointed court painter at Wiesbaden. In 1860 he came to Canada, where his ability won him membership in 1880 to the Royal Canadian Academy of Art, and in 1890 he was elected president.

Jacobins, jăk'ō-bĭnz, the most famous of the clubs of the first French Revolution. When the States-General assembled at Versailles in 1789, it was formed and called the Club Bréton. On the removal of the court and national assembly to Paris it acquired importance and rapidly increased. It adopted the name of Société des Amis de la Constitution, but as it met in a hall of the former Jacobin convent in Paris, it was called the Jacobin Club. It gradually became the controlling power of the Revolution, and spread its influence over France, 1,200 branch societies being established before 1791, and obeying orders from the headquarters in Paris. The Jacobins were foremost in the insurrectionary movements of 20 June and 10 Aug. 1792; they originated the *commune de Paris,* and changed their former name to Les Amis de la Liberté et de l'Egalité. For a while they ruled supreme, and the Convention itself was but their tool. Robespierre was their most influential member; they ruled through him during the Reign of Terror, and were overthrown after his downfall in 1794. In that year the Convention forbade the affiliation of societies; the Jacobin Club was suspended and its hall was closed. The term Jacobin is now often used to designate anyone holding extreme views in politics. Numberless pamphlets were then published in regard to the Jacobins, the most noted being 'La Jacobinade,' 'Le secret des Jacobins,' and 'Les crimes des Jacobins.'

Jac'obite Christians, a subdivision of the sect of the Monophysites (q.v.) comprising those who dwelt in Syria, Mesopotamia, and Babylonia, organized by a certain Jacobus Baradæus, in the reign of Justinian, somewhat later than the middle of the 6th century. Jacobus had been a monk whose poverty-stricken asceticism gained for him the title of Jacobus Baradai (Ragged James). He had been appointed bishop of Edessa in 541, and from that year to 578 he traveled round gathering the members of his heretical sect, until they formed a compactly ordered body which has survived to the present time. They now number about 80,000, and are governed by two so-called Patriarchs, one of Antioch, the other of Jerusalem.

Jac'obites, a party in Great Britain (so styled from Lat. *Jacobus,* James), who after the revolution in 1688 continued to be the adherents of the dethroned King James II. and his posterity. In Ireland they were soon put down by conquest. In England the revolution was accomplished with the apparent consent of all parties; but in a year or two the Jacobite party gained considerable influence, and continued to disturb the government of William throughout his reign. After the accession of Anne and the death of James their efforts slackened for a time; but toward the close of her reign they revived. Bolingbroke and Oxford, with others of the Tory ministers of Anne, were in treaty with the son of James II., and either really or pretendedly negotiated for a restoration. On the arrival of George I. in 1715 a rebellion broke out in Scotland, supported by a more insignificant rising in the north of England. The failure of both these movements damped the enthusiasm of the English Jacobites, but in Scotland the party maintained its influence until the unsuccessful rebellion of 1745 put an end to its political importance, though some ultra-Jacobites did not think themselves justified in transferring their allegiance to the house of Brunswick till the death of Cardinal York in 1807. The hopes and wishes of the

Scottish Jacobites found expression in many beautiful songs, which form an interesting feature of the national literature.

Jacobs, Henry Eyster, American Lutheran clergyman and theologian: b. Gettysburg, Pa., 10 Nov. 1844. He was graduated from Pennsylvania College (Gettysburg) in 1862, from the Lutheran Theological Seminary at Gettysburg in 1865, was professor of Latin and history in Pennsylvania College in 1870–80, of ancient languages in 1880–1, and of Greek in 1881–3. In 1883 he became professor of systematic theology in the Lutheran Theological Seminary, and in 1894 dean of the faculty of that institution. His publications include: 'The Lutheran Movement in England' (1891); a 'History of the Lutheran Church in America' (1893); 'Elements of Religion' (1894); a 'Life of Martin Luther' (1898); and 'The German Emigration to America 1709–40' (1899).

Jacobs, Joseph, Anglo-American author and journalist: b. Sydney, New South Wales, 29 Aug. 1854. He was graduated from St. John's College, Cambridge, was at various times editor of 'Folk Lore,' the 'Literary Year-Book,' and the 'Jewish Year-Book,' was elected president of the Jewish Historical Society, and became literary editor of the 'Jewish Encyclopædia.' In 1896 he lectured in the United States. His publications include, beside translations and editions of English classics: 'Celtic Fairy Tales' (1891); 'Indian Fairy Tales' (1892); 'The Jews of Angevin England' (1893); 'Studies in Biblical Archæology' (1894); 'Literary Studies' (1895); and 'Jewish Ideals' (1896).

Jacobus, Melancthon Williams, American Presbyterian clergyman and educator: b. Allegheny, Pa., 15 Dec. 1855. He was graduated from Princeton in 1877, from the Princeton Theological Seminary in 1881, and after study at Göttingen and Berlin (1881–4), was pastor of the Presbyterian Church at Oxford, Pa., in 1884–91. In 1891 became professor of New Testament exegesis and criticism in the Hartford (Conn.) Theological Seminary. His Stone lectures at the Princeton Theological Seminary (1897–8) appeared as 'A Problem in New Testament Criticism' (1900).

Jaco'by, Harold, American astronomer: b. New York 4 March 1865. On his graduation from Columbia University in 1885, he determined to apply himself to astronomical research, a subject in which he had always evinced interest, and he was appointed assistant astronomer United States eclipse expedition to West Africa (1889–90). He has been professor of astronomy at Columbia since 1894 and is an active member of the leading astronomical and scientific societies at home and abroad. He has written numerous technical monographs in astronomical photography, stellar parallax and star clusters which have been published by French, English and Russian societies. He has also been a frequent contributor to the periodical press on popular astronomy.

Jacotot, Jean Joseph, zhŏñ zhō-zĕf zhä-kō-tō, French educator: b. Dijon 4 March 1770; d. Paris 30 July 1840. He was successively soldier, secretary to the minister of war, and deputy-director of the Polytechnic School, where he was also professor of mathematics. He went to Brussels in 1815, in 1818 was appointed lecturer on the French language in the University of Louvain, and in 1827 director of the Military Normal School. The fundamental principle upon which his system of education rests is that every person is able to educate himself, provided he is once started in the right way. Knowledge should first be acquired through instinctive experience, or by the memory. For example, in imparting a knowledge of a language, Jacotot began by making the pupil commit to memory a single passage; he then encouraged him to study for himself, first the separate words, then the letters, then the grammar, and lastly the full meaning and import. His steps were learn, repeat, reflect, and verify. He expounded his views in 'Enseignement Universel' (1822). Consult: 'Life,' by A. Guillard (1860); Quick, 'Educational Reformers' (1868); Payne, 'Lectures on Education' (1892).

Jacquard, Joseph Marie, zhō-zĕf mä-rē zhä-kär, French inventor: b. Lyons 7 July 1752: d. Oullins, near Lyons, 7 Aug. 1834. His parents were silk weavers, and he learned the same trade. After a long period of hardship, during which he shared in some of the campaigns of the Revolution, he made his name famous by the invention of his new loom, which was publicly exhibited in 1801. He endeavored to introduce it into general use in Lyons, but was mobbed, and all but lost his life. Ultimately, however, his invention was bought by the French government, and he was able to spend the latter part of his life in comfortable independence. The subsequent prosperity of Lyons is largely attributable to his invention, and a more enlightened generation erected a statue to him in 1840 on the very spot where his loom was publicly destroyed. See LOOM.

Jacquard Machine. See DAMASK MANUFACTURE.

Jacquerie, zhäk-ē-rē, the name given to the rising of the French peasantry in the 14th century after the battle of Poitiers. They committed great devastations and outrages — burning castles, murdering men and violating women — particularly in the northeast of France. They were at length quelled by the Captal de Buch and Gaston Phébus, count of Foix, who slaughtered 7,000 of them near Meaux. The term *Jacquerie* is derived from *Jacques Bonhomme,* a familiar epithet for a peasant.

Jade, a remarkably tough, compact, ornamental stone, of green to white color and vitreous lustre, used by the prehistoric peoples of Switzerland, Mexico, Alaska, and other countries for axes, utensils and carvings. It is still highly prized in the East, especially in China and New Zealand. Jade is a general term including two distinct minerals, jadeite and the more common nephrite. Jadeite belongs to the pyroxene group and chemically is a soda-spodumene, easily fusible (at 2.5) and having a specific gravity of 3.3 to 3.35. Nephrite is a variety of amphibole identical with tremolite when of white color, or with actinolite when green, fusing much less easily (at 4) and with specific gravity of 2.95 to 3.0. Much information as to jade and implements made from it may be found

in the publications of the Smithsonian Institution, especially a paper by S. Blondel, 'A Historical, Archæological and Literary Study of Jade,' in the annual report for 1876.

Jad'win, Edgar, American military engineer: b. Honesdale, Pa., 1865. He studied at Lafayette College, was graduated from West Point in 1890, was an assistant in government engineering in 1890–1 and again from 1893, in the Spanish-American War was successively major and lieutenant-colonel of the 3d United States volunteer engineers, and for a time commanded a battalion of this regiment in the sanitation of Matanzas, Cuba. Promoted captain in the corps of engineers, U. S. A. (1900), he was appointed (1902) to direct all Pacific coast fortification and river and harbor work south of San Francisco.

Jæger, yā'gėr. See GULL; SKUA.

Jaffa, jăf'fą or yăf'fā (ancient JOPPA; Ar. *Yafa;* Heb. *Yapho,* beauty), Asiatic Turkey, in the western part of Palestine on the Mediterranean Sea; about 35 miles from Jerusalem. Jaffa is an old Phœnician town mentioned in several places in the Bible. It was the port of entry for Jerusalem and for several of the interior cities of Palestine. Here the cedars from Lebanon were landed and then carried overland for the building of the Temple in Jerusalem. The house where Simon the tanner lived, and where Saint Peter lodged, is still pointed out. In 1187 it was taken by Saladin, in 1191 by Richard I. In 1799 it was captured by Napoleon, who here put to death 1,200 Turkish prisoners. The narrow entrance to the harbor is extremely dangerous. The city is built on a high rocky coast, and presents today the same irregular arrangement of streets, and unattractive looking houses that it may have had hundreds of years ago. The remains of Roman fortifications and dwellings are in the vicinity. The old road to Jerusalem is extremely interesting; but a railroad, built in 1892, connects the city with Jerusalem. The chief exports are oranges (said to be the finest in the world), other fruits, soap, sesame, wine, oil, raw silk, and nuts. The chief imports are sugar, rice, lumber, cotton goods, petroleum, tobacco, and silk goods. The city contains several mosques, a Franciscan monastery, and a mission school. Some attempts have been made to establish colonies of Jews on land near Jaffa. Pop. (1903) estimated, 30,000.

Jagannath, or **Juggernaut** (Sanskrit, *Jagannâtha,* lord of the world, one of the names of Vishnu), called by the natives Purí, a town and celebrated temple of Hindustan, in the presidency of Bengal, province of Orissa, on the Bay of Bengal, 48 miles south of Kattack. The town derives all its importance from the temple. This, the most celebrated shrine in Hindustan, was completed in the 12th century, at an enormous expense. The main street, at the extremity of which the temple stands, consists entirely of religious structures built of stone. The gardens here produce the finest fruits in the province. The temple stands near the shore, in a waste, sandy tract, and appears like a shapeless mass of stone. The idol is a carved block of wood, with a hideous face, painted black, and a distended blood-red mouth, and is magnificently dressed. On festival days the throne of the image is placed on a high tower moving on wheels. Long ropes are attached to the tower, by which the people draw it along. The belief that devotees used to cast themselves headlong in front of this car to be crushed to death probably grew out of the accidental fatalities sometimes occurring. Every year pilgrims flock in crowds to the temple.

Jagersfontein (yā'gėrz-fŏn-tīn) **Excelsior, The,** a name given the largest known diamond; found in the mine of the Jagersfontein Company, Orange Free State, South Africa, in 1893; weight, 971 carats; color, blue white.

Jag'ger, Thomas Augustus, American Protestant Episcopal bishop: b. New York 2 June 1839. He was graduated from the General Theological Seminary, New York, and ordained deacon in the Protestant Episcopal Church 1860. While serving as rector of Holy Trinity parish, Philadelphia, Pa., he was elected to the newly formed diocese of Southern Ohio, and consecrated May 1875. He is the author of 'The Men of the Ages'; 'The Ministry of Phillips Brooks'; 'The Personality of Truth,' the Bohlen lectures for 1900.

Jag'gery, a coarse brown sugar made in the East Indies by the evaporation of the juice of several species of palms, chemically the same as cane-sugar. The sap which yields jaggery becomes by fermentation palm-wine, and from it arrack (q.v.) is distilled. See PALM.

Jaguar, jăg'ū-ăr or jăg'wär, a great American spotted cat (*Felis onca*), once numerous as far north and east as Arkansas, but since the early part of the 19th century rare even in Mexico. It resembles the leopard, but is more robust (exceeding the cougar in weight), has a rounder head, relatively shorter legs and a shorter, thicker tail. The tawny yellow hide is spotted with black, the spots larger than those of the leopard, and inclined to form broken rings with a spot in the centre. Jaguars abound in the tropical forests, especially along the great rivers, where they find most prey. They subsist largely on capybaras, agoutis, etc., but frequently pounce upon deer when they come down to drink. They seem to be more arboreal than most large cats, and a favorite method of obtaining their food is to lie along a tree-limb in some favorable spot and leap down upon the victim. But jaguars also abound in the treeless morasses of the Gran Chaco, and even on the dry uplands of Paraguay and Argentina, where their food and habits are entirely different from those who dwell in the forests. In view of the great extent of country and variety of circumstances in which this animal occurs, formal statements as to its habits are rarely more than locally true; and much error and superstition encumbers popular accounts. In general the jaguar has the manners and disposition of other great cats, changing with environment, season and circumstances. It submits grudgingly to captivity, and gives the same reluctant submission to the training of the circus as is exhibited by other great cats. In some regions it is greatly feared by the people, while in other places it is regarded as little to be feared. Its greatest peculiarity, perhaps, is the tendency to terrific roars and cries, more loud and continuous than those of cougars or leop-

ards. Consult the works of South American travelers and naturalists, especially Humboldt, Azara, Walterton, Wallace, Bates, and W. H. Hudson. Their accounts are well summarized by Porter in 'Wild Beasts' (New York 1894).

Jahn, Otto, German classical scholar: b. Kiel 16 June 1813; d. Göttingen 9 Sept. 1869. The education which he received at the university in his birthplace, Kiel, and later at those in Leipsic and Berlin, he supplemented by wide travel in Italy. In his profession he rose rapidly from the position of docent at Kiel to professorial chairs at Greifswald and Leipsic. His share in the political troubles of 1848–9 caused his removal from the professorship at Leipsic, hut he later received an appointment at Bonn. His works in philology, classical archæology, and the fine arts are of great value to the specialist, but too numerous to list here.

Jains, jīnz, or **Jainas,** jī'näz, a Hindu religious sect, which in union with the Buddhists opposed Brahamanism. They are numerous in the great cities of western and northwestern India, as well as in the Dravidic states of the South. The name signifies a follower of Jina ("conqueror of the world"), one of the denominations of their apotheosized saints. They have many fine temples built in different parts of the Deccan, as well as elsewhere. The Jains deny the divine origin and infallible authority of the Vedas; they reverence certain holy mortals, now termed Tirthankara or saints, and they manifest extreme and even ludicrous tenderness for animal life. They positively affirm that the world exists from all eternity, not being created by God or any other being, and that it will exist forever. This world is divided into three parts — the upper, the middle, and the lower worlds. The Jains believe that not to kill any sentient being is the highest virtue. They believe in a sort of nirvâna (like the Buddhists). Those who attain to this nirvâna, this extinction of action, this final liberation, do not return to a worldly state, and there is no interruption to their bliss; they have perfect vision and knowledge, and do not depend upon works. The Jains are split up into two principal divisions, Digambaras and Svêtâmbaras; the points of difference between them are said to comprehend a list of 700 topics, 84 of which are considered of paramount importance. The Digambara (sky-clad, naked) now wears colored garments, confining the disuse of clothes to meal hours; the Svêtâmbara wears, as the name signifies, white garments. Both the parties have the same sacred books, which they style "angas," but no sacerdotal caste.

Jal'ap (so called from Jalapa, or Xalapa, Mex., whence it is imported), the tuberous roots of several plants of the order *Convolvulaceæ*, that of *Ipomœa purga* being the most important. This is a twining herbaceous plant with cordate leaves and deep pink flowers, growing naturally on the eastern declivities of the Mexican Andes, at from 5,000 to 8,000 feet. The jalap of commerce consists of irregular ovoid dark-brown roots, varying from the size of an egg to that of a hazel-nut. The drug is one of the most common purgatives, but is apt to produce griping and nausea.

Jalapa, hä-lä'pä, or **Xalapa** ("a place of water and sand"), Mexico, city, capital of the state of Vera Cruz; on the railroad which extends from the city of Vera Cruz across the state of Vera Cruz and Puebla; about 50 miles northwest of Vera Cruz. Jalapa is situated about 4,340 feet above the sea, at the base of the basaltic mountain, Cofre de Perote, which rises about 14,300 feet. Before the advent of railroads, the route from Vera Cruz to Mexico City was through Jalapa, which was then of considerable importance. It is a favorite mountain resort for the inhabitants along the coast and in the valleys. The irregularity of the streets, the gardens which surrounded the city, the well-built houses, the parks, and promenades, all make the place most attractive. It was once the capital of the state. It is one of the oldest cities on the continent; one of its churches is said to have been built by Cortes, who found here an Indian town. The Franciscan convent was built in 1556. The great annual fair held here between the years 1720–77 made Jalapa a place of note. People came from far and near to see and purchase goods brought from Europe, mostly from Cadiz. In the city there are three hospitals, a number of good schools, and several fine church buildings. Pop. (1903) 20,500.

Jalisco, hä-lēs'kō, Mexico, a state bounded on the west by the Pacific Ocean, and on the north, east, and south by the states of Durango, Zacatecas, Aguascalientes, San Luis Potosí, Guanajuato, Quenetaro, Michoacan, Colima, and the territory of Tepic. The Sierra Madre range in the eastern portion of the state includes the active volcano Colima (about 14,238 feet) and other high mountains. The largest river is the Santiago, or Lerma, which forms the cascades of Juanacatlan in the vicinity of the city of Guadelajara. At that point the river is 520 feet wide, and falls 65 feet. A large electric plant utilizes the force generated by these falls, supplying electric power to a number of factories. Lake Chapala, the source of the Santiago, is the largest body of water in the republic. The total mineral production of the state is somewhat more than $2,250,000 Mexican silver. There are numerous silver, gold, copper, iron, lead, and cinnabar mines. The high table-lands of the eastern regions have a temperate or cold climate, and produce cereals; in the valleys and on the hot lowlands of the coast sugar-cane, cotton, vanilla, tobacco, oranges, and coffee are cultivated. The maguey plant is one of the chief products of the district of Tequila. The annual output of sugar is 11,000 tons of the raw, and 15,000 tons refined. The capital of the state, Guadalajara (q.v.), has become in recent years one of the chief manufacturing centres in Mexico, producing large quantities of *manta*, or unbleached cotton, and leather goods. More than $300,000 Mexican silver is appropriated annually for the maintenance of schools, which are attended by 31,725 pupils. Private and church schools have an attendance of 14,106. The population of the state in 1900 was 1,137,311.

Jalla'o, a West Indian market-name for the margate-fish (q.v.).

Jamaica, ja-ma'ka, the largest of the British West India Islands. It occupies the central position in the Antillean region, being nearly equidistant from Florida and the northern point of South America; from the mouths of the Orinoco and Galveston; from the head of the

SOUTH AMERICAN JAGUAR AND TAPIR.

Gulf of Honduras, on the west, and St. Thomas, on the east. Its greatest length is 144 miles; greatest breadth, 49 miles; area, 4,200 to 4,218 square miles. The eastern part of the island has, as its most commanding feature, the Blue Mountain range (highest peak 7,360 feet). The centre and west, an elevated plateau of later geologic formation, show the characteristic Antillean limestone, and, more perfectly here than elsewhere in the West Indies, the extraordinary results of exposure of that soluble material to the tropical rainfall. This upland plain, by the action of the elements, has been carved into hills, basins, called "cockpits," 500 feet or more in depth, and much larger and deeper valleys, in which the plantations are situated, and from which the numerous streams often find their way to the sea by underground passages. One of these depressions, the Clarendon Valley (drained through a cañon), is 25 miles wide and 50 miles long; another, St.-Thomas-in-the-Vale, is circular in form, with a diameter of about 10 miles. Throughout the western half of the island such valleys occur, some with, others without, apparent drainage outlets. Coastal plains are most extensive on the south side, where the largest, the plain of Liguanea, has an area of 200 square miles. There are no navigable rivers, but a great number of small streams, pools, and thermal springs. In the limestone region there are many caverns, interesting on account of their size, beauty, or the relics of the old Indian population which they contain. The mean temperature at the coast is very little more than 78° F.; that of the larger part of the habitable regions (1,000 to 3,000 feet above sea-level) is about 73° F.; and at the altitude of 5,500 feet it is 60° F. The maximum for a period of 10 years at Kingston, on the south coast, averaged 87.8° F., and the minimum 70.7° F. On the plateau the annual variation is scarcely 9°; for example, at St. Elizabeth the maximum is 75° F. and the minimum 67° F. As a whole, the island has a pleasant climate. The average rainfall is 66 inches, the extremes being 100 inches on the high mountains and 44 inches at Kingston. The death-rate is 20.9 in 1,000; but this favorable showing, as compared with the other islands of the Antilles, is due much less to natural advantages than to the strict enforcement of local sanitary and quarantine regulations. The total number of inhabitants in 1903 is estimated at about 780,000. The census of 1891 showed 639,491, five sixths of the entire population being blacks or colored people; the whites numbering 14,692, and East Indian coolies 10,116. The birth-rate is little less than twice the death-rate. The Jamaican negroes are fairly good laborers when well fed; the menial work of the island is performed by them, and they are regarded as cheerful, honest, and respectful servants. They have no share whatever in the government.

Fauna, Flora, and Agriculture.— Jamaica has no native mammals. There are many species of lizards, including the large iguana, a few harmless snakes, and the slightly poisonous centipede and scorpion; in the lowlands mosquitoes, ants, and sand-flies are common; butterflies, fireflies, and beetles, parrots, pigeons, water-fowls, and 20 different kinds of song-birds are enumerated. Edible marine fish are seldom caught near the island, but the streams contain a few fresh-water species. The flora is distinguished from that of the other Antillean regions by the total absence of the royal palm, and by the abundance of pimentos, or allspice-trees, which are found nowhere else. Common trees are the ceiba, mango, wild orange, cocoa-palm, plantain, fustic, logwood, and cedar. Begonias, orchids, ferns, and grasses abound, except on the southern coast, which has a flora of the arid type, including the cactus, thorny acacias, etc. There are 739,256 acres under cultivation (tillage 200,168, pasturage 413,152, etc.). Of this total, 83,549 acres are devoted to pimento (allspice), but chiefly as a by-product on lands also used for stock-raising. Since the abolition of slavery the production of sugar has fallen off very greatly. In 1805 Jamaica exported 151,000 hogsheads of sugar, and 5,000,000 gallons of rum; in 1897 the cultivation of sugar-cane constituted only 19 per cent of the whole agricultural industry; in 1902 only 27,342 acres were under this crop. Other products have gradually taken its place, as shown in the following statement of areas devoted to them: Ground provisions, 91,733 acres; coffee, 31,265 acres; bananas, 32,842 acres; cocoanuts, 13,244 acres; etc. Since the great frosts in Florida (1895–6) the exportation of oranges from Jamaica has been carried on profitably; since 1886 tobacco has been grown and cigars for exportation made on a large scale. Coffee from the Blue Mountain estates is of fine quality. The cultivation of cocoa has increased in recent years; ginger grows most readily in the rich soils on the mountains; and among the other exports may be mentioned annatto, lime-juice, tamarinds, nutmegs, a number of dye-woods, cabinet-woods, etc. Special instruction in agriculture is given at the schools, and agricultural and horticultural interests are encouraged by the government and active private associations.

Commerce, Railways, Roads, etc.— The United States has the most important trade relations with Jamaica, furnishing a large part of the staple food supplies, and affording the best market for the island's fruit and sugar. Thus, in 1895–6, the total exports were valued at $8,900,000, the United States taking 57 per cent, and Great Britain 27.6 per cent. Imports in the same year amounted to $13,722,500, Great Britain, Canada, and other British possessions furnishing about 55.6 per cent, and the United States 41.8 per cent. There are about 185 miles of railway, 683 of telegraph, and 154 of telephone. In the year 1901–2 the number of letters and postal-cards transmitted by the post-office was 5,424,814. The system of public highways (3,600 miles), extending into all parts of the island, is admirable: the roads are thoroughly well built and graded, have substantial bridges, and are kept in good repair. The principal line of steamships is the Royal Mail, with fortnightly sailings between England and the Caribbean ports. The Atlas Line and the Boston Fruit Company's steamers maintain communication with New York, Boston, Philadelphia, and Baltimore. A steamer from Kingston circumnavigates the island once a week.

Government, Education, and Religion.— The executive authority is vested in a governor, appointed by the king. He is assisted by a secretary, attorney-general, director of public works, collector-general, and the commanding officer of the military forces. The legislative council consists of 29 members, with the governor as

president; of the whole number 14 are elected (term 5 years), 10 nominated, and 5 are the administrative officers mentioned above. Admittance to the lower grades of the civil service is gained through competitive examinations. The government medical service has in charge 18 public hospitals. The police system includes more than 100 stations in different parts of the island; a force of more than 1,500 men (769 district constables); several prisons, reformatories, and industrial schools. In 1902 the strength of the regular forces stationed in Jamaica was 1,866 officers and men; militia, 763. Fortifications and batteries are at Port Royal, Rocky Point, Salt Pond's Hill, Rock Fort, Fort Augusta, Fort Clarence, and Apostles' Battery. Ships of the royal navy on the North American and West India station are 13 in number (see also below in connection with Kingston). The judicial department includes a high court of justice (9 members), circuit courts, and a magistrate in each parish. Public revenue and expenditure in recent years, each about $3,000,000; the public debt in 1897 was given as $7,581,000. Government schools in 1902 numbered 728, with 84,779 pupils. There are four government training colleges for teachers; several endowed secondary, industrial, and high schools; a public lyceum and museum, with a valuable library, etc. Local examinations are held on the island by the University of Cambridge. In 1870 the Church of England was disestablished and disendowed on the island; in 1902 churches and chapels were: Church of England, 219; Baptist, 189; Methodist, 128; Presbyterian, 73; United Methodist Free Church, 43; Roman Catholic, 28; Moravian, 27; Congregational, 26; Christian Church, 20; and Church of Scotland, 10.

Dependencies.— The Cayman Islands, Turks, and Caicos Islands, and the Morant and Pedro Cays are attached to Jamaica for administrative purposes. Of these, the first group lies in the Caribbean Sea, 180 miles northwest of Jamaica, and comprises Grand Cayman, 17 miles long, 4 to 7 broad; Little Cayman, 9 miles long and about 1 mile broad; and Cayman Brae, 10 miles long and 1 mile broad. The government is administered by a commissioner, and magistrates are appointed by the governor of Jamaica. The population will be referred to under *History*. The second group, Turks and Caicos Islands, situated nearly 500 miles northeast of Jamaica, geographically belongs to the Bahamas; but the governor of Jamaica exercises a supervising power over the local authorities (a commissioner and legislative board of 5 members). Area, 165½ square miles; population, 5,350; capital, Grand Turk; products, salt, sponges, pink pearl, etc. The Morant Cays and Pedro Cays are situated, respectively, about 33 miles southeast, and about 45 miles southwest, of Jamaica.

Chief Towns.— Kingston, the capital, has 46,542 inhabitants, a good water-supply and system of sewerage, well-lighted streets, large shops, a street-railway, etc. The town is, however, unattractive; residences of the officials and wealthy merchants are built in the suburbs. Public institutions are the museum, library, colonial offices, schools, churches, almshouse, penitentiary, asylum, and Victoria Market. Four miles away is the important naval station of Port Royal, headquarters for the British West India naval forces, and a strongly fortified place. Spanish Town, population 5,019, at one time the capital, is situated 15 miles west of Kingston. Port Antonio, on the northeast side of the island; Montego Bay, population 4,803; Savanna-la-Mar, Falmouth, Lucea, St. Ann's Bay, Buff Bay, Port Morant, Black River, etc., are distributed among the three counties of Surrey, Middlesex, and Cornwall.

History.— The native word from which we have the name Jamaica signifies "island of fountains." Names recalling the old Spanish occupation of the island are Montego (Spanish Manteca), Bog Walk (Spanish Boca del Agua), Wag Water (Spanish Agua Alta), and others. As a Spanish colony (1509–1665) Jamaica was backward and of little consequence; the total population in the year last mentioned, when an English fleet captured it, was only 3,000. One half of that number took refuge in Cuba. The settlers who arrived subsequently were peasants from Scotland, Ireland, and England, English subjects from the other West Indian islands, and Jewish traders from Minorca. Negroes were brought from Africa in great numbers; the old town of Port Royal being chosen as a convenient point from which to reship slaves to the other islands and the mainland. That town, once a place of great wealth and importance, was ruined by repeated calamities. "On 7 June 1692 happened that earthquake which swallowed up great part of Port Royal," says Edwards, who explains that the town "was chiefly built on a bank of sand, adhering to a rock in the sea, and a very slight concussion, aided by the weight of the buildings, would probably have accomplished its destruction." Hurricanes in 1712 and 1722, and a conflagration 13 July 1815, completed the work of obliteration. Toward the close of the 18th century the island was occupied by large plantations, and was exceedingly productive. Before that time 610,000 slaves had been landed at Port Royal. The freeing of the negroes (see EMANCIPATION) resulted in the abandonment of the island by many landlords. The effort to regain the lost prosperity through diversified agriculture has already been mentioned. In August 1903 a hurricane inflicted great injury at several points in Jamaica, and destroyed life and property on the Cayman Islands. The population of the latter was 4,322 according to the census of 1891, and the productions tropical fruits.

Consult: Hill, 'Cuba and Porto Rico, with the other Islands of the West Indies'; and Edwards, 'History of the British West Indies.'

MARRION WILCOX,
Authority on Spanish America.

Jamaica, a part of the borough of Queens in the city of New York. Prior to 1 Jan. 1898 Jamaica was the county-seat of Queens County on Long Island, but that portion of Queens County in which Jamaica is situated has been incorporated in the city of New York (Greater New York). The town was settled as early as 1656. Several houses built before the Revolutionary War are in a good state of preservation. In the vicinity there are a large number of market gardens. One of the New York State normal schools is situated in Jamaica.

Jamaica Bay, an inlet of the Atlantic Ocean which indents the southeast shore of Long Island. It is nearly circular in shape; the Rockaway Beach extends across the side toward the ocean and makes of the bay a land-locked body

of water. A number of islands are in the middle and at the entrance. The whole of the bay, except an inlet, Head Bay on the east shore, is within the limits of New York city; Coney Island is near the entrance to the bay.

James, Saint, called the "Greater," the son of Zebedee. He was called to be an apostle, together with his brother Saint John, as they were mending their nets with their father, who was a fisherman. They then followed Christ, were witnesses with Saint Peter of the transfiguration, and accompanied our Lord in the garden of Gethsemane. In the lists of the apostles given in the synoptic Gospels and in the Acts the names of Peter, Andrew, James, and John stand first: and it is plain that these four were at the head of the 12 throughout. After the ascension Saint James persevered in prayer with the other apostles and the women and the Lord's brethren. Nothing further is certainly known of him till the passover of 44, when, being in Jerusalem, the Jews stirred up Herod Agrippa I. against him, who put him to a cruel death. Thus Saint James was the first of the apostles who suffered martyrdom. There is a legend that he went to Spain, and that his bones lent miraculous aid to the Spaniards against the Saracens.

James, Saint, called the "Less," an apostle, the brother or cousin of Jesus. He is called in Scripture the "Just," and is probably the apostle described in Matt. x. 3 and elsewhere as the son of Alpheus. He was the head of the church in Jerusalem when the Scribes and Pharisees threw him down from the gable of the temple, and a fuller dashed out his brains with a club, about the year 62. This is the account of his death given by Hegesippus, a Christian of Jewish origin, who lived in the middle of the 2d century, and it differs somewhat from the narrative of Josephus. Some critics maintain that James, the son of Alpheus, was one person, and James, the brother of Jesus, another. Whether James was the author of the epistle which bears his name is considered doubtful.

James I., king of England, and VI. of Scotland, the only child of Mary, Queen of Scots, by her cousin Henry Stuart, Lord Darnley: b. Edinburgh Castle 19 June 1566; d. palace of Theobalds, Hertfordshire, 27 March 1625. In 1567 he was solemnly crowned at Stirling, and from that time all public acts ran in his name. His childhood was passed in civil wars, under the regencies of Murray, Mar, and Morton, during which time he resided in Stirling Castle, under the tuition of the celebrated Buchanan. From the first he seems to have imbibed those exalted notions of the royal authority and divine right which proved so injurious to his posterity. But James soon found it advisable to ally himself with Queen Elizabeth and accept a pension from her. When, however, it became apparent that the life of his mother was in danger from the sentence of an English judicature, James sent representatives to England to intercede with Elizabeth; but his whole procedure in the matter shows a singular callousness. As a matter of form he ordered the clergy to pray for his mother, but when the news of Mary's execution arrived James was not much moved, though he attempted to make a show of indignation by condemning one of the commissioners to death, a sentence which, however, he commuted to banishment. On 23 Nov. 1589 James married Anne, daughter of Frederick II., king of Denmark. On his return home, after passing the winter in festivities at Copenhagen, he was in some danger from the unruliness of the nobles; and for several succeeding years of his reign the history of Scotland displays much turbulence and party contest. In 1603 James succeeded to the crown of England, on the death of Elizabeth, and proceeded amidst the acclamations of his new subjects to London. One of his first acts was to bestow a profusion of honors and titles on the inhabitants of both countries. At a conference held at Hampton Court between the divines of the Established Church and the Puritans James exhibited the ill-will he bore to popular schemes of church government. The meeting of Parliament also enabled him to assert those principles of absolute power in the crown which he could never practically maintain, but the theoretical claim of which provided the increasing spirit of freedom in the House of Commons with constant matter of alarm and contention. Although James had behaved with great lenity to the Catholics in Scotland, those in England were so disappointed in their expectations of favor, that the famous gunpowder plot was concerted in 1605, the object of which was to blow up the king and Parliament. (See GUNPOWDER PLOT, THE.) In 1612 he lost his eldest son Henry, a prince of great promise, then 19; and in the following year the eventful marriage of his daughter Elizabeth with the elector palatine took place. No circumstance in the reign of James was more unpopular than his treatment of the celebrated Sir Walter Raleigh (q.v.). James had set his heart on marrying his son Charles to a Spanish princess, but the negotiations failed through the overbearing temper of Buckingham, the royal favorite, who quarreled with the grandees of the Spanish court. The close of the life of James was marked by violent contests with his Parliament. He was also much disquieted by the misfortune of his son-in-law, the elector palatine, who, having been induced to accept the crown of Bohemia, and to head the Protestant interest in Germany, was stripped of all his dominions by the emperor. Urged by national feelings for the Protestant cause, he was at length (10 March 1624) induced to declare war against Spain and the emperor; and troops were sent to Holland to act in conjunction with Prince Maurice. James was not destitute of abilities nor of good intentions, but the former were not those of a ruler, and he was neither beloved at home nor esteemed abroad. He received during his lifetime a great deal of adulation on the score of his literary abilities. Consult: Aikin, 'Memoirs of the Court of King James the First' (1822); Burton, 'History of Scotland' (1873); Macaulay, 'History of England' (1858); S. R. Gardner, 'History of England from the Accession of James I. to the Spanish Marriage' (1863–9); ibid., 'The First Two Stuarts' (1876).

James II., king of England, second son of Charles I. and of Henrietta of France: b. London 15 Oct. 1633; d. St. Germain, France, 16 Sept. 1701. He was at once declared Duke of York, though only formally raised to that

dignity in 1643. At the Restoration in 1660 he took the command of the fleet, as lord high-admiral, and was also made Warden of the Cinque Ports. He had previously married Anne, daughter of Chancellor Hyde, afterward Lord Clarendon (q.v.). In 1671 the Duchess of York died. Before her death she declared herself a convert to the Roman Catholic faith, which had been secretly that of the duke for many years, and was now openly avowed by him. This declaration laid the foundation of the opposition which finally drove him from the throne. A test act being soon after passed, to prevent Roman Catholics from holding public employments, the duke was obliged to resign his command. On 21 Nov. 1671 he married Mary Beatrice of Este, daughter of the Duke of Modena, and in 1677 his eldest daughter, Mary, was united to William, prince of Orange.

On the death of Charles II., 6 Feb. 1685, the duke succeeded, under the title of James II., and from the time of his ascending the throne seems to have acted with a steady determination to render himself absolute, and to restore the Roman Catholic religion. At variance with his Parliament he was under the necessity of accepting a pension from Louis XIV. He sent an agent to Rome to pave the way for a solemn re-admission of England into the bosom of that Church, conduct which encouraged the rebellion of the Duke of Monmouth. The unrelenting temper of James was again exhibited in the executions on this account. The legal proceedings under Jeffreys were brutal in the extreme; and no fewer than 320 persons were hanged on the western circuit alone, which attained an unenviable notoriety as the Bloody Assize. He gradually proceeded to a direct attack on the Established Church, by the formation of an ecclesiastical commission, which cited before it all clergymen who had done anything to displease the court. Apparently to conciliate the Puritans a declaration of indulgence in matters of religion was ordered to be read by the clergy in all the churches of the kingdom, but its real object, however, was to favor the Roman Catholic element. Seven bishops met and drew up a loyal and humble petition against this ordinance, and for this act they were sent to the Tower, on a charge of seditious libel. On 29 June 1688 they were acquitted amid the most enthusiastic rejoicings of the populace. The innovations, in regard both to the religion and government, gradually united opposing interests, and a large body of nobility and gentry concurred in an application to the Prince of Orange, signed by seven of the most prominent and influential political leaders, to occupy the throne. James, who was long kept in ignorance of these transactions, when informed of them by his minister at the Hague, was struck with terror equal to his former infatuation; and, immediately repealing all his obnoxious acts, practised every method to gain popularity. All confidence was, however, destroyed between the king and the people. William arrived with his fleet in Torbay 5 Nov. 1688, and landed his forces, amounting to 14,000 men. Several men of rank went over to William, and the royal army began to desert by entire regiments. Incapable of any vigorous resolution, and finding his overtures of accommodation disregarded, James resolved to quit the country. He repaired to St. Germain, where he was received with great kindness and hospitality by Louis XIV. In the meantime the throne of Great Britain was declared abdicated, and was occupied, with the national and parliamentary consent, by his eldest daughter, Mary, and her husband, William, conjointly; Anne, who had equally with her sister been educated a strict Protestant, being declared next in succession, to the exclusion of her infant brother, known in history as the Pretender, who had been born on 10 June of that year. Assisted by Louis XIV., James was enabled, in March 1689, to make an attempt for the recovery of Ireland. The battle of the Boyne, fought 1 July 1690, compelled him to return to France. All succeeding projects for his restoration proved equally abortive. Consult: Burnet, 'History of the Reign of King James the Second'; Cavelli, 'Les derniers Stuarts à Saint Germain-en-Laye' (1871); Klopp, 'Der Fall des Hauses Stuart' (1875–88).

James I., king of Scotland, of the house of Stuart: b. Dunfermline 1394; d. Perth 21 Feb. 1437. He was the son of Robert III. In 1406, while on his way to France, he was taken by the English and carried to the Tower of London. For the next 18 years he remained a prisoner in England, being confined during part of his captivity in Nottingham Castle, Evesham, and Windsor Castle, where he wrote the 'King's Quhair' and other poems. Robert III. died very shortly after learning of his son's captivity, and James was proclaimed king; but during the remainder of the reign of Henry IV., and the whole of that of Henry V., he was detained in England, with a view to prevent the alliance of Scotland with France. In 1424, under the regency of the Duke of Bedford, he was restored to his kingdom, at which time he was in his 30th year. Previous to his departure he married Jane or Joanna Beaufort, daughter of the Earl of Somerset, a lady of the blood royal of England, who is the fair dame alluded to in his poem 'The King's Quhair.' On his return to Scotland he restored Scotland to some degree of order, but so severe was his treatment of his turbulent nobles that he was at last murdered by their emissaries at Perth in the 13th year of his reign.

James II., king of Scotland, son of James I.: b. 16 Oct. 1430; d. Roxburgh, Scotland, 3 Aug. 1460. During the minority his kingdom was distracted by struggles for power between his tutors Livingston and Crichton and the great house of Douglas. In 1449 he assumed the government and married Mary of Guelderland. He had latterly allied himself with the Douglases, but being deprived of all real power, he resolved to free himself from their yoke. This he did in 1452 by inducing the Earl of Douglas to come to Stirling Castle, where he stabbed him with his own hand. He then quelled a powerful insurrection headed by the next earl, whose lands were confiscated. In 1460 he infringed a truce with Henry VI. of England by besieging the castle of Roxburgh, and was killed by the bursting of a cannon in the 29th year of his age.

James, III., king of Scotland, son of James II.: b. 10 July 1451; d. 11 June 1488. He was crowned at Kelso on his father's death, but in 1465 came under the influence of Bishop Ken-

nedy and the Boyd family, one of the latter espousing the king's sister in 1467. James married Margaret of Denmark in 1469 and dismissed the Boyds from favor only to advance other favorites. Prominent among these was Cochrane, through whom one brother of James was obliged to flee the kingdom, and another was put to death. The nobles seized Cochrane and five others and hanged them. Subsequently a plot was formed to dethrone the king, and though many peers remained loyal to him the royal army was defeated at Sauchie, near Stirling. James escaped from the field, but was murdered during his flight.

James IV., king of Scotland: b. 17 March 1473; d. Flodden 9 Sept. 1513. He was the son of James III. He commanded the nobles who vanquished and killed his father at Sauchieburn, and was crowned at Scone in June 1488. He married Margaret, the daughter of Henry VII. of England, but taking umbrage at the hostile attitude of his brother-in-law, Henry VIII., allied himself with France. He was defeated and slain at the battle of Flodden (q.v.) during an invasion of England.

James V., king of Scotland, son of James IV.: b. Linlithgow, Scotland, 10 April 1512; d. Falkland Palace 14 Dec. 1542. He came to the throne under the regency of his mother in 1513 and assumed the reins of government in 1528. He married Madeleine of France in 1537, and on her death married the daughter of the Duke of Guise, Mary of Lorraine, in 1538. He ruled with much vigor and decision, and on account of his mingling freely with his people was called "the king of the commons." Becoming entangled in war with England in 1542 he was defeated at the battle of Solway Moss and died a month later. He was succeeded by his daughter, Mary, Queen of Scots, who was but seven days old at his death.

James, Bushrod Washington, American oculist: b. Philadelphia 25 Aug. 1836. He was graduated from the Homœopathic Medical College of Pennsylvania in 1857, became well known as a practitioner, was elected president of the Pennsylvania Homœopathic Medical Society in 1873, of the American Institute of Homœopathy in 1883, and in 1896 was vice-president of the Homœopathic Medical Congress held at London, England. His publications include: 'American Climates and Resorts' (1889), a manual of climatology (1889); 'Alaskana' (1892); 'Echoes of Battle' (1895); and 'Alaska: Its Neglected Past and its Brilliant Future' (1897; rev. ed. 1901).

James, Charles, English novelist and playwright: b. London 26 Dec. 1858. He received a private education, became lieutenant-colonel of the Royal West Kent regiment, and published: 'A Bird of Paradise' (1889); 'The New Faith' (1890); 'Honors Easy' (1892); 'A Worker in Iron' (1894); 'At the Sign of the Ostrich' (1895); and 'Where Thames is Wide' (1896); etc.

James, Edmund Janes, American college president: b. Jacksonville, Ill., 21 May 1855. He was educated at Northwestern University and at Harvard, was principal of the high schools at Evanston and Normal, Ill. (1878–82), professor of public finance and administration in the Wharton School of Finance and Economy of the University of Pennsylvania (1883–95), and professor of political and social science in the university (1884–95). In 1896 he became professor of public administration in the University of Chicago and director of the extension division; in 1902 president of the Northwestern University; and in 1905 president of the University of Illinois. He became president of the American Academy of Political and Social Science in 1889, and in 1891–5 was president of the American Society for the Extension of University Teaching. His writings include: 'The Legal Tender Decisions' (1887); 'The Canal and the Railway' (1890); 'The Federal Constitution of Germany' (1890); and 'The Growth of Great Cities in Area and Population' (1900).

James, Florence, "Florence Warden," English novelist: b. Hanworth, Middlesex, 16 May 1857. She taught as a governess, 1875–80, and was on the stage, 1880–5. Her novels, many of which are strongly sensational in tone, have been very popular in this country as well as in England. They are published under the pseudonym "Florence Warden," and among them are: 'At the World's Mercy'; 'The House on the Marsh,' which established her reputation; 'A Prince of Darkness'; 'Scheherezade'; 'A Perfect Fool'; 'Pretty Miss Smith'; 'A Lady in Black' (1897); 'A Very Rough Diamond'; 'Morals and Millions'; 'One too Often' (1901); 'A House with a History.'

James, George Payne Rainsford, English novelist and historian: b. London 9 Aug. 1801; d. Venice 9 May 1860. As a young man he traveled widely on the Continent. He began his writing under the influence of Scott's novels, and wrote in all over 100 novels; he was also known as the author of popular historical books, and in 1839 was appointed historiographer royal, in this capacity writing 'History of the United States Boundary Question' and 'The Corn Laws.' In 1850 he was British consul in Massachusetts, two years later was transferred to Norfolk, Va., and in 1856 became consul general at Venice. His novels include: 'Richelieu' (written 1825, published 1829); 'Darnley' (1829); 'DeLorme' (1830); 'Philip Augustus' (1831); 'Henry Masterton' (1832); 'The Gypsy' (1835); 'Attila' (1837); 'Man at Arms' (1848); 'King's Highway' (1848); 'Agincourt' (1844); 'The Smuggler' (1845); 'Ticonderoga' (1854). His historical works include: 'Memoirs of Great Commanders' (1832); 'Life of the Black Prince' (1836); 'Life of Richard I.' (1842–9). James' novels were very popular when first written, and a new edition appeared in 1903.

James, George Wharton, American explorer, lecturer and ethnologist: b. Gainsborough, Lincolnshire, England, 27 Sept. 1858. He has spent many years in making geological and other researches in California, and elsewhere in the southwestern United States, and is a member of various learned societies in this country and England. He has published: 'The Lick Observatory' (1888); 'Nature Sermons'; 'Picturesque Southern California'; 'Missions and Mission Indians of California'; 'From Alpine Snow to Semi-Tropical Sea'; 'In and Around the Grand Canyon' (1900); 'Indian Basketry'

(1900); 'The Indians of the Painted Desert Region' (1903).

James, Henry, American Swedenborgian theologian: b. Albany, N. Y., 3 June 1811; d. Cambridge, Mass., 18 Dec. 1882. He was educated at Union College and Princeton Theological Seminary, traveled abroad and became a Sandemanian and later a Swedenborgian. He subsequently lived in New York, Newport, R. I., and lastly at Cambridge. Among the most noted of his works on morals and religion are: 'What is the State?' (1845); 'Moralism and Christianity' (1852); 'Lectures and Miscellanies' (1852); 'The Nature of Evil' (1855); 'Christianity the Logic of Creation' (1857); 'Substance and Shadow' (1863); 'The Secret of Swedenborg' (1869). His 'Literary Remains,' edited by William James, appeared in 1885.

James, Henry, American novelist and essayist: b. New York 15 April 1843. He was the son of a clergyman, Henry James (q.v.), who gained fame as a writer on philosophico-theological subjects, first from the Sandemanian, and afterward from the Swedenborgian standpoint. The novelist, known until his father's death as Henry James, Junior, was educated under his father's guidance in New York, Geneva, Paris, and Boulogne. He lived in Europe with his parents during the years 1855–9, and after his return to the United States studied in the Harvard Law School in 1862. He began his literary career about 1865 as a contributor to American magazines, and soon afterward published 'The Story of a Year, a tale of the American Civil War.' In 1869 he took up his residence in Europe, and since then he has resided chiefly in England and Italy. 'Roderick Hudson' (1875) was his first long novel. His subsequent novels include: 'Watch and Ward' (1878), originally published in 1871 in the 'Atlantic Monthly'; 'The American' (1877), by some regarded as his best; 'Daisy Miller' (1878); 'The Europeans: a Sketch' (1878); 'Confidence' (1880); 'Washington Square' (1880); 'A Bundle of Letters' (1880); 'Diary of a Man of Fifty' (1880); 'The Portrait of a Lady' (1881); 'The Bostonians' (1886); 'Princess Casamassima' (1886); 'The Tragic Muse' (1892); 'The Other House' (1896); 'The Spoils of Poynton' (1897); 'What Maisie Knew' (1897); 'The Awkward Age' (1899); 'The Sacred Fount' (1901); 'The Wings of a Dove' (1902); 'The Better Sort' (1903). He has also written a great many short stories, among which are: 'A Passionate Pilgrim, and other Tales' (1875); 'Pension Beaurepas' (1878); 'An International Episode' (1879); 'The Madonna of the Future, and Other Tales' (1879); 'The Siege of London' (1883); 'The Point of View' (1883); 'Tales of Three Cities' (1884); 'The Author of Beltraffio, and other Stories' (1885); 'Stories Revived' (1885); 'The Aspern Papers, and other Stories' (1888); 'The Reverberator' (1888); 'A London Life, and other Stories' (1889); 'The Lesson of the Master, and other Stories' (1892); 'The Real Thing, and other Tales' (1893); 'Picture and Text' (1893); 'The Private Life' (1893), a collection of stories; 'The Album' (1894); 'The Reprobate' (1894); 'Tenants' (1894); 'Disengaged' (1894); 'Terminations, and other Stories' (1896); 'In a Cage' (1898); 'The Two Magics' (1898), consisting of two stories; and 'The Soft Side' (1900), a series of stories. In very many of his stories he describes the life of Americans in Europe, and they depend for much of their interest upon the contrasts between American and European character and institutions. Though a very prolific writer, he is never careless, his style being always felicitous, while in respect to the substance of his work he ranks as the subtlest of American novelists. A dramatic version of 'The American' was produced in London in 1891, but neither it nor his subsequent play 'Guy Domville' (1895) was successful. He has turned his intimate knowledge of modern French literature to good account in his volume of essays entitled 'French Poets and Novelists' (1878). Other works of a similar kind are 'Transatlantic Sketches' (1875); 'Portraits of Places' (1884); 'A Little Tour in France' (1884; new ed. 1900); 'Partial Portraits' (1888); 'Essays in London and Elsewhere' (1893). He also contributed the volume on 'Hawthorne' (1879) in the 'English Men of Letters' series, and in 1903 published 'William Wetmore Story and his Friends,' a notable biography.

James, Thomas Lemuel, American banker: b. Utica, N. Y., 29 March 1831. He early learned the printer's business and bought out a weekly Whig paper, the 'Madison County Journal,' at Hamilton; and in 1856 changed its name to the 'Democrat-Republican,' which was for 10 years the most powerful Republican organ in Madison County. He was collector of canal tolls at Hamilton 1854–85; was appointed inspector of customs in New York 1861; weigher in 1864; and in 1870 was promoted to be deputy collector in charge of the bonded warehouse, which department he immediately proceeded to arrange according to a new system. In 1873 President Grant appointed him postmaster of New York, and he was reappointed by President Hayes in 1877. He filled this office with signal success and originated improvements in the delivery system involving the whole postal methods of the United States. President Garfield in 1881 gave him the portfolio of postmaster-general, and his chief important service during his 10 months' incumbency was his initiation of inquiries which led to the investigation of the Star Route frauds. In 1882 he became president of the Lincoln National Bank of New York.

James, William, American psychologist and philosopher: b. New York 11 Jan. 1842. He is the son of Henry James, theologian (q.v.), and brother of Henry James, novelist (q.v.). He was educated in private schools and by tutors in New York and abroad, studied in 1861–3 at the Lawrence Scientific School of Harvard University, accompanied the Thayer expedition to Brazil in 1864–5, was graduated from the Harvard Medical School in 1870, in 1872 was appointed instructor in anatomy and physiology at the school, and in 1876 assistant professor of physiology. In 1885 he was appointed assistant professor of philosophy in the university, in 1889 professor of psychology, and subsequently professor of philosophy. He was Gifford lecturer on natural religion in the University of Edinburgh in 1899–1901. His best known work has

been done in the domain of analytical psychology, in which he won European recognition. His works are marked by a most readable style and skilful exposition of different topics. He was a founder of the American Society for Psychological Research in 1884, and published: 'Principles of Psychology' (1890); and 'Psychology, Briefer Course' (1892), both popular text-books: 'The Will to Believe' (1897); 'Human Immortality' (1898); 'Talks to Teachers on Psychology' (1899); and 'The Varieties of Religious Experience' (1902).

James Bay, an inlet of Hudson Bay, in the southern part. The bay was named in honor of Captain Thomas James, an English navigator, who explored this body of water in 1631–3. The bay is about 320 miles long and from 140 to 160 miles wide. It contains a number of islands, the largest, Agomska, being about 70 miles in length. Several large rivers flow into James Bay; the Albany, Moose, Noddawai, and East Main are the largest. Moose Factory, at the mouth of Moose River, on the southern shore, is the most important Canadian trading station, next to York Factory, of the Hudson's Bay Company.

James, Epistle of, an encyclical letter addressed to the Jews of the Dispersion. It was written by a Jew for Jewish readers, all of whom are supposed to be subject to the Jewish law. Its date is about 50 A.D., at latest, certainly before the fall of Jerusalem. The epistle was not at first admitted into the canon, and it is not much quoted by the earlier writers, Origen indeed being the earliest we find quoting it by name. Eusebius places it in his list of books controverted but recognized by most (*Antilegomena*), and Jerome expresses the doubt more strongly still. It was finally declared canonical by the third Council of Carthage (397), and already we find it acknowledged by Cyril of Jerusalem, Epiphanius of Cyprus, Athanasius, Gregory of Nazianzus, and all later theologians, down to the time of the Reformation, when it was rejected by Erasmus and Cardinal Cajetan, and stigmatized by Luther as "a downright epistle of straw . . . with nothing evangelical about it," although Calvin thought that it was worthy of an apostle.

The aim of the epistle is throughout ethical rather than doctrinal, Christianity being prominently put forward as the ethical fulfilment of the law, the perfect man being he whose faith has constantly proved itself in practice, and who is patient under all tribulation. It echoes closely the language and method of Christ himself; as Beyschlag says, "essentially it is the teaching of Christ, and thus there is little teaching about Christ." Besides the discourses of the Master, especially his Sermon on the Mount, we find distinct traces of familiarity with the Wisdom of Solomon, and the Ecclesiasticus of the son of Sirach. Formalism, greed of gain, respect of persons, falsehood, evil-speaking, boasting, wrangling and bitterness in debate, attention to dogmatic definitions instead of holiness of life — such are the sins against which the author inveighs with vivid and abrupt invective. His Greek is unusually pure, and some scholars, as Schmidt, Bertholdt, and Bishop Wordsworth, have supposed that the epistle was first written in Aramaic and afterward translated.

The passage in the second chapter (14–26) has been interpreted by many theologians as a direct attack on the Pauline view of faith and justification, that Christ by his death had accomplished a new order of salvation, in which the law, which was merely temporary, was now abrogated, and that thus Christianity had fitted itself to become a universal religion; but Paul's conception is more philosophical and comprehensive, although it by no means excludes the conception of James, whose faith without works is not Paul's justifying faith at all, but the profitless faith without love condemned in 1 Cor. xiii.

The Tübingen school, as might have been expected, claimed the Epistle of James as a polemic against Paul, and made its author a pseudonymous writer of later time, who employed the name of James as an accepted type of spiritualized Jewish Christianity.

Bibliography.— Besides the general introductions of Bleek, De Wette, S. Davidson, Hilgenfeld, Holtzmann, Salmon, Dods, and Weiss, and the works on the New Testament canon by Kirchofer, Overbeck, Westcott, and Zahn, may be consulted the special commentaries by Bassett (1876), Reuss (1878), Erdmann (1881), Schegg (1883), E. H. Plumptre (1884), Beyschlag (1888; the 5th ed. of the commentary in the 'Exegetisches Handbuch'), and R. Johnstone (2d ed. 1888).

James Island, an island in Charleston harbor, in South Carolina. It is separated from the city of Charleston by the Ashley River and the South Channel of the harbor, here a little over a mile wide. On the northeast coast of the island is Fort Johnson and nearby a quarantine station. Just northeast of the island is Fort Sumter (q.v.). The battle of Secessionville, fought on 16 June 1862, and several other engagements of the Civil War, took place on this island.

James Milliken University, an organization which includes three institutions of learning: the Lincoln College, located at Lincoln, Ill.; the Industrial School and the Decatur College, at Decatur, Ill. The synods of the Cumberland Presbyterian Church of Iowa, Indiana, and Illinois, founded, in 1865, the Lincoln College. Schools of art, music and elocution, a classic college, and a preparatory department, at times a commercial school, all made up Lincoln College. The Decatur College and Industrial School are endowed institutions opened in 1903. In 1900–01 a fund for a university was provided by gifts from James Milliken, an appropriation from the Cumberland Presbyterian synods of Iowa, Illinois, and Indiana, and donations from the citizens of Decatur. The three schools mentioned were united in the James Milliken University, but each one retains to a certain degree its own independence.

James River, a stream which has its rise in Wells County, in North Dakota, and flows south into South Dakota, and in a southerly direction across the State into the Missouri River. Some of the largest cities and towns of the interior of both North and South Dakota are on or near the James River; Aberdeen, Huron, Mitchell, and Yankton near the mouth, in South Dakota; and Jamestown in North Dakota. It is about 450 miles long.

James River, the largest river in Virginia, has its rise in the western part of the State, in

the Alleghany Mountains; the head-waters are the Jackson and Cowpasture rivers which unite at Covington, in Virginia. The James flows southeast to Buchanan, in Botetourt County, then northeast to Balcony Falls, where it breaks through the Blue Ridge Mountains, again southeast to Lynchburg, then northeast to Scottsville, from which point the general course is southeast to the Chesapeake Bay. Its length is about 456 miles. At the Rocketts, just below Richmond, where the river becomes a tidal stream, is the head of navigation for steamboats of 130 tons, about 150 miles from the mouth. Ocean steamers come up the river as far as City Point, at the mouth of the Appomattox River. From City Point to the mouth, 66 miles, the stream is really a broad, deep estuary with Hampton Roads (q.v.) at its entrance to the Chesapeake. The falls in the river at Richmond, about 100 feet in six miles, furnish a large amount of water power. From Richmond to Buchanan, a distance of nearly 200 miles, the Kanawha Canal follows the course of the river and utilizes extensive reaches of slack water navigation. The chief tributaries of the James are the Chickahominy (q.v.) from the north, and the Appomattox from the south. The broad body of water at the entrance into Chesapeake was early explored by European navigators, and Jamestown (q.v.), the first permanent English settlement, was located on this river.

Jameson, jā'mē-sŏn, **Anna Brownell Murphy,** English author and art critic: b. Dublin 17 May 1794; d. Ealing, Middlesex, England, 19 March 1860. In 1827 she was married to Robert Jameson, afterward speaker of the House of Assembly of Upper Canada, and attorney-general, but the union proved unhappy. She made her first appearance as an authoress by the publication of the 'Diary of an Ennuyée' (1826), which was very favorably received. Her 'Loves of the Poets' appeared (1829), and was succeeded by 'Memoirs of Female Sovereigns' and 'Characteristics of Shakespeare's Women.' In 1836 Mrs. Jameson visited her husband in Canada, and published 'Winter Studies and Summer Rambles in Canada' (1838). Later works of hers include: 'Handbook to the Public Picture-galleries of Art' (1842); 'Companion to the Private Galleries of Art in London' (1844); 'Memoirs of the Early Italian Painters' (1845); 'Memoirs and Essays on Art, Literature, and Social Morals' (1846); 'Sacred and Legendary Art' (1848); 'Legends of the Monastic Orders' (1850); 'Legends of the Madonna' (1852). In these the author has given admirable expositions of the works of the old masters and the religious bearings of mediæval art. Few writers have done so much to refine the public taste, and diffuse sound canons of art criticism. Consult: Macpherson, 'Memoirs of the Life of Anna Jameson' (1878).

Jameson, John Franklin, American historical writer: b. Boston 1 April 1859. He was graduated from Amherst College in 1879 and was professor of history at Brown University 1888–1901. He has been managing editor of the 'American Historical Review' from 1895 and the head of the department of history at the University of Chicago from 1901. He has published 'History of Historical Writing in America' (1891); 'Dictionary of United States History' (1894); etc.

Jameson, Leander Starr, Scottish physician, administrator, and freebooter: b. Edinburgh 8 Feb. 1853. He studied medicine in Edinburgh and London, began professional practice at Kimberley, Cape Colony, in 1878, in 1891 became administrator of Rhodesia for the British South Africa Company, and in 1895 led the now well known raid into the Transvaal. During disturbances between the Boers and the Uitlanders, or foreigners, in the South African Republic, Jameson had, by order of Cecil Rhodes (q.v.), then premier at the Cape, assembled a Rhodesian military force on the Transvaal border, to act in case of emergency. On 29 December, with 600 troopers, Jameson, proceeding on his own judgment, entered the South African Republic for the support of the Uitlander party. His force was compelled to surrender to the Boers at Doornkoop on 2 Jan. 1896. Jameson, with his officers, was handed over by President Kruger to the British government for trial. He was sentenced, May 1896, to ten months' imprisonment, but in December was released because of illness. In 1897 he returned to Rhodesia, and in the second Boer war served in the English army. Jameson's surrender was followed by a congratulatory message to Kruger from the German emperor which for a time threatened serious consequences.

Jameson, Patrick Henry, American physician: b. Monroe Township, Jefferson County, Ind., 8 April 1824. At 19 he went to Indianapolis, taught school there four years, studying medicine meanwhile, and was graduated from Jefferson Medical College, Philadelphia, in 1849. He then returned to Indianapolis, where he became very prominent as a physician. During the Civil War he served as military surgeon and was commissioner of the Indiana hospital for the insane, 1861–80. He was likewise active in the establishment of the Indianapolis city hospital and in the organization of the University of Indianapolis, and was for 30 years a director of Butler College, at Indianapolis. From 1863 to 1869 he was a member of the Indianapolis common council and compiled the city ordinances in 1865. He has published 'Memoirs of Prominent Physicians of Indianapolis.'

Jameson Raid, The. See JAMESON, LEANDER STARR.

Jamestown, jāmz'town, N. Y., city in Chautauqua County, on the Conewango Creek, which is the outlet of Chautauqua Lake; and on the Erie and the Jamestown & C. L. R.R.'s; about three miles from Chautauqua Lake, 25 miles from Lake Erie, and 70 miles, by rail, southwest of Buffalo. Lake steamers and trolley cars connect it with a number of the nearby towns. The first permanent settlement was made in 1810, by settlers in search of agricultural lands. The location, so near the outlet of the lake and in the midst of a fertile agricultural region, attracted settlers, and in 1815 the town was planned; and was incorporated as a village in 1827. The country around developed rapidly, but Jamestown was not chartered as a city until 1886. The chief manufactures are furniture, woolen goods, photographic paper, metallic goods, boots and shoes, agricultural implements, and brooms. It has saw-mills, canning factories, lumber and brick yards. The city has the James Prendergast Free Library, containing about 17,000 volumes, and an excellent high school.

The municipal officers are a mayor, who holds office two years, a city council, a clerk, overseer of the poor, sealer of weights and measures, constables, assessors, justices of the peace, and police justices, all of whom are elected by the people. Other subordinate officials are appointed by the mayor subject to the approval of the council. Jamestown was the home of Reuben E. Fenton (q.v.). There are about 8,000 Swedes now living in Jamestown. Although they are adopted citizens, those born in Sweden still use their native language in the homes; and they have their own Swedish papers and literature. Pop. (1890) 16,038; (1900) 22,892.

Jamestown, N. D., city, county-seat of Stutsman County; on the James River, and on the main line and a branch of the Northern Pacific railroad; about 80 miles west of Fargo, on the Red River of the North, and 100 miles east of Bismark on the Missouri River. It is situated in an agricultural region, noted for its extensive wheat fields and large stock farms. Some of the industrial establishments are flour-mills, grain elevators, stock-yards, wholesale groceries, lumber and brick yards. It is the trade centre for a large extent of country, and the small towns off the railroad procure their local supplies of manufactures and groceries from Jamestown. Pop. (1900) 2,853.

Jamestown, Va., in James City County, the first permanent English settlement in the New World, and capital of Virginia 1607–98; on what was a peninsula of the James River some 32 miles from its mouth, nearly opposite the present Williamsburg, with a neck overflowed at high tide, and since then washed away, leaving the place an island; the front also has been eaten away by the river, so that the site of the original huts is submerged. It was ill chosen and malarious, and the place never prospered; but no towns did in early Virginia. It was founded 13 May 1607 by the company of Gosnold, Wingfield, John Smith, etc., with Capt. Newport; and was first a triangular wooden blockhouse called Fort James, after the king, around which some huts sprang up. These were entirely destroyed by fire in 1608, but soon rebuilt. In 1609 there were 50 or 60 wooden houses of one and two stories, with a chapel and a storehouse, surrounded by a log palisade 15 feet high, and with a fort at the neck. During the Starving Time of 1609–10 it was nearly depopulated, and on 7 June 1610 the remnant deserted it and started for England; but meeting Lord Delaware with provision ships at the mouth of the river, all turned back and reoccupied it. Delaware found the chapel "ruined and unfrequented." In 1616 John Rolfe says there were 50 inhabitants. By 1619 a church of hewn timber 50 x 20 had been built; in July 1619 the first legislative assembly in America was held there. A timely warning enabled its inhabitants to escape the great Indian massacre of 1622, and it was a place of refuge for those outside it. The first brick edifice in Jamestown was erected in 1640; a brick church some time after; between 1676 and 1684 was built the brick church whose ivy-mantled tower still stands, and which is incorrectly supposed by many tourists to be the one in which Rolfe married Pocahontas. About the same time a more ambitious fort was begun, with a magazine still traceable; but so injudiciously located for guarding the river-channel that it was above instead of below the place to be defended. Jamestown has little history separate from the colony thence till Bacon's Rebellion (q.v.); as Berkeley's capital, it was burnt to the ground by Bacon, that it might no longer "harbor the rogues." Again rebuilt, in the last decade of the century it was once more destroyed by fire, and never rose from its ashes. It had long been dwindling, and removal of the capital had been mooted, and in 1698 Williamsburg was made the capital. Till very recent years the ruins of Jamestown were left to sink gradually into the encroaching river; but some years ago the Association for the Preservation of Virginia Antiquities bought it, and with the help of the national government have built a sea-wall and saved the relics from further destruction. Besides the church tower, a few tombstones and remains of two or three houses still exist. Consult Tyler, 'Cradle of the Republic' (1900).

Jamestown Weed. See DATURA.

Jamieson, jā'mĭ-sŏn, **Cecila Viets Dakin**, American novelist: b. Yarmouth, N. S., 1848. She was married in 1878 to Samuel Jamieson of New Orleans. She has published 'The Story of an Enthusiast': a novel (1887); 'Lady Jane'; 'Toinette's Philip'; 'Seraph'; 'The Little Violinist'; 'Woven of Many Threads'; 'The Lily of San Miniato'; etc.

Jan Mayen, yän mī'ĕn, an island in the Arctic Ocean, about 250 miles northeast of Iceland; area, about 160 square miles. It is volcanic, with an irregular surface, mountainous near the extinct volcano, Beerenburg, about 6,500 feet in height. One of the active volcanoes is about 1,500 feet high. There are some large glaciers on the island, one near Beerenburg. Vessels from Norway and Scotland occasionally visit the island. In 1882–3 scientists from Austria lived on the island for some months, engaged chiefly in making meteorological observations. The island was named after Jan Mayen, a Dutch navigator, who discovered the land in 1611. Later it was ascertained that Henry Hudson visited the island in 1607.

Janauschek, yä'now-shĕk, **Fanny** (FRANZISKA MAGDALENA ROMANCE). American actress: b. Prague, Bohemia, 20 July 1830; d. Amityville, L. I., 28 Nov. 1904. She first went upon the stage in Cologne, playing in that city and also in Frankfort, 1848–60, and subsequently played in Dresden and the principal cities of Germany. In 1852 she was married to Captain Frederick Pillot, of the Germany navy. She made her first tour in America, 1867–9, playing in the German language and securing most favorable notice. Returning to Germany she studied English, and in 1873 made her second visit to the United States, when she played in English the most exacting Shakespearian roles. She was also very successful in such roles as Meg Merrilies, Mary, Queen of Scots, and in double roles, as in 'Bleak House' and other plays. She retired from the stage in 1898.

Jane Eyre, ār, a famous novel by Charlotte Brontë, published in 1847. In the character of Jane Eyre, the young authoress first found an outlet for the storm and stress of her own

nature. The book is therefore autobiographical in the truest sense.

Janes, Edmund Storer, American Methodist Episcopal bishop: b. Sheffield, Berkshire County, Mass., 27 April 1807; d. New York 18 Sept. 1876. In 1830 he entered the Methodist ministry in the Philadelphia conference, in 1835 became financial agent for Dickinson College, in 1840–4 was financial secretary of the American Bible Society, and in 1844 was elected bishop. In connection with his episcopal duties he traveled widely in the United States and abroad, and subsequent to the Civil War aided in the reorganization of his Church. He had some reputation as a preacher.

Janes, Lewis George, American scholar and author: b. Providence, R. I., 19 Feb. 1844; d. Greenacre, Maine, 5 Sept. 1901. He was president of the Brooklyn (N. Y.) Ethical Association in 1885–96, lecturer on sociology and civics in the School of Political Science there in 1893–6, and in 1896 became director of the Cambridge (Mass.) conferences and the Monsalvat school of comparative religion. In 1899 he was elected president of the Free Religious Association of America. Among his works are: 'A Study of Primitive Christianity' (1887); 'The Evolution of Morals' (1889); 'Life as a Fine Art' (1891); 'War and Progress' (1893); 'Cosmic Evolution as Related to Ethics' (1895); 'Social Ideas and Social Progress' (1899); and 'Health and a Day' (1901).

Janesville, jānz'vĭl, Wis., city, county-seat of Rock County: on the Rock River and on the Chicago, M. & St. P. and the Chicago, N. W. R.R.'s; about 85 miles northwest of Chicago and 60 miles southwest of Milwaukee. The first permanent settlement as a village was in 1837, and it was chartered in 1853. Janesville is located in an agricultural region, noted for the amount and quantity of tobacco raised. The chief manufactures are agricultural implements, foundry products, wagons and carriages, furniture, cotton and woolen goods, boots and shoes, flour, fountain pens, and school supplies. It has large lumber and brick yards, storage houses, and stock yards. Its principal trade is in its own manufactured goods, farm and dairy products. Some of its principal buildings are the State School for the Blind, the Saint Joseph's Convent, the Y. M. C. A. buildings, two hospitals, the churches, high school, public library, court house, and city hall. The mayor holds office for two years. The mayor, council, board of education, attorney, city clerk, treasurer, sealer of weights and measures, and justices of the peace are chosen by popular election. The mayor appoints, subject to confirmation by the council, the directors of the public library; the council elects the city engineer, the assessors, and the street commissioners. The members of the fire and the police departments are selected from the eligible civil service lists. From 1885 to 1903 there has been a constant and healthy expansion in industrial and commercial lines. Pop. (1890) 10,836; (1900) 13,185.

Janiuay, hä-ne-wī', Philippines, a pueblo of the province of Iloilo, Panay, situated 18 miles northwest of the town of Iloilo, near the Jalaur River. It lies in a hilly country and petroleum has been reported in the vicinity. Pop. 28,700.

Janizaries, jăn'ĭ-zā-rĭz (Turkish, *jeni-tcheri,* new soldiers), an infantry force of Turkey, first organized by the Sultan Orkhan about 1330, and in 1362 increased to about 10,000 by Amurath I., who gave them considerable importance by bestowing on them special privileges. The janizaries thus became a class of warriors so deeply imbued with the military spirit that they proved in many instances a means of salvation to the empire. It was their boast that they had never fled in battle, and they were the nerve and sinew of the Ottoman army. The regular troops of janizaries at one time amounted to 60,000 or more, but they were afterward reduced to 25,000. They were kept in barracks in Constantinople and a few other cities. The irregular troops amounted to 300,000 or 400,000, and were scattered among all the cities of the empire, in time of peace performing police duties. The janizaries who constituted the sultan's bodyguard became in time so dangerous and their insurrections so frequent that several unsuccessful attempts were made to reform or disband them. In 1826 they rebelled on account of a proposal to form a new militia, when the sultan, Mahmoud II., having displayed the flag of the Prophet, and being supported by their commander-in-chief, defeated the rebels and burned their barracks, when many of them perished in the flames. A royal proclamation abolished the corps. As many as 15,000 were executed, and fully 20,000 were banished.

Janko (yŏn'kō) **Keyboard,** a keyboard for the pianoforte, invented 1882 by Paul von Janko; introduced in London 1888, in New York in 1890. It consists of six rows or banks of keys arranged like a fan, placed in a semi-circle. Each note has three different keys. The keyboard can be attached to any pianoforte, grand, upright or square.

Jans, Anneke, ăn'nā-kė yāns (or ANNETJE), Dutch colonist in America: d. Albany, N. Y., 1663. She came from Holland to New Netherland in 1630 with Roeloff Jansen, her husband, who secured in 1636 a grant of a tract of land containing 62 acres and reaching from the Hudson to the present Broadway and from a point near Desbrosses Street to Warren Street. In 1654, Anneke, upon the death of her second husband, Everardus Bogardus (q.v.), obtained in her name a patent-right to the tract. In 1671 the land was sold by the heirs to the English Governor Lovelace. Three of the heirs, however, did not sign the document. Subsequently the property was confiscated by the English government and deeded to Trinity Church corporation (1705). From 1749 the possession of the property has been the subject of numerous suits by the heirs, based chiefly on the omitted signatures, and all decided for the defendants.

Jansen, yăn'sĕn, or jăn'sĕn, **Cornelius,** Dutch theologian: b. near Leerdam, Holland, 28 Oct. 1585; d. Ypres, Belgium, 6 May 1638. From his 17th year he applied himself to the study of theology and first came into notice while professor of theology at Louvain (1630), as a teacher of the most rigid Augustinianism, especially in connection with the doctrine of free will and divine mercy. This brought him into conflict with the Jesuits. He was appointed (1636) bishop of Ypres, where he completed his famous work, on which he had labored for 22 years, under the title 'Augustinus, sive Doctrina Sti. Augustini de Humanæ Naturæ Sanitate, Ægritudine, Medicina.' In this he

declared philosophy, especially that of the Aristotelians, to be the source of Pelagian error, and in accordance with rigid Augustinianism, maintained the utter corruption of human nature and the extinction of free will, together with predestination. The school of thought he thus founded is now known as Jansenism (q.v.).

Jansenism, jăn'sen-ĭsm, the teaching of the Jansenists, a sect of Christians still existing in the Netherlands and named after Cornelius Jansen, bishop of Ypres. They profess to hold the truth as it was taught by Augustine, bishop of Hippo, and prefer to be called 'Disciples of St. Augustine.' The free grace of God, the free will of man, and predestination, in the Augustinian sense, formed the main articles of their belief. The Jansenists were, however, accused of reviving the teaching of Michael Baius (1513–89) which had been pronounced heretical by Popes Pius V. and Gregory VIII. Baius taught that original justice is an integral part of human nature, and not a free gift of God; that fallen man, being utterly depraved in his nature, is incapable of doing good; that all actions of man in the natural order are sinful, and that divine grace compels men to be and do good, without the concurrence of their will. The book of Jansen was condemned by Urban VIII. in his 'In Eminenti' (1642), but the pope's decree was not generally accepted in Flanders. The Jesuit Molina and the Molinists, his followers, supported views opposed to those of Jansen. Alexander VII. declared that the errors attributed by the Molinists to Jansen, and which the Jansenists said could not be found in 'Augustinus' were held and enunciated by Jansen. The Port Royalists, Arnauld, Nicole and Pascal, wrote famous books defending Jansen against the Jesuits.

In 1679 Arnauld and his followers were constrained to take refuge in the Netherlands. In 1702 the Sorbonne decided that a priest accused of Jansenism could grant absolution. In 1694 Quesnel's 'Moral Reflections' were published and the controversy had been revived. In his bull 'Unigenitus,' Clement XI. condemned the Jansenist passages in Quesnel's work and the author fled to Brussels, and died in Holland 1719. The Jansenists of Utrecht number about 8,000; they profess to be Roman Catholics, are governed by an archbishop, to whom, however, the pope always refuses confirmation and the gift of the palla. They reject the bull 'Unigenitus' and published a protest against the dogmas of the Immaculate Conception, and Papal Infallibility. Consult: Reuchlin, 'History of Port Royal' (1844); Fuzet, 'Les Jansenistes du 17me Siècle' (1877); Jervis, 'History of the Church of France' (1872). See PASCAL, BLAISE; ARNAULD.

Jans'sen, John, American Roman Catholic bishop: b. Keppeln, Rhine Province, 3 March 1835. He pursued theological courses in the seminary of Münster, and in 1858 in the United States, was ordained priest in 1858, was in missionary work at Springfield and Alton, Ill., was vicar-general of Alton diocese in 1870–7 and 1879–86, and in 1888 was consecrated bishop of Belleville, Ill.

Januarius, jăn-ū-ā'rĭ-ŭs, **Saint:** b. Naples or Benevento, Italy, 21 April 272; d. Pozzuoli, Italy, 19 Sept. 305. He became bishop of Benevento in 303 and at the time of the persecution of the Christians by Diocletian was beheaded. He is the patron saint of Naples. His body lies in the crypt of the cathedral at Naples; and two phials of his blood which a pious matron caught, according to tradition, at his execution, are preserved in a chapel in the south aisle. It is asserted that the blood liquefies on being brought near the head of the saint. A trial is made on three festivals of each year, the chief of which is the anniversary of the martyrdom, and also when public danger and calamity exists or is impending. It is believed that the patron saint is particularly propitious if the blood moves briskly in the phials and appears of a clear red, while the opposite is regarded as presaging some ill to the country.

Jan'uary, the first month of the year, was by the Romans held sacred to Janus, from whom the name was derived. The Roman year originally began with March, and consisted of only ten months. Numa is said to have added January and February to the calendar; but although the Romans as early as 251 B.C. accepted January as the first month of the year, the nations of Europe did not universally adopt it as such till the 18th century. The 25th of March was the beginning of the ancient Jewish year, and that day, instead of 1 January, long held a legal position in Christian countries as the opening of the new year.

Janus, jā'nŭs, an ancient Latin divinity, after whom the first month of the year was named. He was held in great reverence by the Romans, and was represented with two faces, one looking forward, the other backward. All doors, passages, and beginnings were under his care. His principal festival was New Year's Day, when people gave each other presents. The temple of Janus, which was open in time of war and closed in time of peace, was shut only three times in the long space of 700 years.

Janvier, jăn'vĭ-ā, **Thomas Allibone,** American author: b. Philadelphia, Pa., 16 July 1849. He received a common school education; was an editorial writer for the Philadelphia *Press, Bulletin,* and *Times* in 1870–81; lived in New York during most of the period 1884–94, and then made his residence in France and England. Among his works are 'The Mexican Guide' (1887), 'The Aztec Treasure House' (1890), and 'Stories of Old New Spain' (1891), material for which was largely derived through visits to Mexico and New Mexico; 'An Embassy to Provençe' (1893), the chronicle of a European journey; 'In Old New York' (1894), popular historical sketches; 'The Passing of Thomas, and Other Stories' (1900); 'In Great Waters' (1901); 'The Dutch Founding of New York' (1903).

Japan, an empire off the northeast coast of Asia, consisting of an archipelago in the North Pacific Ocean. Besides Nippon or Hondo, Kiusiu, and Shikok, three large mountainous and volcanic islands, with about 500 smaller islands, forming Old Japan or Japan proper, it comprises the outlying large island of Yezo or Hokkaido, north of Hondo, separated by Tsugaru Strait; the long chain of the Kurile Islands between Yezo and Kamchatka; the Loo-choo or Liu-Kiu Islands, stretching southwestward toward Formosa, and lastly Formosa and the Pescadores Islands, acquired as a result of the

war with China in 1894, together with the southern part of Sakhalin, ceded by Russia in 1905. The Japanese dominions are separated from the Asiatic continent by the Sea of Okhotsk, the Sea of Japan, the Strait of Korea, Tong Hai or the Eastern Sea, the Strait of Tokien or Formosa, and are distant from China 420 miles, from Kamchatka 270 miles, and from California, 5,000 miles. The area of Japan proper is estimated at 111,239 square miles, of which Hondo, the main island, occupies 87,846; Kiusiu 16,839, and Shikok 6,932 square miles. Yezo has an area estimated at 36,300 square miles; adding the Kurile and Liu-Kiu Islands, Formosa, and Sakhalin (25,000 square miles), the total area of the empire is fully 185,000 square miles. The native term *Niphon, Nipon,* or *Dai Nippon* — "Great Nippon," the latter word meaning "Sunrise" or "East," a former specific name for the largest island of the group, is really the name of the empire, the Japanese now calling this island Hondo or Honshiu. The capital of the empire is Tokio or Yeddo; other important towns are Osaka, Kioto, Nagoya, Kobé, Yokohama, Hiroshima, Nagasaki.

Political Divisions.— Japan anciently divided by native geographers into the eight great divisions of Gokynay, Tokaydo, Tosando, Fukurokudo, Sanindo, Sanyodo, Nankaydo, and Saykaydo, subdivided into 68 provinces or principalities, and these again into 622 districts, now comprises for Japan proper the three great fu or residential districts of Tokio, Kioto, and Osaka, and 43 ken or rural prefectures, Yezo and Formosa having minor subdivisions for administrative purposes.

Physical Features.—The largest island, Hondo, is upward of 700 miles long northeast and southwest, breadth varying from 50 to 100 miles; Kiusiu, on the southwest, separated from Hondo by the Strait of Shimonoseki, which in one part is narrowed to 2 miles width, is about 200 miles long north to south and 120 miles broad; Shikok, the third and smallest of the three principal islands, is 140 miles long by 60 miles broad. It lies east of Kiusiu, and is separated from it by the Strait of Bungo, which at its narrowest part is not more than 10 miles broad. The straits which divide Shikok from Hondo are scarcely broader, and are thickly set with small islands. The more or less enclosed stretch of sea between Kiusiu, Shikok, and Hondo is known as the Inland Sea. Yezo is of a roughly triangular form, having its sides respectively 300 miles, 260 miles, and 220 miles in length. It is separated from Hondo on the southeast by the Strait of Tsugar, Matsmai, or Sangar, about 8 miles broad in the narrowest part. West of Hondo lies the important island of Sado. The coasts of the larger islands are extremely irregular, being deeply indented with gulfs, bays, and inlets, which form magnificent harbors, although in the north especially, they are difficult of access; not only from the multitude of rocks and islands that surround them, but from the prevalence of gales and fogs. Though there are some large plains, the surface of the islands generally is broken by hills and valleys, in many instances rising into high mountains. The main island is traversed throughout its whole length by a regular chain of mountains, the highest peak of which variously called Fuji-san, or Fuji-yama,— "Matchless Mountain," a dormant volcano, covered with perpetual snow — is 13,977 feet high; but the elevation of the range is in general so low as to admit of cultivation up to the watershed of its streams. The Japanese islands form a part of the line of volcanic action which commences, in the north, with the Aleutian Isles, passes through the Philippines, Sumbawa, and Java to Sumatra, and then in a northwest direction to the Bay of Bengal. The volcanic vents, which indicate the direction of the line, are numerous in Yezo, Hondo, and Kiusiu; earthquakes, often causing great devastation, are of frequent occurrence, and it is calculated that every seven years a Japanese city is destroyed by their agency. In Yezo some dreadful eruptions have occurred — one in 1783 destroyed 23 villages; and the volcano of Wunzendake, one of five active in the island of Kiusiu, is the terror of the surrounding inhabitants — an eruption of it in 1792 having destroyed 53,000 people. Almost equally disastrous was the tidal wave in 1896, which, besides causing the death of over 26,000 people, injured many thousands more, and destroyed a vast amount of property.

Hydrography.— Streams are numerous in Japan, but have very short courses, and are for the most part rather torrents than rivers. Though valueless as channels for the development of commerce they are of great value for the purposes of irrigation. The principal rivers or gawas of the main island are: the Shinanogawa, which rises in Shinano, and after a northwestward course of 320 miles flows into the Sea of Japan; the Tonegawa, which rises in Kodzuke, and after a course of 170 miles flows into the Pacific near Tokio; the Kisogawa, which enters the gulf of Izeh; and the Yodogawa, the outlet of Lake Biwa, which flows into Osaka Bay. Ishikari in Yezo is the longest river of Japan, having a course of 407 miles. There are a number of lakes scattered throughout the islands, the largest being Biwa or Omi, in the southern part of Hondo, 40 miles long.

Geology and Mineral Resources.— The prevailing formations in these islands are trachyte and basalt; plastic clay, marl, and feldspar occur in various localities; and there are whole mountains of porcelain earth. The metallic wealth of the empire is considerable and comprises gold, silver, copper, tin, lead, and iron. The island of Sado is particularly rich in auriferous ore. Both the tin and copper of Japan are of superior quality. Coal is found in several districts, and the output is gradually increasing, in 1902 amounting to over 9,700,000 tons. Petroleum is becoming a product of some consequence. Sulphur abounds; thermal and mineral springs are of frequent occurrence; and ambergris is met with on some of the shores. Among the precious stones are agates, carnelians, and jaspers, while pearls are found in the shell fisheries around the islands.

Climate.— The climate of Japan, though extremely various — being intensely cold in the north and warm in the south — is, on the whole, much milder than its latitude would indicate; owing, chiefly, to the influence of the surrounding ocean. A remarkable difference of climate exists also between the east and west shores; the cold being more intense on the


JAPAN AND KOREA.
SCALE OF MILES.
0 50 100 150 200 250
Population of places is indicated by different lettering, thus:
150,000 and over — SEOUL
50,000 to 150,000 — Niigata
25,000 to 50,000 — Nagano
5,000 to 25,000 — Honjlo
Smaller Places — Hamada
Railroads
Telegraph Lines
Copyright, 1904, by The Americana Company.
Longitude 128° East from 130° Greenwich
TOKIO and vicinity.
SCALE OF MILES.
TOKIO
BAY OF TOKIO
YOKOHAMA
CHINESE EMPIRE
RUSSIAN EMPIRE
SEA OF JAPAN
YELLOW SEA
KOREA BAY
KOREA STRAIT
Broughton Strait
Kirin
Vladivostok
Peter the Great Bay
Niuchwang
Port Arthur
Weihaiwei (Br.)
SEOUL
Chemulpo
Phyengyang
Haiju
Chhungju
Chinju
Fusan
Wonsan or Gensan
Broughton Bay
Port Lazarev
Diamond Mts.
Quelpart I.
Matsu Shima
Oki Shima
Tsu Shima
Shimonoseki
Moji
Fukuoka
Nagasaki
Kumamoto
Kagoshima
Hiroshima
Okayama
Tottori
KIUSHIU (Saikaido)
SHIKOKU
Tanega Shima
Yako Shima
Van Diemen Str.
Shiohi To or Linschoten Is.
Goto Shima
Koshiki Shima


PACIFIC OCEAN
YEZO (HOKKAIDO)
Sapporo
Otaru
Hakodate
Sendai
Morioka
Niigata
Toyama
Nagano
TOKIO
YOKOHAMA
NAGOYA
Shizuoka
Sado
Shichi To
O. Shima
Miyake Shima
Hachijo Shima
Mikura Shima
Inaba Shima
Kamitsu Shima
Shin Shima
SOUTHERN EXTENSION OF JAPAN.
Same Scale as Main Map.
FORMOSA
(Taiwan)
Pescadores Is.
Pescadores Channel
Niitaka Yama
Garampi
NAMBU SHOTO GROUP
Miyako Shima
Ishigaki Shima
Iriomote Shima
Yonakuni Sa.
RIU-KIU OR LUCHU IS.
Shichi To or Linschoten Is.
Tanega Shima
Yaku Shima
Kuro Sa.
Takara Shima
HOKUBU SHOTO
Amami o Shima
GROUP
Tokuno Shima
Okino Erabu Sa.
TSUBU SHOTO
GROUP
Okinawa Shima
Kume Sa.
Heto C.
Yoro Shima
KURILE OR CHISHIMA ISLANDS
Yetorup (Iturup)
Urupp
Simushir
Onekotan
Paramushir
Shumshir
Diana Str.
Boussole Str.
NORTHERN EXTENSION OF JAPAN
SCALE OF MILES.
0 50 100 150 200

latter than the former, owing to the proximity of the Asiatic continent; while the east coasts are protected from the cold continental winds by the lofty central ridge of mountains that traverses the islands north to south. From March to the second half of May a splendid spring prevails; from June to September summer extends, introduced by heavy rains followed by intense heat; from September to the end of November there is a brilliant autumn; and three months of winter succeed, rendered not unpleasant by the continued serenity of the sky. In Kiusiu, and in the south parts of Hondo, the thermometer ranges between 29° and 104° F., 80° being the average in the middle of summer, and 35° in the coldest months of winter. In lat. 32° N. ice is formed of several lines in thickness; in lat. 36° the lakes are covered with a sheet of ice, and in 38° to 40° the ice becomes so thick that the rivers may be crossed upon it; while in Yezo, near Cape Saga, lat. 45° 21′ N., winter is so severe as to drive the hardy Ainos to the protection of caverns. Rain is very frequent; hurricanes and water-spouts also occur often, and typhoons and equinoctial gales frequently sweep about the change of the monsoons.

Forestry.— The forests of Japan cover an area of 20,062 square miles and, especially in Yezo, form a source of wealth which is being increasingly exploited. Japan produces most of the trees common to temperate regions. The fir and cedar grow to immense size, the latter sometimes to the diameter of 18 feet. Of the oak, two species are peculiar to the country; their acorns when boiled form a palatable and nutritious article of food. The mulberry and the varnish tree grow wild. The nuts of the latter yield solid oil for candles, as do those of the camphor tree, which lives to a great age, and attains a great size. A camphor tree observed by Kämpfer in 1691 was then 36 feet in circumference, the same tree measured by the Dutch traveler Siebold in 1826 was 50 feet in circumference. Camphor has long formed an important article of commerce, the value of the exported product in 1903 amounting to over $1,750,000. Chestnut and walnut trees also abound.

Flora.— The flora as a whole resembles that of a great part of North America. The vegetation is exceedingly various, the products of the tropics being intermingled with those of the temperate and frigid zones. The palm, banana, bambpo, bignonia, and myrtle flourish. Sweet oranges, pomegrantes, pears, apricots, peaches, and above 500 of the principal ornamental and useful plants are of foreign origin, having probably been introduced from Korea and China. The *kadsi*, or paper-tree, a species of mulberry, grows naturally in the fields, and furnishes textile fibres from which paper is produced; paper is also made from various other plants. The chrysanthemum is a common and favorite plant, and has become an emblem of Japan. The camellia, cultivated in several hundred varieties, grows to a large size, and is a great favorite both for the beauty of its leaves and of its flowers.

Fauna.— In consequence of the general cultivation of the soil the wild animals are necessarily few in number; hut bears, hyenas, deer, hares, foxes, and wild boars are still found in the north of Hondo. Dogs are common; there is a small highly prized species of spaniel, from which it is supposed was derived the English variety known by the name of King Charles. Rats infest the houses in great numbers, notwithstanding the abundance of cats. Flying squirrels and monkeys are faunal features. There is a great variety of birds — including song-birds, birds of prey, birds of the pheasant kind, and in particular numerous water-birds, of which the cormorant is trained to catch fish for its owner. Snakes are not unfrequent, and at least one species is venomous; there are also tortoises, lizards, scorpions, and centipedes; and of the insect tribes there are white-ants, winged grasshoppers, and several beautiful varieties of moths.

Fisheries.— The rivers of Yezo supply abundance of salmon. The surrounding seas abound in great varieties of fish constituting important sources of food supply and fertilizing agents which are receiving systematic and scientific exploitation. Within a decade raw and manufactured fishery products doubled in value, reaching a total of $35,000,000 annually, to which are added since 1905 the Sakhalin fisheries conservatively estimated at $5,000,000 a year.

Agriculture.— The soil of Japan is naturally indifferent; but the patient industry of the agriculturists, favored by the genial climate, has covered with vegetation every spot capable of bearing anything. The rugged mountain sides, where the plow cannot be used, are often built up in terraces, and tilled by hand. Agriculture is greatly promoted by a law which provides that land remaining unused for more than a year shall become forfeited to the public. The agriculture of the Japanese is conducted with diligence and skill. Irrigation is judiciously applied, and manure of all kinds is carefully collected and used in the production of generally abundant harvests. In the south the sugar-cane is cultivated with success; and rice yields two harvests, and constitutes the chief article of food. Wheat and barley, maize and millet, are grown to an important extent, and buckwheat, potatoes, melons, pumpkins, and cucumbers in great abundance. Ginger, pepper, cotton, hemp, and tobacco are cultivated in considerable quantities; and there are extensive plantations of the tea plant — yielding, however, a product inferior to that of China. Silk is also a product of importance. Horticulture is highly developed and Japanese gardeners have long attained the art of dwarfing and unnaturally enlarging vegetable productions.

Stock-raising.— Buffaloes and zebus are common and are used principally as beasts of burden and for agricultural purposes. Horses of various breeds — but generally small — in 1902 amounted to 1,515,373; the cattle numbered 1,275,382; pigs 213,417; goats 62,203, and sheep 2,289. Poultry-farming is also receiving increased attention.

Commerce.— In 1852 American diplomacy succeeded in removing the restrictions which for centuries hampered foreign intercourse with Japan. Prior to that date the foreign commerce of Japan was limited to the Chinese and the Dutch. The Chinese trade was confined to Nagasaki, where a few junks arrived annually from the ports of Amoy, Ningpo, and

Shanghai. The Dutch were allowed to visit the port of Nagasaki, where they had a factory on a small island called Desima, in which 12 or 13 merchants lived, closely watched by the Japanese, and allowed very little liberty. Two ships were annually sent from Batavia. Goods were conveyed by land on pack-horses and oxen. But the principal carriage of merchandise was by water, for though the peculiar construction of the Japanese vessels unfitted them for long sea voyages, they were well enough adapted to the navigation of lakes and rivers, and for coasting from port to port, and crossing from island to island. The rapid introduction of railways particularly throughout the main island greatly stimulated trade and as Japan progressed in its career of modern expansion, each year showed a substantial increase in exports until in 1895 they exceeded the imports by $3,411,789. In 1894 the total exports reached $67,813,776; ten years later they had more than doubled, in 1904 reaching $158,995,795.71. The leading items of export then were: Raw silk, $44,000,000, of which the United States took $30,000,000; silk manufactures, $22,000,000, three per cent of which came to the United States; cotton yarns, $14,500,000; copper, $6,500,000; coal, $47,500,000; cotton fabrics and matches, each $5,000,000; tea, $6,000,000; mats and matting $2,500,000; rice, $2,300,000; camphor, $1,500,000; cuttle fish, $1,300,000; cigarettes, $1,250,000; porcelain and earthenware, $2,000,000. With abundance of low priced and efficient labor, convenient ports of entry, ambitious leaders, and in fact, practical government supervision, the country's commerce grew rapidly in volume, and notwithstanding the Russo-Japanese War of 1904–5, which severely taxed the nation's resources, no commercial loss was sustained. War supplies increased the imports, but with the advent of peace, a balance in favor of the exports was re-established with increased business in almost all lines of trade. In the six months ending with June, 1905, the exports and imports totaled $213,757,006; the United States led in the export trade, taking from Japan in that period merchandise valued at $32,518,509, China being second with $21,931,507. British India led in the import trade with $34,030,288; Great Britain being second with $32,623,660; and the United States third with $20,304,294. The foreign trade is carried on chiefly through the ports of Yokohama and Kobé. For the fiscal year 1904 the former exported $85,104,726, and imported $68,132,505; Kobé exported $43,988,089, and imported $87,427,600. The ports of Osaka, Nagasaki, and Moji-Shimonoseki had an aggregate export trade of $24,698,205, and imports $24,480,246. The chief items of import are metals and metallic ware, machinery, arms, cottons, woolens, etc.

Manufactures.— The Japanese work admirably in iron, silver, gold, and all metals. Manufactures are carried on in every part of the country, and some of them are brought to such a degree of perfection as to surpass those of any other part of the world. Their lacquering in wood excels that of all other nations. They work with great skill in *sowas*, a mixture of gold and copper, which they color blue or black in a manner unknown elsewhere. Their silk and cotton goods are well made, and glass, pottery, and porcelain in all their branches are of superior manufacture. Their steel swords are unapproachable in quality, and they make excellent mirrors of steel. Paper is made from the bark of the mulberry tree in great abundance and of remarkable strength; it is used not only for writing and printing, and for wrapping goods, but for handkerchiefs and napkins. Paper began to be used in Japan as early as the 7th century, and printing from engraved wooden blocks in the Chinese manner was introduced about 1200 A.D. Kioto is the chief seat of the book trade, and is eminently a literary city. The Japanese are skilful in carving and die-sinking, and in the casting of metal statues, which are extensively used for idols. Their iron works, tobacco factories, breweries, distilleries, and other manufacturing establishments on a large scale, employ hundreds of workmen. The cities of Kioto, Tokio, and Osaka are the great seats of manufactures. At Kioto are made damasks, satins, taffetas, and other silk fabrics of every kind, lacquered articles, caps, scarfs, screens, fans, pins, bow-strings, paints, tea-boxes, grindstones, and porcelain and earthenware; at Osaka cotton goods and iron ware; and at Tokio nearly every species of manufacture is carried on. Government ownership of public utilities and manufactures such as railroads, telegraphs, and telephones, salt, tobacco, and camphor, and governmental supervision of industries, control and foster their development. Great progress has been made in the production of iron, steel, electric-light appliances, wire, rails, and cars, cottons, and these with other lines are assuming commercial independence of foreign-made articles. Ordnance, firearms, ammunition, and supplies are made at the Tokio, Osaka, Shimose, and Senji arsenals, and steel and iron ware and merchant vessels at the Yokosuka, Kuré Maizura, Takeshiki, and Ominato shipbuilding and dockyards.

Shipping and Navigation.— Exclusive of Formosa and the coasting trade, in 1903, 9,038 vessels, including 3,827 Japanese steamships, 1,717 Japanese junks and sailing ships, 3,420 foreign steamships and 74 foreign sailing ships, with a total tonnage of 13,571,389, entered Japanese ports; 3,848 Japanese steamships, 1,833 Japanese junks and sailing ships, 3,406 foreign steamships and 77 sailing ships, giving a total of 9,164 vessels of 13,584,079 tonnage, cleared the ports. The British ships numbered 1,777 of 4,758,534 tons; 427 were German with 1,277,278 tons; 407 were Norwegian with 392,343 tons; 284 were American with 975,834 tons; 265 were Russian with 353,667 tons; and 113 of 234,408 tons were French. The mercantile navy in 1903 comprised 1,088 modern steamers of 657,269 tons; 3,514 modern sailing vessels of 322,154 tons, and 1,114 native craft above 8 tons.

Railways, Roads, Posts, Telegraphs, and Telephones.— In 1904 there were 4,651 miles of steam railroad in operation, several extensions and new tracks projected and building, and over 300 miles of electric street railroads. In March 1906, the Imperial Diet promulgated a bill nationalizing the railroads. The chief highways or roads comprised 4,481 miles of government roads and 15,362 miles of prefectural roads. In 1904–5 there were 6,524

HIS IMPERIAL MAJESTY MUTSUHITO,
The Emperor of Japan.

post-offices throughout the empire handling annually a mail of 920,280,136 pieces.

In the same year there were 10,482 miles of telegraph lines and 2,173 miles of submarine cable. The number of telegrams delivered in the year was 10,410,674. The telephone service consisted of 5 bureaus, 323 call offices, 35,065 subscribers, and 3,021 miles of communication.

Weights, Measures, and Money.— The chief obstacle to profitable trade after the opening of the ports was the conflict between native and foreign ideas on the subject of currency. The money of Japan consisted of a great variety of gold, silver, and copper coins. The largest gold coin was the obang, a piece 6 inches in length and 3½ in breadth, worth about $100. It was not in common use. The largest gold coin in ordinary circulation was the cobang, which was 2½ inches in length, 1½ in breadth, and worth about $7.50. A still more common coin was the itzibue, which when of gold was worth intrinsically about $1.75. The silver itzibue was the common silver coin, and worth about 20 cents. Foreign coins were not allowed to circulate, and foreigners were compelled to exchange their own money for Japanese coins, at a valuation which rendered it difficult to carry on a profitable trade. Arrangements, however, were made which remedied these difficulties, and a modern monetary law based on the metric system came into force in October 1897. The unit of value is the yen, equaling 0.75 grammes of pure gold, for which however there is no corresponding coin, the former one yen silver piece having been withdrawn. The gold coins consist of 20, 10, and 5 yen pieces, the silver coins of 50, 20, and 10 sen pieces, a nickel piece of 5 sens, and bronze coins of 1 sen and 5 rin pieces. The yen is divided into a hundred sen, and the rin is the tenth part of a sen. The weights are the mommé 0.2666 mommé = 1 gramme; the kin (160 mommé) = 1.325 pounds avoirdupois; and the Kwan (1,000 mommé) = 8.21 pounds avoirdupois. The measures are the shaku = .994 foot, 3.3 shaku equaling 1 metre; the Sün = 1,193 inches; the ken (6 shaku) = 5.965 feet; the chô (60 ken) = $\frac{1}{15}$ mile; the ri (36 chô) = 2.44 miles; the square ri = 5.9552 square miles; the chô land measure = 2.45 acres. The liquid koku = 39.7033 gallons; the dry koku = 4.9629 bushels; the liquid to = 3.9703 gallons, the dry to = 1.9851 peck.

Banking.— The principal bank of Japan is the Nippon Ginko or National bank, founded in 1882 and authorized to issue notes convertible to gold on presentation. The notes in circulation on 1 April 1904 amounted to $106,574,593. Besides the National bank there are the Nippon Industrial bank, the Yokohama Specie bank, the Hokkaido Colonization bank, and the Taiwan bank. There are also an Agricultural-Industrial bank with 46 branch offices, a Common bank with 1,754 head offices, 1,441 branch offices, a paid-up capital of $129,198,932, and deposits amounting 31 Dec. 1903 to $288,113,870, and savings banks with 469 head offices, 586 branch offices, a paid up capital of $14,765,199, and deposits amounting 31 Dec. 1903, to $23,007,396. In the post-offices which also act as savings banks 2,335,173 persons in 1900-1 deposited $19,717,006 and withdrew $7,350,281.

Government and Administration.— The government of Japan was, until 1889, a hereditary absolute monarchy, vested in the mikado, or emperor. This was the ancient form, but in 1585 the emperor's commander-in-chief usurped the governing power, and for nearly three centuries reduced the mikado to a secondary position. The latter resided in the royal and sacred city of Miako (or Kioto), where he was kept secluded, under the guise of a mysterious sanctity; while the shogun, living at Yeddo, exercised imperial authority, and was regarded, by foreigners at least, as a second and supreme sovereign. In 1868, however, a revolution overthrew the power and office of the shogun — he had been usually, but erroneously, called by a Chinese title, tycoon — and the mikado was restored to his ancient supremacy. In 1889 Japan received a constitution, becoming a constitutional monarchy. The mikado is sovereign of the empire, can declare war, make peace, and conclude treaties; and exercises executive powers with the advice and assistance of his cabinet, who are appointed by himself. He is also assisted by a privy-council, who give their advice in important matters when consulted. The cabinet includes the prime minister, and the statesmen at the head of the foreign office, treasury, war, navy, education, public works, etc. The legislative power is vested in the mikado and the diet or parliament, which consists of two houses, a house of peers and a house of representatives. The former consists of members of the imperial family, princes, and marquises; counts, viscounts, and barons elected by their respective orders; and a certain number of persons nominated by the emperor and by a few wealthy taxpayers, the total number being about 300. The house of representatives numbers 300; the members being elected for a period of four years, so many from each electoral district. They are paid, as are also the nominated members of the house of peers.

Finances.— The estimated revenue for 1905–6 was $189,231,398 and the expenditure $105,262,218. The chief items of revenue are the land tax, 2½ per cent of the market value of the land, the taxes on saké and other liquors, the tobacco monopoly, customs dues, stamp duties, income tax, and the profits on the public utilitarian services controlled by the government, telegraphs, posts, railways, mines, etc. The principal items of expenditure for 1904–5 were the army $18,635,686, navy $10,908,976, justice $5,098,526, communications $9,971,933, finance $29,712,626, etc. War finance representing the conflicts with China and Russia is treated separately; receipts and expenditure for war purposes to April 1904 amounted to $288,000,000; the public debt to $282,459,475.

Army and Navy.— Every male Japanese of the age of 17–40 is liable to military service, and after reaching the age of 20 has to undergo three years' army training. The army on a peace footing in 1900 numbered 632,007 of all ranks, including 11,611 officers. The cavalry mounts [illegible]. In war the total strength of position of the recruits is high. They are very well educated, as a rule, nearly 8 per cent being graduates of the higher common schools, 8 per cent of equivalent education (though not graduates), 25 per cent graduates of the lower common schools, 16 per cent of equivalent edu-

cation (though not graduates), 27 per cent (besides the foregoing) can read and do ordinary sums in arithmetic, while only 16 per cent cannot read or write.

The Japanese navy has its ministry and department of naval command in Tokio. The expansion of her naval resources as exhibited in the Chinese war of 1894–5 and the war with Russia, 1904–5, has been such as to give Japan a fleet that is equal to any in the world of the same size. With the vessels captured in her naval battles, the fleet in 1906 comprised 11 battleships and 4 coast defense vessels, 9 first-class armored cruisers, 20 protected cruisers of the second-class, 17 torpedo-boat destroyers and 67 torpedo-boats, all of the most modern type of naval constructive science. A programme laid down for strengthening the Japanese navy began with the year ending 31 March 1904 and provided for an expenditure of $49,930,152 to be spread over 11 years. Of this $31,174,134 was to be spent on warships. The facilities for naval construction and repair possessed by Japan are exceptional. The naval arsenal at Yokosuka, the foundations of which were laid by French engineers, has grown to great dimensions, and there is no work connected with the construction and equipment of a war vessel that cannot there be accomplished satisfactorily. The principal dockyard is large enough to admit the heaviest battleship afloat, and in 1906 there was building on the stocks a warship of the enormous displacement of 19,000 tons to carry an armament of four 12-inch, twelve 10-inch, and twelve 4.7-inch guns. Yokosuka lies inside the Gulf of Tokio, the narrow entrance to which is defended by heavy batteries, mounted both on the surrounding hills, and by forts built on islands in the gulf. Other fully equipped imperial dockyards are situated, that of Kuré with fortifications on adjacent islands, near the west entrance to the Inland Sea, and that of Hiogo-Kobé, protected by forts at Wakawama and on the island of Awaji, near the eastern entrance. Sasebo, a fortified naval port approached by narrow winding channels, is on the west coast of the southern island of Kiusiu. The Tsugaru Strait separating Hondo and Yezo is fortified at Omazaki and Hakodate.

Ethnology.— The Japanese belong to the great Mongolian family of peoples (apart from the Ainos of Yezo, who belong to a prehistoric aboriginal race). The Japanese are of middling size, and generally of a yellow color, though some are brown and others nearly white. Their eyes are small, oblong, and deeply sunk in the head. Their noses are short and thick, and their hair thick, black and glossy. The people of rank have generally fair complexions, and ladies who are not exposed to the sun have sometimes perfectly white skins and blooming cheeks. The men are vigorous and active, and the women well-formed and graceful, while both sexes are of a higher degree of intelligence than is common among Asiatic nations. Their chief characteristics are courage, frankness, and perseverance, with good humor, natural politeness and a large measure of self-confidence. The agricultural population in particular, are distinguished for their industry, temperance, and courteous hospitality.

Population.— On 31 Dec. 1903, the population of Japan amounted to 46,732,841, showing an annual increase in six years of 1.54 per cent. The population consisted of 23,601,571 males and 23,131,270 females, divided among the various classes as follows, the 63 members of the imperial family not being included: 5,055 kwazoku or nobles, 2,167,389 shizoku or knights; 44,551,830 common people, including 17,783 Ainos in Yezo. Also included in the population were 153,785 Japanese resident in foreign countries, of whom 109,643 were in the United States or in United States colonies. On 31 Dec. 1903, there were 13,709 foreigners in Japan, of whom 7,423 were Chinese, 2,113 English, 1,624 Americans, 640 Germans, 554 French, 195 Russians, 176 Portuguese, 120 Swiss and 89 Dutch.

Sociology.— Apart from members of the imperial family, the people are divided socially into three classes: *kwazoku* or nobles, comprising five ranks, corresponding with prince, marquis, baron, etc.; *shizoku* or knights, and *heimin* or common people; the classes are kept distinct with all the strictness of caste. Before 1868 feudalism prevailed in Japan, and the chief nobility were feudal princes called *daimios,* who kept as military retainers, the celebrated *samurai* (q.v.); the distinctive mark of rank was the sword, the wearing of which was strictly prohibited to the lower orders; the middle classes carried one, and the higher ranks two swords, which were worn on the same side, one above the other. The uniforms of both the army and the navy are now fashioned on western patterns; western dress is commonly worn by the upper classes on formal occasions and during the discharge of official duties, and the western method of dressing the hair is almost universally adopted. The national costume, however, has by no means been totally discarded, and is not likely to be among the mass of the common people. The ordinary native dress of both sexes and of all ranks is very similar in form, differing chiefly in the colors, fineness, and value of the materials, those of the higher orders being generally of silk, and of the lower orders of linen or calico. The dress consists of a number of loose, wide gowns worn over each other, with the family coat of arms woven or worked into the back and breast of the outer garment, and all fastened at the waist by a girdle. The sleeves are very long and wide, and the part of the sleeve that hangs below the arm is made to serve as a pocket. The dress of the women very much resembles that of the men, but is usually of brighter colors, and the robes bordered with gay embroidery or gold. Upon occasions of full dress a cloak is worn together with a trousers-like garment called *hakkama.* Indoors, socks are the only covering of the feet. Shoes are worn abroad with soles of straw matting or of wood, which on entering a house are always taken off. Formerly hats were worn except in rainy weather, and the whole front and crown of the head was shaved, the rest of the hair being formed into a tuft on the bald skull. The women keep their hair very long, and usually wear on their heads numerous costly ornaments of tortoise-shell. A singular custom which still lingers among the

GATE OF THE GOLDEN TEMPLE, TOKIO.

FUJIYAMA, FROM TOKAIDO ROAD.

women of the lower classes is that of blackening the teeth and shaving or pulling out the eyebrows when they are married. Married women also tie their girdles before and single women behind. Polygamy is not permitted, but the power of divorce on the part of the husband is limited only by the requisition that he shall provide in a suitable manner for the support of the repudiated wife; though in case she is divorced for barrenness, or for other reasons recognized by the tribunals as sufficient, she has no claim upon the husband for maintenance. Under no circumstances whatever can a wife demand to be separated from her husband. Legal concubinage was abolished in 1880. Prostitution is permitted by law, and the profession of the courtesans or geishas is not deemed particularly disreputable; they are destined to their trade from infancy, and, being generally well educated and accomplished, are often selected as wives by respectable men.

The Japanese are very punctilious in all matters of etiquette, and the rules that govern social intercourse are formed into a regular system, and published in books, which are diligently studied at school. Though much has been borrowed from the Western nations in recent times, the Japanese will not be likely to give up many of their manners, customs, and ways of living, their foods and methods of cooking, their lightly-constructed houses, etc. The houses of the Japanese are low, and built of wood. The walls are coated with a cement that gives them the appearance of stone. In the windows the place of glass is supplied by very fine strong paper, which is protected from rain by external wooden shutters. Verandas encircle the houses, and to almost every dwelling, even in the cities, there is attached a garden. Store-rooms or warehouses made fire-proof by copper shutters and a thick coating of clay are numerous in the cities, where the tradesmen keep their stock of goods, and private families their valuable effects, as pictures, books, etc. Fires are frequent, and from the combustible nature of the common buildings are often terribly destructive. Conflagrations consuming thousands of houses sometimes occur. It is the custom on the completion of a new dwelling house to give a house-warming, for which purpose the neighbors and friends of the master of the new house send him liberal presents of eatables and drinkables. Tea is a universal beverage, and smoking is general among the men. In a morning call pipes and tea are served to the guests as regularly as pipes and coffee are among the Turks. At the conclusion of the visit sweetmeats are handed to the visitor on a sheet of white paper ornamented with tinsel. Fish is a general article of diet, and is varied with game, venison, poultry, and all sorts of vegetables, including a kind of sea weed. Food is eaten out of light lacquered bowls and dishes made of papier maché. Feasts are followed by music and dancing, and are commonly closed by drinking tea and a spirit called saké. Though industrious, the Japanese are eminently a social and pleasure-seeking people, are fond of feasts and frolic, and have frequent national holidays. Music, dancing, and the theatre are favorite amusements with all classes. Mummers, mountebanks, tumblers, conjurers, and all manner of jugglers are seen in the streets of the cities, and are highly popular with the people. Their jugglers surpass those of all other countries. Among their wonderful feats is the formation from pieces of tissue paper of artificial butterflies, which, guided by the motions of a fan, fly about, advance, retreat, appear to sip the honey from flowers, and display all the airs and graces of real butterflies. The ladies of the upper classes spend much of their time in the fabrication of pretty boxes, artificial flowers, pocketbooks, and purses, and in the painting of fans and pictures of birds and animals. In fine weather they join with the men in all sorts of outdoor and rural amusements, taking especial delight in fishing on the lakes and rivers, in vessels elegantly fitted up and adorned. The Japanese gentleman is invariably described as a person of pleasing address and most polished manners; even the commonest people are scrupulously observant of the forms of politeness. All classes are remarkably cleanly in their houses and persons, and bathe frequently. There are many public bath-houses in the towns open to all comers for a fee generally equal to the 8th of a cent, where the sexes, prior to its legal prohibition in 1880, bathed together entirely nude, without apparently the slightest idea of impropriety. Suicide formerly was common by the fashionable mode of hari-kari or "happy despatch" which was generally committed by cutting open the abdomen by two gashes in the shape of a cross. It was tolerated, if not in some cases approved by the laws, and was common as a means of escaping disgrace or avenging an affront, the adversary as a point of honor being obliged to follow the example. It is now legally forbidden. There are numerous benevolent and charitable institutions throughout the empire, workhouses and foundlings established by local corporations and private persons, while the central government provides funds for sufferers from extreme calamities and grants relief to the indigent, the helpless and friendless. Famines frequently occur owing to failures of the rice crop; that of 1906 in northern Japan was greatly alleviated by American benevolence.

Education.— Education is almost universal, the poorest and lowest laborers being taught to read and write. The women are educated with nearly as much care as the men, and there are extraordinary facilities for elementary, secondary and university instruction. During 1902–3 the percentage of children of school age receiving the prescribed course of elementary instruction was 90.35 for boys and 71.75 for girls. The total number of elementary schools was nearly 27,000. The number of teachers fell but a little short of 93,000, and the total number of children in the schools exceeded 4,683,000. The percentage of the enrolled pupils who attended daily was 84.61 per cent. The training of teachers receives careful attention, conditions of the school buildings are undergoing continual improvement.

There are seven secondary schools, in different parts of Japan, which are intended as preparatory for the universities. There are also a number of special schools in which the direct practical applications of the subjects studied are kept in view. In the Tokio Foreign Languages School, English, French, German, Russian, Ital-

ian, Spanish, Chinese and Korean are taught. The Tokio Fine Arts School provides five courses of study, including painting, designing, sculpture, architecture and industrial fine arts. The Tokio Academy of Music furnishes complete instruction in both Japanese and foreign music. There are technical schools intended to prepare men to take charge of industrial operations. The agricultural school at Supporo trains agriculturists for the island of Yezo, which is to Japan what Alaska is to the United States. The Tokio Technical School trains managers and foremen of factories, and a similar institution, already fully equipped, has been started in Osaka. Even the commercial aspect of education is not overlooked; the higher commercial school in Tokio has 53 instructors and 666 pupils.

There are in Japan two universities, the Imperial University of Tokio and the Imperial University of Kioto. The former comprises a University Hall and six colleges of law, medicine, engineering, literature, science and agriculture. The college of engineering offers nine courses: civil engineering, mechanical engineering, electrical engineering, naval architecture, technology of arms, civil architecture, applied chemistry, technology of explosives, and mining and metallurgy. In 1903 the total number of resident instructors was 222, and there were 35 assistant professors now studying in foreign countries. The students numbered 2,880, and included eleven foreigners, one of them a native of the United States. The University of Kioto, though founded much later than that of Tokio, includes, besides the University Hall, colleges of law, of medicine, and of science and engineering. The college of science and engineering provides courses in mathematics, physics, pure chemistry, chemical technology, civil, mechanical and electrical engineering, and mining and metallurgy. In 1903 there were 25 professors and 186 students.

There are laboratories for special purposes and many public libraries, and the combination of educational forces exhibits the astonishing progress in education made by Japan within 30 years.

Religion.— The chief religion is that of Buddha, which is, however, exotic and comparatively modern. Another and older faith exists, called Shinto or Shin-Syu. The word *shinto* is equivalent to spirit worship. The Shinto belief supposes the existence of an infinite number of spirits, exercising an influence over the affairs of the world, who are to be propitiated by prayers and the observance of certain rules of conduct, by cleanliness of person, and purity and cheerfulness of heart. The chief of these spirits is the sun, and after him the elements. These are called Dai Zin, "great spirits." The inferior spirits, who are very numerous, are chiefly heroes canonized for their worthy deeds or illustrious qualities. The most prominent and popular of these minor deities is Fatsman, the god of war, who is an apotheosis of the 16th emperor of Japan. He is supposed to have been born in a supernatural manner, and is universally honored throughout the empire. Although there are a large number of nominal Christians in Japan, it is not believed that Christianity has made many real converts, motives of self-interest — such as the obtaining of a free western education in the mission schools — often underlying so-called conversions to the Christian faith. There are no fewer than 12 sects of Buddhists with 32 creeds. Freedom of religious belief and practice when not prejudicial to peace and order is ensured by the constitution.

Judiciary.— A modern system of justice comprising four classes of courts has been established. Throughout the empire (exclusive of Formosa) there are 302 subdistrict courts for all petty, civil, and criminal cases; 49 district courts exercising a more extensive jurisdiction in civil and criminal cases, and a revising jurisdiction over the subdistrict courts; seven courts of appeal from the decisions of the district courts; and one court of cassation in Tokio, the supreme court exercising an appellate jurisdiction over the courts of appeal, and an original jurisdiction in serious crimes against the imperial house and state, and in serious charges against members of the imperial family. Seven judges preside in the court of cassation; five judges in the courts of appeal; three judges in the district courts, one being chief judge, and one judge in the subdistrict courts. A court under the direct supervision of the emperor deals with disputes respecting administrative affairs.

Local Government.— In 1876 a new division of the empire into districts or prefectures for local govern. ent was made, namely, 43 *ken* or rural districts, and 3 *fu* or residential districts: Tokio (Yeddo), Osaka, and Kioto. The prefectures are subdivided into *shi* = municipalities, and *gun* = counties; the counties are again subdivided into *chō* = towns, and *son* = villages. The units of local government are village, town and municipality, forming local corporations of the same name; supervising all are the prefectural governor, assembly and council. Citizenship and electoral qualifications are conferred on all male Japanese not less than 25 years of age who for two years reside in a municipality, town, or village, share its burden, and pay land tax or not less than $1 direct national tax annually.

History.— The history of Japan, like that of other ancient nations, begins with a mythical period, during which gods and goddesses mingled openly in the affairs of men. The authentic annals of the country commence with the reign of Sin Mu, who was at the same time high priest and emperor, about 660 B.C. He is said to have civilized the people, and to have established laws and a settled government. For many centuries his posterity reigned on the throne he had founded, bearing the title of mikado, and claiming to rule by divine right and inheritance. They were worshipped as gods upon earth, and long exercised the most absolute power. Women were not excluded from the succession, and in ancient Japanese history there are many famous empresses. The most celebrated of these was the Empress Singokogu, who began her reign in the 3d century of the Christian era. She conquered Korea, and gave birth to a son who succeeded her. He was so successful and renowned that at his death he was deified, and is now the Japanese god of war. In this early period a free intercourse appears to have been carried on with China, from which country about the middle of the 6th century Buddhism entered Japan, and was extensively spread among the people. Toward the end of the 7th century the claims of two

OSAKA CASTLE.

brothers to the throne led to a great civil war, which was ended by the defeat and suicide of the younger. About the end of the 8th century a foreign people of whom nothing more is known than that they were not Chinese, but natives of some more distant country, invaded Japan, and being constantly reenforced from home, maintained hostilities for 18 years before they were entirely expelled. Between the 9th and 12th centuries several new religions were introduced by foreign priests or by Japanese returning from foreign countries. The reign of the emperor Itsi Sio (987–1012) was remarkable for a great epidemic over the whole country, and for the number of learned men who adorned the court. In the reign of Go Rei Sen (1046–69) a great rebellion took place in the province of Osju, which lasted for five years, and is much celebrated in Japanese literature. Another famous rebellion was headed by Kyomori, a prince of the blood, in the reign of To Ba (1108–24). About the middle of the 12th century, during the reign of the Emperor Kon Yei, the authority of the mikado began to decline. The vassal princes took advantage of the weakness of the imperial government to strengthen their own power, and great confusion ensued. To remedy these evils, the court of the mikado created the office of shogun or commander-in-chief of the army, and appointed to the post Yoritomo, one of the most celebrated characters in Japanese history. He was a young soldier of high birth, related to the imperial family, and was successful and ambitious, so that after quelling the turbulence of the great vassals and restoring the authority of the crown, he contrived to concentrate in his own hands the real power of the government, without, however, depriving the mikado of his nominal rank, dignity, and religious supremacy. The office of shogun was made hereditary in the family of Yoritomo, whose descendants became in fact joint emperors with the mikado. The Mongols having invaded China in 1260 and conquered the greated part of it, their leader Kublai Khan sent envoys to Japan in 1268, and again in 1271 and 1273, summoning the Japanese government to enter into an alliance with him. The Japanese dismissed the envoys without any answer. The Mongol conqueror, irritated at their insulting indifference to his proposals, sent against them a great fleet and army in 1274, or according to Marco Polo in 1264. This expedition landed in Japan, but was defeated and the army cut to pieces. A still greater expedition was despatched in 1281, and met a similar end, the Japanese sparing only three of the invaders to carry back to China the news of the fate of the rest. Japan from that time to the present has not been molested by invaders. In the 16th century civil wars broke out, and a revolution took place, by which Faxiba, a man of extraordinary ability and energy, originally a private soldier, was raised to the supreme command, and became shogun, under the name of Taiko Sama or Lord Taiko, with the additional title of tycoon, which is now the appellation commonly given to the emperor at Yeddo, or lay emperor. He was the first secular monarch who assumed entirely the absolute control of the empire, some share in the government having been hitherto granted to the mikado, who was now reduced to the condition of a merely nominal monarch. Taiko Sama is regarded by the Japanese as the greatest character in their history, at least since the mythical period, and was eminent not only as a warrior and statesman, but as a legislator. His laws and policy until modern times were observed by the government of Japan, and secured to the nation an almost unequaled permanence of peace and prosperity. The turbulence of the vassal princes, who were then only 60 in number, and were individually powerful, was the chief source of the troubles that had afflicted the empire, and Taiko Sama took the decisive step of reducing their forces by dividing each principality into several. This policy, steadfastly carried out by him and his successors, resulted in establishing 604 distinct principalities and lordships, none of which was of sufficient magnitude to be formidable to the imperial power. It was during the confusion that preceded the rise of Taiko Sama that the Europeans began to be connected with the affairs of Japan. The existence of that empire was first made known to Europeans by Marco Polo, who in his narrative, written about 1298, mentions it under the name of Zipangu, a modification of the Shipen-kue of the Chinese, from whom he had obtained his information. He says: "Its inhabitants have fair complexions, are well made, and are civilized in their manners. Their religion is the worship of idols. They are independent of any foreign power, and governed only by their own kings. They have gold in the greatest abundance, its sources being inexhaustible; but as the king does not allow of its being exported, few merchants visit the country, nor is it frequented by much shipping from other parts." The Portuguese, after Vasco da Gama had doubled the cape of Good Hope in 1497, rapidly extended their discoveries and conquests in southern Asia. In 1542, three Portuguese sailors, who had deserted their ship and taken possession of a Chinese junk, were driven by storms upon the coast of Japan, and to them is ascribed its European discovery. About three years later a Portuguese adventurer, Fernam Mendez Pinto, while cruising with some companions of his own nation in the vessel of a Chinese pirate, was driven by foul weather into a harbor in one of the smaller Japan islands. He was well received, and carried back to the Portuguese settlements in China such a report of the riches and magnificence of Japan that great numbers of traders and adventurers flocked thither, and an active commerce soon sprang up. Missionaries speedily followed the merchants, and in 1549 Japan was visited by the celebrated "Apostle of the Indies," St. Francis Xavier. Both merchants and missionaries were favorably received, and while the one class found a ready and most profitable market for their goods, the other rapidly converted vast numbers of the natives to Christianity. Three of the most powerful of the Japanese nobles, the princes of Bungo, Avima, and Omura, were among the converts. In 1582 the Japanese Christians sent an embassy with letters and presents to Rome to do honor to the Pope, and assure him of their submission to the church. In the two years which followed their return (1591–2) it is said that 12,000 Japanese were converted and baptized. Tempted by the success of the Portuguese, the Dutch East India company in 1598 despatched five merchant vessels to Japan, one of which reached it in 1600. In 1609 other Dutch ships

arrived, and were well received by the Japanese, who conceded to them the port of Firando for a factory or settlement, with considerable privileges. Before the arrival of the Dutch, who were then at war with Portugal, the Japanese government had become distrustful of the Portuguese, whose astonishing success made them haughty and disdainful of the feelings and prejudices of the natives. Portugal was at that time united with Spain, and a Spaniard, when asked by Taiko Sama: "How is it that your king has managed to possess himself of half of the world?" indiscreetly answered: "He sends priests to win the people; his troops then are sent to join the native Christians, and the conquest is easy." This answer, it is said, made a deep impression on the Japanese government. In 1587 Taiko issued an edict for the banishment of the missionaries; the edict was renewed by his successor in 1596, and in 1597 23 priests were put to death in one day at Nagasaki. The Christians on their part took no measures to pacify the government, but defied it, and began to overthrow idols and pull down heathen temples. This led to dreadful persecutions in 1612 and 1614 when many of the Japanese converts were put to death, their churches and schools destroyed, and their faith declared infamous and rebellious. The Portuguese traders were no longer allowed free access to the country, but were confined to the island of Desima at Nagasaki. In 1622 a frightful massacre of native Christians took place in the neighborhood of Nagasaki, and horrible tortures endured with heroic constancy were inflicted on multitudes in the vain effort to make them recant. In 1637 it was discovered by the Japanese government that the native Christians, driven to despair by persecution, had entered into a conspiracy with the Portuguese and Spaniards to overthrow the imperial throne. The persecutions were renewed with increased rigor. Edicts were issued banishing the Portuguese forever from Japan, and prohibiting any Japanese, or any Japanese ship or boat, from quitting the country under the severest penalties. By the close of 1639 the Portuguese were entirely expelled, and their trade transferred to the Dutch, who, as enemies to the Portuguese and to the Roman Catholic faith, were not involved by the Japanese in their condemnation. In 1640 the oppressed native Christians rose in open rebellion in the province of Simabara. They seized a fortified place, made a long and gallant stand against the imperial troops, and were at length subdued only by the artillery and military science of the Dutch, who were either persuaded or compelled by the Japanese to cooperate against the rebels. The Christian stronghold was finally carried by storm, and all within its walls, men, women, and children, to the number of many thousands, put to death. In the next year the Dutch were ordered to quit their factory at Firando, and take up their residence, under very rigid inspection, in the island of Desima at Nagasaki. There they remained for more than two centuries in undisturbed monopoly of the entire European trade of Japan, notwithstanding occasional efforts of the Russians and English to obtain intercourse with the secluded empire. These efforts were resolutely repulsed, and led in one case to the imprisonment for two years in Japan of the Russian Captain Golownin and several of his companions. In 1852 the United States government, in consequence of complaints made to it that American seamen wrecked on the coast of Japan had been harshly treated by the authorities of that country, despatched an expedition under the command of Commodore M. C. Perry, who was instructed to demand protection for American seamen and ships wrecked on the coast, and to negotiate if possible a treaty by which American vessels should be allowed to enter one or more ports to obtain supplies and for purposes of trade. In February 1854, Commodore Perry, with a squadron of seven ships of war, entered the bay of Yeddo and came to anchor within a few miles of that capital. During the previous year he had entered the same bay and delivered to the Japanese a letter to the emperor from the President of the United States. On 31 March 1854, after much difficult negotiation, a treaty was agreed upon, dated at Kanagawa, the nearest large town, though really signed at the village of Yokohama. By this treaty the ports of Simoda and Hakodadi were appointed for the reception of American ships, where they can be supplied with wood, water, provision, coal, and other requisite articles, and protection and assistance were guaranteed to shipwrecked seamen. Liberty to trade under certain restrictions was also granted, and an arrangement made for the residence of American consuls at Simoda and Hakodadi. In September 1854, a British squadron commanded by Rear-Admiral Sir James Stirling entered the harbor of Nagasaki, and a treaty was soon concluded between Great Britain and Japan, by which Nagasaki and Hakodadi were opened to foreign commerce. Subsequently the Russians made a similar treaty and obtained equal privileges; and by a treaty dated 9 Nov. 1855, the Dutch in Japan were relieved from most of the restrictions so long imposed upon them at Desima. On 17 June 1857, a new treaty was negotiated at Simoda with the Japanese government on behalf of the United States by Mr. Townsend Harris, United States consul-general for Japan, by which the port of Nagasaki, in addition to those of Simoda and Hakodadi, was opened to American trade, and additional privileges granted to American merchants. In 1858 Mr. Harris succeeded in reaching Yeddo, where he concluded a still more favorable treaty. In the same year a British squadron conveyed a British ambassador, the earl of Elgin, to Yeddo, where, on August 26, a new treaty was concluded between Great Britain and Japan, by which the ports of Hakodadi, Kanagawa, and Nagasaki were opened to British subjects after 1 July 1859, Nee-e-gata or some other convenient port on the west coast of Niphon after 1 Jan. 1860, and Hiogo after 1 Jan. 1863, and various commercial privileges granted to British merchants. In 1860 a Japanese embassy visited the United States, and in 1861 an embassy was sent to the European courts. The rebellion of 1868 already referred to under the paragraph *Government*, followed on the deposition of the shogun, and the reform movement for modernizing Japanese institutions organized by Iwakura, Okulo, Saigo, and Kido.

This progressive movement was chiefly, if not solely, the result of political foresight. The Japanese were at heart as anti-foreign as their Chinese neighbors; but, unlike the latter, they grasped the fact that western encroachment could only be checked by western methods.

SCENE ON THE BAY OF YEDDO, JULY 11, 1853.

LIEUT. BENT IN THE MISSISSIPPI'S CUTTER PASSING THROUGH A FLEET OF JAPANESE BOATS.

FIRST LANDING OF AMERICANS IN JAPAN, JULY 14, 1853.

When the progressive and sagacious statesmen of Japan perceived that their existence as a nation depended upon meeting the great powers of the West on their own ground, they determined upon a thorough and comprehensive metamorphosis. Not only was the youth of Japan sent to Europe for the purpose of acquiring western sciences, but foreign advisers were called in wholesale to reorganize the army and to instruct the nation in the ways of the West. The first innovation was the construction of a railway in 1869, and since that date an immense railway system has been developed, chiefly for strategical purposes, and latterly with but little assistance from foreign engineers.

The building up of a powerful and efficient navy was one of the first considerations of the Japanese government; and not contented with merely organizing a fleet, they prepared for the chronic industrial warfare, which is the inevitable condition of modern life, by subsidizing the construction and the maintenance of a mercantile marine. Determined to make themselves independent of Europe and America, the Japanese established dockyards and arsenals, at which modern ships and armaments are now turned out under foreign supervision, and frequently by native engineers unaided by Europeans. Although the workmanship attained in the latter case is not, generally speaking, on a level with that of the West, it is admitted that the Japanese are making rapid progress in engineering and ship-building. The problem of education received the early attention of Japanese reformers, Commissioners were despatched to Europe in 1871 charged with the task of mastering the essential points of Western education. On their report an educational code, which has since been frequently revised, was drawn up. The new conditions of life necessitated the abolition of Japan's traditional code of laws, which she proceeded to replace with a legal code borrowed from the West; and to these laws foreigners in Japan since the nullification of extra-territoriality in 1899, are now obliged to submit themselves. Although the native industries may be said to die hard in Japan, the country has undergone during the last few years little short of an industrial revolution. In 1897 Japan adopted a gold currency, and placed herself thereby on a financial level with the civilized powers of the West. Side by side with the modern development of their country the Japanese have preserved a remarkable spirit of patriotism. These reforms were not effected without considerable opposition and several risings of the nobles, who, in consequence of the revolution of 1868, were deprived of their privileges, and to a large extent of their incomes, took place. That of 1876–7, headed by the reformer Saigo, taxed the resources of the government pretty severely before it was quelled. In 1894 war with China broke out, ostensibly owing to disturbances in Korea, over which both China and Japan had long claimed a suzerainty, and which had been a frequent source of friction between the two countries on former occasions. Active hostilities began in Korea, from which the Japanese gradually drove out the Chinese troops. A great naval engagement took place off the mouth of the Yalu River, which separates Korea from China, and the result was entirely in favor of the Japanese, who then pushed their way into Manchuria, driving the Chinese before them. Further great successes were the capture of the Chinese fortified port and arsenal of Port Arthur, at the entrance of the Gulf of Pe-chee-le of New-chwang, Wei-hai-wei, and great part of the Chinese fleet. China then saw that it was hopeless to continue the struggle, and in March 1895, Li Hung Chang was sent to Shimonoseki to sue for peace. Japan demanded, in addition to a heavy war indemnity, the cession of the Liao-tung peninsula. To these terms China's plenipotentiary ostensibly agreed, but it had been secretly arranged that Russia should step in and forbid the alienation of territory on the mainland. Accordingly Japan found her demands opposed by Russia, France, and Germany, and was compelled to forego the legitimate fruits of her victory. There is no doubt that Japan's primary object in making war was to check the advance of Russia to a threatening position on the mainland of Korea. Her statesmen hoped, by the insistence on Western reform, to make Korea a powerful buffer state between their own country and Muscovite aggression, and after the conclusion of the war there began a constant — and singularly even — struggle of diplomacy between Japan and Russia for paramount influence in Korea. Instead of the Liao-tung peninsula, the island of Formosa and the Pescadores Islands were ceded to Japan, who was thus obliged to relinquish her design of thwarting Russia's objects in Northern China. A subject which constantly occupied the attention of Japanese statesmen during the 12 years that preceded the war with China was treaty revision. Japan had sacrificed national pride in order to place herself upon an equality with the West, her progress had been serious and genuine, and her statesmen protested against the continuation of extra-territorial privileges which relegated the country to the level of barbarous and uncivilized states. Great Britain was the first power to acknowledge Japan's claims to equality, and in July 1894, a new treaty, which was not to take effect for five years, was concluded by the two governments. Other powers followed suit, and on 17 July 1899, Japan attained her international majority. The principal effect of treaty revision was to abolish extraterritoriality, and to throw open the whole of Japan to foreigners for purposes of travel, trade or residence. The differences with Russia in regard to Manchuria and Korea, came to a crisis on 6 Feb. 1904, when after due notification, Japan broke off diplomatic negotiations. War ensued on the battlegrounds of Korea, Manchuria, and in the adjacent waters, until peace was re-established 5 Sept. 1905, Japan strengthening her position by a new treaty of alliance with Great Britain. See ANGLO-JAPANESE TREATY; KOREA; MANCHURIA; PORTSMOUTH, TREATY OF; RUSSIA.

Language and Literature.— Though the Japanese language is grammatically analogous both to those of the Mongolo-Tartaric and Manchu-Tungusic families, it differs radically from them. The Japanese language is not monosyllabic (like Chinese), but agglutinate, and has an alphabet of 47 letters, which are written in two different forms, one rendered complex by the addition of variations, known as the Fira-Kana form of character; and the other, the Kata-Kana character, entirely without variations, and consequently much simpler. Its claim to be akin to

the Chinese is invalidated by the essential characteristics of the Niphonese tongue, which differs from the Chinese as to the etymic import of its elements and in its polysyllabism. The genuine portion of the former is called *Yomi*, while the Chinese superfetation goes under the name of *Koye*. Siebold endeavors to establish genetic connections of the Japanese with various other languages, as for instance with that of the Ainos inhabiting the northern part of the island of Yezo and the southern point of Saghalien (Tarakai); with that in Santam on the coast of Manchuria, south of the Amoor; with those of the Incas of Peru and the Bochicas of New Granada; with that of the Muiscas of Brazil, etc. Although the Korean languages have many features in common with the Japanese, their divergence is radical. The area of the Japanese comprehends the three great islands with some parts of Yezo and other southern Kuriles, of South Saghalien, and also the Loo Choo group of islands, where a dialect or closely related language is spoken. The vernacular idiom differs remarkably from the written, by peculiar terminations, particles, and construction. The written language has also a peculiar style, named *naiden*, for religious and mystical subjects, and another, called *gheden*, for profane composition. There are also two styles of allocution, the one of etiquette, the other vulgar. The speech of women also differs in some particulars from that of men. The Yomi is sonorous, soft, and agreeable; almost all words end in vowels, which, however, are often dropped, and in *m* and *n*. Some sounds are of difficult pronunciation to us. A too soft utterance of consonants produces vagueness between the sounds of *p, b, f,* and *v;* between *s* and the English *z, sh* and the French *j*. Although there are no decided *h* and *l*, some Europeans fancy they hear them, while better phonetic authorities credibly assert that they are really *f* and *r* respectively. The initial *r* sounds almost like *dr*. The number of original vocables is inconsiderable. Technical terms are generally Chinese, and often much altered. There are two graphic systems. (1) Sinography, somewhat modified. At the request of Ozinteno, the 16th Daïri, Kieu-su-wang (Jap. Kosuvo), king of Pe-tsi (Takusai, in Korea), sent Wang-jin (Jap. Vonin), in 285 A.D., to Japan to introduce there the *Tshin-tse* (Jap. *Sinzi*, China letters), which were afterward named *Han-tsé* (Jap. Kanzi). From that time both the *Tshin-tsé* and the Chinese language became common in Japan; although the former are peculiarly pronounced, as may be seen in the examples within parentheses below. This divergence is, however, scarcely greater than that of the Chinese dialects from the Mandarin idiom. The sinograms of the learned are called *Taf* and *Sso*. With the varieties of sounds there are about 380 Japanized sinograms, beside the unaltered *Tshin-tsé*. The former are explained by the *Kata-kana* (see below); thus: *kekkō*, beautiful, by the Jap. *birei; mei-fit* (celebrated pencil), fine writing, by *nō-zio*, etc. Sinograms are sometimes pronounced very differently from their proper sounds; thus: *ye* (the 27th Chinese syllable), river, from the sinographic *sin-kiang; me* (17th Chinese syllable), woman, sinogr. *niù*. Synonyms are often written with the same sinograms. Prefaces of books are commonly written in sinograms. (2) As these did not altogether suit the peculiarities of Japanese phonetism and grammar, Kibi or Kibi-ko (733), who had been educated in China, selected 47 sinograms, and simplified them into syllabic signs, in analogy with their original sounds. This syllabary was named *I-ro-fa*, from the first 3 syllables, just as our alphabet is named from the first two letters. This Irofa, surnamed *Kata-kana* (half letters or signs), is used collaterally with sinograms, explaining their sounds, and serving beside for the indication of grammatical particles; in the same manner as the Manchu interlinear or marginal letters serve in Chinese texts. This form is called sometimes the writing of men. The 2d Irofa, surnamed *Fira-kana* (expanded letters), was contrived by the celebrated bonzes Comiu and Kobo (774–835), and became so manifold by the licenses of the pencil as to be almost illegible, especially owing to additions by a third bonze, Kiakuso, who added a 48th sign for a nasal sound. This is the cursive writing for daily transactions, sometimes called the writing of women. The 3d Irofa is *Mun-yo-kana* (myriad-leaves-letters, so called from the poem *Mun-yo-sio* by Tatsi-bana-no Moroye, about the middle of the 8th century, containing 10,000 verses), and is almost a sinogrammatic prototype of all the Irofas. The 4th is the *Yamato-kana*, a simple cursive script, which is used promiscuously with all the others. The original idea of the Irofa is Buddhistic and Indian. The varieties of form in all the Irofas are a great impediment to expeditious reading, the difficulty of which is increased by the many ligatures between the letters. Writing and reading proceed in vertical columns downward and from right to left. There are also some other diacritic as well as punctuating signs. The former are two, namely: the *nigori*, which is almost like our quotation mark (″), and indicates that the hard or rough sound of a letter is modified, so as to cause the *ko, fo, to,* etc., to be pronounced *go, bo, do;* and the *maru* (°), which indicates tenuification, or hardening, for instance of *fo* into *po*. The marks of punctuation denote also the transposition, repetition, etc., of syllables; they also separate sinograms from Irofas. The order of syllables is as follows: *i, ro, fa, ni, fo, fe, to,* and so on, without any symmetry or analogy. Properly classed, they are: the 5 Latin vowels, *a, e, i, o, u;* the labial *f* with these vowels suffixed (*fa, fe, fi, fo, fu*); the guttural *k* with the same; the *m* with them; then the *s* with them (and modified by diacritics into *z*, French *j*, Eng. *sh*); then *y, t, r, n*, all with those vowels attached; lastly, two more, *n'a, n'e*. The *t* is sometimes *ts, dz*, etc. The transcription by Europeans is variable. There is, beside, a kind of metaphony, by which *fò* becomes *fau* and *fafu; riò, riyau; kvo, kavau, kafau*, etc. This is similar to the Latin *lavo, lavatum* and *lautum, lotum; favco, fautum, fotum, fœtus*, etc. Dialectic variations depend chiefly on modifications of sounds; in Yeddo, for instance, *r* predominates; elsewhere *f* is pronounced *v; fu* like *u*, etc. In the grammar, there is no gender; the male sex is indicated by *vo*, the female by *me*. Substantives do not differ on the whole from adjectives. The latter are often replaced by qualitative verbs or by the particle of the genitive, and are euphonically varied, according to their position; thus, for instance; *akae fana*, red flower; *akashe fanava*,

AMERICAN SAILORS IN THE TEMPLE GROUNDS, SIMODA, JULY 8, 1854.

RELIEF MAP OF THE FIELD OF RUSSO-JAPANESE WAR.

FROM A MAP PREPARED BY THE INTELLIGENCE BUREAU OF THE WAR DEPARTMENT OF JAPAN.

red is flower-the; *akovo naru*, red becomes it (as in Magyar *vörössé lesz*); *aka irono fana*, Lat. *rubri coloris flos*. There is no proper article, but the suffix *va* sometimes determines the acceptation, or shows the French *partitif;* and *sya* signifies "as regards." Cases are indicated by suffixes, as in the following example: *sten*, or *sten-va*, Lat. *cælum; sten-no* (oftener *sten-ga*, as in Korean), *cæli, sten-ni, cælo, versus*, and *ad cælum; sten-ye, in cælum; sten-vo, cælum*, accusative (also *sten-voba*); *sten-de, cælo*, ablative; *sten-yori, ex cælo; sten-kara, de cælo, per cælum*, etc. The plural is formed by suffixes, as *tatsi, domo, ra, syo*, which signify all, much, many; or by reduplication, as *fito-bito*, men, from *fito*, man, with altered initial. The genitive precedes: *fitono yomi*, Lat. *viri arcus; anagono, fana, mulieris flos*. The numerals are various. We give here the Koye in the first place, and within parentheses the Yomi or common ones first, and after them those of days, namely: 1, *itsi* (*fitots', tsuitats*); 2, *ni* (*fotats', futska*); 3, *san* (*mits', mika*); 4, *si* (*yots', yokka*); 5, *go*, (*itsots', itska*); 6, *vok* (*mots', muika*); 7, *sitsi* (*nanats', nanuka*); 8, *fats* (*yats', yòka*); 9, *kŏ* (*kokonots', kokonoka*); 10, *yo*, (*tovo, tovoka*), etc. The other Koye are: 11, *zyo-itsi* (10 + 1); 12, *zyo-ni* (10 + 2), etc.; 20, *ni-zyo* (2 × 10); 30, *san-zyo* (3 × 10), etc.; 100, *fyak;* 1,000, *sen;* 10,000, *man;* 100,000, *vok* (and *roksya*, Sanskrit *lak-sha, a lac*); 1,000,000, *teô;* 10,000,000, *kei* (*kotsi*, Sanskrit *kōti*). There are 3 sets of figures of numbers. Many particular words are also used in the sense of numerals, as in Chinese. Of pronouns, those of the 1st and 2d person seem to have been lost in the words of etiquette. I, to equals and inferiors, is *vasi*, to a superior, *vatakusi;* we, to equals or inferiors, *vasi-domo*, to superiors, *vatakusi-domo*. There are more than 12 ceremonious quasi-pronouns for the 2d person. The 3d is *ano fito*, this man, etc. (as in Korean). There are many demonstratives. Relatives are wanting, being supplied by participles or understood from the context of the phrases, thus: *vasino miru sto*, Lat. *mei* (*mihi*) *visus vir*, for *vir quem vidi;* but *vasivo viru sto, me videns, vir*, for *vir qui me vidit*. The verb is the most perfect part of Japanese speech. *Aru* (to be, or to act), united with nouns, produces many compound verbs. It is affected by many moods, voices, and other logical categories, as in the Altai-Uralic and in many American languages; as for instance: *tata-ku*, Lat. *fer-ire, percut-ere; tata-keru, ferire posse; tata-kerareru, percuti jubere; tata-eteoru, percutientem esse; tata-kau, se mutuo ferire, pugnare; tata-sashereau, facere ut inter se pugnent, bellum ciere*, etc., to a greater extent than the Semitic *kal, piel, nifol, hifil, hithpael*. The suffixes of the tenses are: present, *ru*, past *ta*, future *o;* of negation, *nu, zu*. Persons and the plural are indicated by pronouns. The theme of the verb, which is also a substantive noun, is employed without alteration if others follow, and receives the suffixes only when it is not followed by others, or when it is the last word in the phrase. Various euphonic modifications take place in such a combination with the suffixes. Certain particles denote the moods. The participle is of very extensive application, rivalling that of the Greek. Adverbs are like adjectives, as in certain German phrases. The syntax adheres to a strict order, which is: first the subject (nominative), then the object, attributes, the verb, and the conjunction last. Many of the simple words abound in significations, which must be discriminated by sinograms. Compounds and derivatives are as frequent and easy as in Greek or German. Examples of the former are: *kara-mi*, Lat. *corporis truncus; kono-mi, arboris fructus; futa-no, telæ paginæ; tsi-sivo, pectoris liquor* (blood); *yamabato*, mountain bird, wild pigeon. Derivatives from *stat*, under, below, inferior, are: *statva*, humility; *statno*, humble; *statni*, humbly; *stat-nisheru*, to humble; *stat-ninaru*, to be humbled; *stat-vonarsu*, to cause humiliation, etc. Other derivatives are: *yomo*, to read, *yomi*, reading, *yomite*, reader; *itomo*, to afflict, *itami*, affliction; *orano*, to hate, *orani*, hatred; *kako*, to write, *kakite*, writer, etc. The following are paraphrases for avoiding ambiguity: *fai-tori-gumo*, fly-catch-spider, for *kumo*, which means cloud as well as spider; *ine-kari-gama*, rye-cut-scythe, for *kama*, scythe, frog, dish, etc. Many synonyms need explanation, as given in lexicons, where they are determined by sinograms, as for instance *ka-yari-bi*, fire-drive-gnats, because each of the three words has different meanings; *kami-fusuma*, a paper cloak, because *kami* signifies paper, god, head, above; *kino-doku*, mind-poison, grief; *ine-bikari*, rye-splendor, lightning; *issun-bōsi*, one-inch-bonze, for dwarf, etc. The following are examples of plurisignificants: *in-yen*, cause, banquet; *idziu*, to inhabit, to leave the house; *kanten*, heat and cold (so in Latin, *altus*, high and deep, *calidus* and *gelidus*, Eng. *coal* and *cool*, etc.). Many Yomi and Koye coincide, others diverge altogether in signification; thus: *kiba*, Japanese, tool, Chinese, cavalry; *kido*, Japanese, city-gate, Chinese, joy, anger, etc. The adoption of Roman script of the English alphabet as a substitute for her ancient system of ideography, is one of the most remarkable and not least important of all Japan's steps toward harmonizing herself with the highest civilization of Europe and America. For several years a knowledge of Roman script has been increasing in Japan among the most highly educated. Now it is proposed by the most influential educational organization in the empire to make the teaching of our alphabet and of our mode of word formation compulsory and universal in the public schools. It seems probable that the government will adopt the proposal, in which case, of course, all private schools will have to do the same, with the result that all the children of Japan will be learning to write and read their own language in English fashion.

At present the great stumbling block in the way of mastering Japanese is the necessity of learning a multitude of different ideographs. Once Japanese words are expressed in letters like our own, the task of learning will become immeasurably easier. It will then also be much easier for the Japanese to learn our language, for of course our alphabetically formed words seem as strange to them as their ideographs do to us. Moreover, it will cause a change amounting almost to transformation in the Japanese mind, or in the linguistic functions of that mind. The Japanese will for the first time regard words not as indivisible integers of speech, but as composite things formed of letters.

The literature of Japan comprises works of all kinds, histories, geographical and other scientific treatises, books on national history, voyages and travels, moral philosophy, dramas, romances, poems, dictionaries, and cyclopædias. A collection of the works of their poets, accompanied by short memoirs, has been made, and almost every Japanese is familiar with the best passages of the principal poets, and fond of quoting them in conversation. Many of their novels are of an interesting character and exhibit a higher imagination and more truth to nature than is found in the fictions of other Oriental nations. Their dramas, of which the people are passionately fond, are generally founded on national history or tradition, or the exploits, lives, and adventures of Japanese heroes and gods. Some of them are designed to illustrate and enforce moral precepts. Their general tendency is of an elevating, patriotic, and decorous nature, though some are strongly tainted with the national passion for revenge, and have horrible exhibitions of cruel punishments. The unities are totally disregarded, and the scene shifts from country to country and flies over great spaces of time without much regard to probability. Only two actors are usually upon the stage at the same time, and the female parts are performed by boys, as was formerly the case in Europe. The actor is most esteemed who can most frequently change parts in the same piece, and the leading actors receive very high pay.

Art.—Japan is in every sense an artistic nation. Owing to the timber construction that prevails in the buildings, which are marked by the characteristics of braced uprights, the overhanging curved roof, and an absence of arches, the architecture of Japan presents no very striking features except in the wealth of ornamental detail and brilliant color. The most imposing architectural monuments are various temples of which two of the earliest and finest are the 7th century hondo or chief temple of Horinji, Yamato, and the pagoda of Yakushiji, near Nara. In sculpture and carving, however, their work is fine almost to microscopic detail, while still preserving the big effect. Their statuary, dating from the 8th century, is marked by a vigor and freedom of design which has resulted in a standard of high artistic merit. In their bronze statuettes and in carving in wood and ivory they are unsurpassed. The artists love to represent Japanese life as it exists, and the incidents of every-day life, more especially the comical and grotesque, are worked out in wood with extraordinary skill. But it is by painting, especially, that Japanese art is best exemplified.

In Japan the art of painting is of such ancient date that its origin is enshrouded in the mists of antiquity. China, India, Korea, and Persia exercised a notable influence upon early Japanese art, but its history cannot be traced back farther than the 9th century.

In the Japanese dwelling there are no pictures, according to the conventional acceptation of the term, in their place is the kakemono, a gay and pleasing mural hanging, consisting of a strip of silk, satin, or crêpe, painted in a bold design of flowers, birds, or figures. This silk, often of thin or transparent texture, is sized in such a manner that it becomes an excellent vehicle for the retention of transparent washes in India-ink or water-colors.

The kakemono is appropriately framed in bands of rare brocade, gold or silver cloth, or of silk or paper decorated with a painted pattern. The bordering usually harmonizes in design and color with the subject. A glittering golden network is sometimes placed at the top or bottom, a silken fringe or other suitable finish. It rolls up like a map, and is weighted at the bottom with a cylinder of wood, bone, or ivory. From this cylinder sometimes depend handsome tassels of silk or carven ornaments of bronze, bone, or ivory; but these ornaments are admissible only on very expensive examples. When not in use the panel is carefully rolled up, deposited in a box covered with silk or paper, and put away until it is needed.

The kakemono has no determinate dimensions, the size being governed by the whim of the artist, or the space in which it is to be hung.

The kakemono is invariably assigned to the place of honor in a home, and is hung in a receptacle known as the tokonoma. This is a hooded and partitioned recess made of bamboo or some light wood, built at right angles with the wall of the room, and so constructed that it always commands a good light. These panel pictures are changed as often as three times a week, changes being governed by the season, occasion, or rank of company expected. The kakemono is a favorite adornment for the tea-house, the gayest ones being selected for this purpose.

Some of the finest ancient examples are enshrined in sacred temples, many of them being representations of Buddha and the numerous pagan gods worshipped by the Japanese; others are emblematical, consist of holy symbols, and are bordered with the most expensive fabrics.

Kosé Kanaoka is said to be the father of Japanese painting; he was the painter and poet-laureate of the imperial court and is regarded as the most eminent artist of antiquity. But few of his works are extant, and they are treasured with such veneration that they are dedicated to the sacred shrines.

Up to the beginning of the 17th century the Japanese painters disdained to reproduce any but heroic and religious subjects. It was not until the 18th century that any paintings portrayed the every-day life of the common people. Four artists soon became celebrated as prominent exponents of this new school of art. Iouasa Matahei was the founder of it, and has presented to posterity the pictorial history of the common people. He shows the peasant laboring in the field, the shopkeeper vending his wares, the artisan plying his various vocations, and the courtesan with her painted cheeks and gorgeous raiment. Hence the kakemonos of Matahei are of inestimable worth to the antiquarian, as they depict with admirable fidelity the manners and costumes of old times.

Motonobou was another able exponent of the realistic school; he began life as an art-embroiderer, and the embellishment of textile fabrics with fine needlework was due to his influence. It was he who created the fashion of the sumptuous trained robe still worn by the women of Japan.

Katsou-Kava was also a realist or impressionist. He devoted his talents to painting scenes from the theatre, and also pictures of women engaged in various occupations, with a smiling landscape or a sumptuous interior for a background. These paintings of picturesque peasant

girls, these counterfeit presentments of gaudily apparelled actors, are mostly to be found decorating the walls of tea-houses. Katsou-Kava was an able exponent of this school of art, which had many followers; he revelled in brilliancy of color, and under his skilful fingers the saffron yellows, the turquoise blues, and the rich violets were blended into a harmonious ensemble with consummate skill; his figures seemed imbued with life and motion.

Yeisai was one of the most delicious colorists of the latter-day impressionistic school, and is responsible for originating the exaggerated type of female who soon became the fashion in the cities of Japan. Although these exaggerations shock our refined tastes, we cannot fail to admire the voluptuous grace of his women, clad in the sumptuous stuffs that the looms of the Orient alone can produce. Another painter fond of portraying females of the refined aristocratic type was Outamaro, whose women are imbued with a languid sensuous charm. His paintings greatly resemble those of the modern French school, and remind one of a mellow rhythmical harmony in music.

Hakousai is undoubtedly the greatest painter, from a European standpoint, that Japan has ever produced, and may justly be compared with the most distinguished painters of Europe. His works are a veritable encyclopædia of dress and customs, but he was pre-eminently the artist of the people, and died unrecognized by the aristocratic classes.

Science.—In science the Japanese cultivated particularly medicine, astronomy, and mathematics. Superstitious prejudices prevented them from studying anatomy by dissection, and they therefore were but little skilled in surgery, but as physicians were able to cope with the most difficult and dangerous diseases. Chemistry also was imperfectly studied, but botany was successfully pursued. Great advance has been made along all scientific lines under the modern regime, as demonstrated during the war with Russia, and especially in the wonderful results achieved in the saving of life through the improved surgical methods of treatment of the wounded.

Music.— Native music is almost identical with that of China, having the same scale of five tones with an invariable common time. Marked by monotonous melodies chiefly in a minor key, and by an excessive use of chromatics, it is generally disagreeable to occidental ears. The use of the samsie or native guitar is an invariable part of female education. Old standards, however, are being abandoned, and western music introduced into schools and colleges is gradually gaining ground.

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CHARLES LEONARD-STUART, B.A.,
Editorial Staff, 'Encyclopedia Americana.'

Japanese Art. See JAPAN.

Japanese Deer. See SIKA.

Japanese Fern-balls. See FERNS.

Japanese Quince, a small species of *Pyrus* (*P. japonica*), closely related to the typical quince, but cultivated wholly as a flowering shrub, as its small apple-like fruit is of little value. The flowers are large, numerous, early, vary from white to deep crimson, and universally admired.

Japan'ning, the art of varnishing in colors. All substances that are dry and rigid, or not too flexible, as woods, metals, and paper prepared, admit of being japanned. Paper is rarely japanned till converted into *papier mâché,* or wrought into such a form that its flexibility is lost. The article to be japanned is first brushed over with two or three coats of seed-lac varnish to form the priming. It is then covered with varnish, previously mixed with a pigment of the tint desired. This is called the ground color; and if the subject is to exhibit a design, the objects are painted upon it in colors mixed with varnish, and used in the same manner as for oil-painting. The whole is then covered with additional coats of transparent varnish, and all that remains to be done is to dry and polish it. Japanned works are chiefly of iron and tin, such as coal-boxes, trays, tin canisters, etc., which are both rendered ornamental and protected from rust. Much care is necessary to secure a high and equal polish. For a description of the Japanese process see LACQUERING; also see VARNISH.

Japheth, jā'fĕth, the second of the three sons of Noah, Gen. x. 1. His descendants peopled Europe and northern Asia. The Armenians, Medes, Greeks, Thracians, etc., were of the stock of Japhet. In Arabian legend he is said to have had 11 sons, each of which was the founder of a nation. Some philologists designate the Indo-Germanic languages by the term Japhetic, thus identifying his progeny with the Aryans; and the patriarch is said by others to be represented by the Japetus of Greek mythology, whose wife was Asia, and bore him a son Prometheus, the founder of civilization.

Japp, Alexander Hay, English editor and author: b. Dun, Forfarshire, 25 Dec. 1839. He was educated at Edinburgh University, and was for several years sub-editor of 'Good Words' and the 'Contemporary Review' and editor of the 'Sunday Magazine.' Several of his works have appeared over various pseudonyms — "H. A. Page," "Benjamin Orme," and others. He wrote: a 'Life of Thomas De Quincey' (1874); 'Thoreau: his Life and Aims' (1878); 'German Life and Literature' (1881); 'De Quincey Memorials' (1885); 'Cuckoos and other Parasitical Birds' (1899); 'Darwin and Darwinism' (1900); 'Darwin as Ethical Thinker (1901), and other volumes.

Japura, zhä-pŏŏ-rä'. See YAPURA.

Jararaca, zhä-rä-rä-kä', a venomous crotaline serpent (*Lachesis jararaca*) of northeastern South America. Compare BUSHMASTER.

Jaro, hä'rō, a pueblo of the province of Iloilo, Panay, situated on the Jaro River four miles northwest of Iloilo, the provincial capital. It is one of the earliest Spanish settlements in the Philippines, having been founded in 1584; in 1865 it was made an Episcopal see. The river is navigable for native boats and there is considerable trade. Pop. 10,400.

Jarool', an English spelling of the native name of an East Indian tree (*Lagerstræmia flos-reginæ*). It has large purple flowers, and yields valuable timber.

Jarves, järv'vĕs, **James Jackson**, American art writer: b. Boston, Mass., 20 Aug. 1818; d. Tarasp, Switzerland, 28 June 1888. In 1838, in consequence of ill health, he sailed for the Sandwich Islands, and resided for several years in Honolulu, where he published the first newspaper ever printed there, the *Polynesian*. Before returning to the United States he traveled extensively in California, Mexico, and Central America, and subsequently published a 'History of the Hawaiian or Sandwich Islands' (1843); 'Scenes and Scenery of the Sandwich Islands' (1844); and 'Scenes and Scenery in California' (1844). He afterward resided in Europe, chiefly in Florence, devoted to the study of art and engaged in making a collection of old masters which eventually became the property of Yale University. For his services to Italian art the king of Italy made him a chevalier of the Crown of Italy. His later works include: 'Parisian Sights and French Principles' (1855–6); 'Art Hints' (1855); 'Italian Sights and Papal Principles' (1856); 'Kiana, a Tradition of Hawaii' (1857); 'Confessions of an Inquirer' (1857); 'The Art Idea'; 'The Old Masters of Italy' (1861); 'Glimpses at the Art of Japan' (1876); 'Italian Rambles' (1884).

Jar'vis, Abraham, American Protestant Episcopal bishop: b. Norwalk, Conn., 5 May 1739; d. New Haven, Conn., 3 May 1813. He was graduated at Yale in 1761, and in the autumn of 1763 sailed for England, where he was ordained deacon in February, 1764, and priest a few weeks later. He left England in April, and was settled as rector of Christ's church, Middletown, Conn., the same year. In 1797 he became the second bishop of Connecticut.

Jarvis, John Wesley, American painter: b. South Shields, England, 1780; d. 1840. John Wesley was his uncle and sent him in his fifth year to Philadelphia, where his father, a seafaring man, had settled. Jarvis had but little regular art training, but was encouraged by Malbone. He had a studio in New York and painted portraits of statesmen, preachers and soldiers, some of which are in the City Hall, New York, and in the collection of the New York Historical Society.

Jasher, Book of, a lost book of the Hebrew Scriptures, twice mentioned in the Bible (Josh. x. 13, and 2 Sam. i. 18), and about which various conjectures have been made. It was most probably a national song-book of post-Solomonic age, whose contents were partly secular, partly religious. From the mention of the book in Joshua and 2 Samuel it has been inferred that the book of Joshua could not have been written before the time of David's lamentation. But this assumes that the book of Jasher was all written at once, an assumption which in our ignorance regarding it we are not at liberty to make; for the book of Jasher may have been written at different times. The theory of Dr. Donaldson as to its scope and contents, in conformity with which he proceeded to reconstruct it from the fragments which he thought he could trace throughout the several books of the Old Testament, has met with little favor either from English or Continental scholars. See Donaldson, 'Fragmenta Archetypa Carminum Hebraicorum in Masorethico Veteris Testamenti Textu passim tessellata.'

Jasmin, Jacques, zhäk zhäs-măn (Provençal, JAQUOU JANSMIN), Provençal poet: b. Agen 6 March 1798; d. there 4 Oct. 1864. In his 'Mous Soubenis' (My Recollections) he gives a humorous description of the humility of his origin and of the poverty of his kindred. All his poems and songs are written in the patois of the peasantry on the banks of the Garonne, supposed in its purest state to be identical with the old Provençal, the language of the troubadours. His poetry deserved and acquired more than a local celebrity, and was warmly welcomed not only in Southern France, but throughout the whole of Europe. He was elected a member of the academies of Agen and Bordeaux; the city of Toulouse awarded him a gold laurel; and in 1846 he was created a Knight of the Legion of Honor. The poetry of Jasmin is distinguished by beauty and power, and though his genius inclined him to gaiety rather than to pathos, yet perhaps his most striking and successful passages are those in which he addresses himself to the feelings. His principal works are: 'The Charivari', (1825), a mock-heroic poem; 'Lou Tres de May' (1830), an ode; 'The Blind Girl of Castel Cuillé' (1836), his masterpiece in poetry, which has been translated by Longfellow; 'The Curl-papers of Jasmin' (1835); 'Françouneto' (1842); 'The Two Twin Brothers' (1846); 'Maltro L'Innoucento' (1847); and 'La Semmano d'un Fil' (1849). Consult Rabain, 'Jasmin, sa vie et ses oeuvres' (1867); Montrond, 'Jasmin, poète d'Agen' (1875); Andrien, 'Vie de Jasmin' (1882); Smiles, 'Barber, Poet, Philanthropist' (1892).

Jas'mine, or Jessamine, a genus (*Jasminum*) of beautiful plants of the olive family, including many cultivated species and varieties. Most of these are shrubs with long twining branches bearing usually compound leaves and panicles of fragrant white or yellow flowers. They are natives principally of the East Indies. The common jasmine (*J. officinale*) has become naturalized in the south of Europe, where it grows eight or ten feet tall, and is practically an evergreen. The oil of jasmine is obtained from *J. officinale* and *J. grandiflorum*, but it is usually imitated or adulterated. *J. sambac* also furnishes an oil in the East; and a very common greenhouse species is *J. humile*.

Several shrubs are called jasmines which are only loosely related to the true jasmine. Thus the red jasmine of the West Indies (*Plumeria rubra*), the source of the perfume frangipanni, is of the oleander family; the Chile jasmine, *Mandevillea suavolens*, is another fragrant species of the same family, widely cultivated, and others might be mentioned. Two of these outside "jasmines" are familiar in the United States, one of which is a native. The Cape jasmine

(*Gardenia florida*) is a Chinese (not South African) shrub of the madder family, which found its way to England and America about the middle of the 18th century; it is cultivated everywhere in greenhouses, in a double-flowered variety; and it grows out of doors along the southern seaboard, it being the special pride of Charleston, S. C., after one of whose citizens the genus *Gardenia* was named by Linnæus.

The native species is the Carolina or yellow jasmine (*Gelsemium sempervirens*), an exceedingly odorous climbing plant of the family *Loganiaceæ*, common throughout the South Atlantic States. It is a vine, whose blossoms grow in axillary racemes of from one to six vivid yellow tubular flowers; and "evening trumpet-flower" is a common name. "Early laden, indeed, is the warm air of spring with its delicious perfume. . . . Through woods and thickets it wends its way vigorously and gleams as brightly as does later the Cherokee rose. It is one of the joys of the season." The roots are regarded by the country people as possessed of medical virtues.

Ja'son, in Greek legend, the son of Æson, king of Iolcos in Thessaly, a hero of ancient Greece, celebrated for his share in the Argonautic expedition, before which he had distinguished himself in the Calydonian hunt. He belonged to the family of the Æolidæ at Iolcos, and his instructor was the centaur Chiron, who educated most of the heroes of that time. (For his adventures in the Argonautic expedition see ARGONAUTS.) On his return to Iolcos with Medea as his wife he avenged the murder of his parents and his brother by putting Pelias to death. But he was unable to retain possession of the throne, and was obliged to resign it to Acastus, son of Pelias, and flee with his wife to Corinth. Here they passed ten years, till Jason, wearied of Medea, fell in love with Glauce (Creusa, according to some accounts), daughter of Creon, king of Corinth, married her, and put away Medea and her children. Medea, having revenged herself on her hated rival, fled from the wrath of Jason in her car drawn by winged dragons, the gift of Helios, to Ægeus, king of Athens, after she had put to death Mermerus and Pheres, her sons by Jason. According to some, Jason killed himself from grief; but others relate that, after passing a miserable wandering life, he came to his death by accident. Others say that he was reconciled to Medea, and returned with her to Colchis, where he ruled many years.

Jas'per, William, American soldier: b. South Carolina about 1750; d. Savannah, Ga., 9 Oct. 1779. At the commencement of the revolutionary war he enlisted in the 2d South Carolina regiment, in which he became a sergeant. Subsequently, in the attack upon Fort Moultrie by a British fleet, he distinguished himself by leaping through an embrasure to the ground, under a shower of cannon balls, and recovering the flag of South Carolina, which had been shot off. Governor Rutledge presented him with his own sword, and offered him a lieutenant's commission; this, however, Jasper declined, saying: "I am not fit to keep officers' company; I am but a sergeant." His commander gave him a roving commission to scour the country with a few men, and surprise and capture the enemy's outposts. His achievements in this capacity seem to belong to romance rather than history and in boldness equal any recorded in the revolutionary annals of the southern States. Prominent among them was the rescue by himself and a single comrade of some American captives from a party of British soldiers, whom he overpowered and made prisoners. At the assault upon Savannah he received his death wound while fastening to the parapet the standard which had been presented to his regiment. His hold, however, never relaxed, and he bore the colors to a place of safety before he died. A county of Georgia and a square in Savannah have been named after him.

Jasper, Ind., town, county-seat of Dubois County; on the Patoka River, and on a branch of the Louisville, E. & St. L. railroad; about 47 miles northeast of Evansville. Jasper is situated in an agricultural region. The chief manufacturing establishments are saw-mills, lumbering and planing-mills, flour-mills, a furniture factory, and a brick-yard. Pop. (1900) 1,863.

Jasper, an impure quartz, less hard than flint or even than common quartz, but which gives fire with steel. It is entirely opaque, or sometimes feebly translucent at the edges, and presents almost every variety of color. It is found in metamorphic rocks, and often occurs in very large masses. It admits of an elegant polish, and is used for vases, seals, snuff-boxes, etc. There are several varieties, as red, brown, blackish, bluish, Egyptian. Ribbon or agate jasper is jasper in layers.

Jassy, yäs'sē, Rumania, the former capital of Moldavia; on the Bahluiu River. The churches and educational institutions are quite noted; the industrial enterprises are few; but the commerce is extensive and important. The chief exports are petroleum, grain, meat, and salt; the chief imports are coal and clothing. It was in Jassy, in 1821, that Alexander Ypsilanti really began the work for Greek independence. About one-half the population are Jews. Pop. (1902) 80,500.

Jastrow, jăs'trō, **Joseph,** American psychologist: b. Warsaw, Poland, 30 Jan. 1863. He was a son of Rabbi Jastrow (q.v.) and came to America in childhood. He was graduated from the University of Pennsylvania in 1882 and has been since 1888 professor of psychology at the University of Wisconsin. He became president of the American Psychological Association in 1900. He has published 'Time-Relations of Mental Phenomena' (1890); 'Epitomes of Three Sciences' (1890); 'Fact and Fable in Psychology' (1900); 'Modern Psychology.'

Jastrow, Marcus M., American rabbi and lexicographer: b. Rogasen, Posen, 1829; d. Germantown, Philadelphia, 13 Oct. 1903. After the usual rabbinic and academic studies he graduated from the University of Halle in 1854, became a barber in Berlin, and then rabbi at Warsaw. After five years he was obliged to leave by reason of his political opinions, after being subjected to arrest. He was called to the Congregation Rodef Sholen, Philadelphia, in 1866, with which he was connected until his death, within recent years as rabbi *emeritus*. Besides some monographs and contributions to the press, he is best known for his 'Dictionary of the Targumim, the Talmud Bahli and Yerushalmi, and the Midrashic Literature,' which is nearing

completion (1903) and is a monument of untiring erudition and broad scholarship.

Jastrow, Morris, Jr., American Orientalist: b. Warsaw, Poland, 13 Aug. 1861. He was a son of the preceding, and coming to Philadelphia with his parents in early childhood, he was trained in the schools of that city, graduated from its university in 1881, and from the University of Leipsic 1884. He has been for many years professor of Semitic languages and librarian of the University of Pennsylvania. He was originally trained for the Jewish ministry, studying for some time at the Jewish Seminary of Breslau, Germany, and was appointed assistant to his father's synagogue, Philadelphia, which position he voluntarily resigned. His published works are: 'Religion of the Assyrians and Babylonians' (1898); 'Two Grammatical Treatises of Abu Zakariyya Hayyug' (1897); 'A Fragment of the Babylonian Dibbarra Epic' (1891); 'The Study of Religion' (1901). He has edited 'Selected Essays of James Darmesteter' (1895). He is a frequent contributor to learned periodicals and to various encyclopædias.

Jatropha, jăt'rō-fạ, a genus of euphorbiaceous plants of the tribe *Crotoneæ,* tropical and chiefly American. They are of interest principally for their medicinal properties, which reside mostly in the seeds. These, in the case of *Jatropha curcas,* are called Barbados or physic nuts,—the last in allusion to their purgative power. The so-called jatropha-oil is extracted from the seeds of the coral-plant (*J. multifida*) and of the East Indian *J. glauca,* and is used externally as a stimulant. A common species in the southern United States is the spurge-nettle or tread-softly (*J. stimulosa*). Compare MANIHOT.

Jats, jâts, the most numerous of the agricultural population of the Panjab, India, numbering about four and a half millions. They are by many identified with the *Getæ;* and some of the best authorities accept the theory that they are descended from Scythian invaders of India in prehistoric times. Some scholars believe them cognate with the Gypsies (q.v.).

Jaundice, jân'- or jân'dĭs, a morbid condition arising from the circulation of bile in the blood, with consequent staining of the tissues and a peculiar train of symptoms resulting from the poisoning. The tint of the skin and certain mucous membranes varies from a light yellow to a brownish or saffron hue. Staining of the conjunctiva is first observed, and is most intense. Jaundice, with reference to its origin, may be either obstructive or toxic. The term obstructive means causing a hindrance to the outflow of the bile from the gall-ducts into the intestine, with its consequent absorption into the hepatic vein and general circulation. Not only is the skin stained, but all the secretions as well, the urine becoming dark brown. As no bile is thrown into the intestine, the stools become clay-colored and usually hard. There is frequently distressing cutaneous itching, and other skin-maladies are not uncommon. The blood partially loses its power of coagulation, and the vessels are apt to allow the escape of blood into the tissues, giving rise to purpuric spots. The pulse is usually slow, and the patient somewhat melancholic. In bad cases death may follow a period of convulsions, delirium or coma. The cause of this obstruction may be anything occluding the lumen of the ducts from within, as catarrh of the membrane of the intestine, where the bile-ducts open, or catarrh anywhere along the course of the ducts; stones or thickened bile may block up some part of the tubes, or they may be occluded from pressure on the outside by tumors, constricting bands, or shrinking of the liver-substance. (See LIVER, DISEASES OF THE.) The toxic form of jaundice is due to the circulation of poisons in the blood which break down the red cells or, more rarely, destroy the liver cells. The jaundice in this form is not so intense, and the other symptoms caused by the poison are of more importance. Many of the infectious diseases, such as influenza, typhoid fever, yellow fever, pneumonia, pyæmia, and acute atrophy of the liver, cause this form. Mineral poisons, particularly phosphorus, act in the same way. Jaundice in the new-born is so common as to be considered a natural condition, and usually lasts but a few days. It is evident from the many conditions that may give rise to jaundice that it must be considered as a symptom, and treatment should be directed to aiding the bodily functions until the exact cause can be determined.

Jaurés, Jean Leon, zhŏñ lā-ôñ zhō-rā, French Socialist: b. Castres 1859. He taught at Albi and Toulouse, and in 1885 entered politics and was elected to the Chamber of Deputies from Tarn; at this time he was a moderate Republican. In 1889 he failed of re-election, and returned to Toulouse, where he was active in the establishing of a college of medicine. Becoming a Socialist, he defended the strikers at Carmaux, and in 1893 was again elected to the Chamber, where he became one of the leaders of the Socialists. He failed of re-election in 1898, but was again elected in 1902. When the Socialist Millerand accepted a position in the cabinet, Jaurés defended his action, thus opposing Guesde and the *Parti Ouvrier,* but sought at the same time to reconcile the factions. He also took an important part in obtaining a revision of the Dreyfus case. He still holds a position of leadership and influence in the Socialist party of France, and is acknowledged to be one of the best orators in the chamber of deputies.

Java, jä'vạ (native, *Siti-Java* or *Yava,* land of millet), an island of Dutch East India; situated between lat. 5° 52′ (Saint Nicholas Point), and 8° 50′ (South Cape) S.; and lon. 105° 13′ and 114° 39′ E. The island is bounded on the north by the Java Sea, on the east by Bali Strait, which separates Java from Bali Island, on the south by the Indian Ocean, and on the west by Sunda Strait which separates the island from Sumatra. It extends east and west, declining 15° toward the south. It is about 660 miles long, from 40 to 125 miles wide, and the area, including Madura Island, off the east coast, is about 50,554 square miles. The Indian Ocean, which beats with great force along the south coast, has prevented the formation, on that side, of such alluvial plains as extend along the north coast. From the same cause the south coast is generally unsafe for shipping, while the north affords excellent anchorage at almost all times and places. The south presents a continuous front of crags and rocks, forming the outer edge of an extremely mountainous country; the north is flat and low, and covered in

many places with mangrove swamps. The chief harbors on the north are those of Surabaya and Batavia; on the south that of Chilatjap, formed by the small island Kambangan.

Topography and Hydrography.— The whole configuration of the island has been transformed by volcanic action. There are at least 50 volcanoes in Java, of which half are active. In the western end of the island they are grouped in a mass and attain a height of 10,000 feet, but in the eastern portion, though more scattered, they are generally higher, one, Semeru, 12,044 feet, being the highest in the island. Among the chief are Salak (7,266), near Batavia, now extinct; Gedé (9,720); Tjirmaj (10,075); Marbabu (10,670); Raun (10,820); Slamar (11,250). Papandayang, in the southwest, destroyed about 3,000 persons in 1772. In 1822 great damage was done by the eruption of Galungung, one of the volcanoes in the western part of the island. In 1686, about 10,000 lives were lost by the eruption of Ringghit, once over 12,000 feet high, but now a low mountain. The eruption of Kloet (q.v.), in 1901, was most disastrous. The eruption of Krakatoa (q.v.) in 1883, was one of the horrors of modern times.

The island is subject to earthquakes, usually not severe. Three earthquakes are known to have preceded and 19 accompanied volcanic eruptions. In 1867 occurred a most destructive earthquake. A low range of non-volcanic hills, about 3,000 feet high, extends along the south coast. The crater of an extinct volcano called Guwa Upas, or the Vale of Poison, about one half mile round, is held in horror by the natives. It is said that every living creature that enters it drops dead, and the soil is covered with the carcasses of deer, birds, and even the bones of men, killed by the carbonic acid gas which lies in the bottom of the valley; but its terrors have been much exaggerated. "In another crater in this land of wonders," says Sir Charles Lyell, "the sulphureous exhalations have killed tigers, birds, and innumerable insects; and the soft parts of these animals, such as the fibres, muscles, hair, etc., are very well preserved, while the bones are corroded and entirely destroyed." Numerous rivers flow from the north and south sides of the mountains, carrying fertility with them, and affording supplies to innumerable artificial water-courses used in irrigation. These streams are generally rapid, shallow, and so encumbered with sandbanks as not to be navigable; so that only two rivers, the Solo and the river of Surabaya, are navigable for large boats; the others are only suitable for proas or canoes of the lighest draught, or for floating down timber from the mountains. The Tji Tarun and the Tji Manuk are navigable a part of the year.

Climate.— Java is considered fairly healthy, but proper care must be taken to avoid the excessive heat of midday and the night air from the marshes. The temperature of the plains and valleys is during the day from 85° to 94° F., and during the night from 73° to 80°. At an elevation of 6,000 feet the thermometer descends to 60°, while the tops of the highest peaks are often covered with ice but no snow falls. The breezes from the water modify the temperature. There are two seasons; the dry from April to October, and the rainy season from October to April. During the rainy season there is an almost continuous rainfall except for a short time in the morning. The annual rainfall is about 80 inches. The island is not subject to storms which injure life or property, but near the high mountains there are frequently thunder storms.

Geology.— Java is formed mainly of tertiary, though partly of post-tertiary strata; but by volcanic action the arrangement has been much disturbed. Rocks containing fossil invertebrates are common, but the fossils of vertebrates have not been discovered. There are no metallic veins of sufficient length or depth to be profitable for mining; the Bantam coal-mines, in the northwestern part of the island, yield only lignite; sulphur, naphtha, and asphalt are found in several places, and small quantities of salt saltpeter, and magnese. Limestone and marble are in the southern part. Its minerals are not considered of sufficient value to be classed among its natural wealth-producing resources.

Vegetation.— With a temperature ranging from 94° to the freezing-point, a volcanic soil plenteously watered naturally and artificially, it is not surprising that Java should be of astonishing fertility; the range of its vegetation naturally follows that of its temperature, from the palms of the tropics to the mosses of the temperate zone. The coast is fringed with cocoanut trees; behind them the ground rises gently to the foot of the mountain chain, and is completely cultivated. Vast fields of rice, artificially watered, distributed amphitheatrewise on the flanks of the hills, yield often three harvests annually. In the same altitude are found the cotton plant, the mangoes, sugar-cane, indigo, palm-trees, and other tropical vegetation. Higher up than the rice-fields the bases of the mountains are covered with vast forests of the fig-tree tribe of different species, remarkable for their great height and vigorous growth. Tea, coffee, fruits, cinchona, sandalwood, mahogany, camphor, bamboo, rattan, and many other forms of vegetation are found in this altitude of from 2,000 to 4,000 feet. These are followed still higher up by the plane-like liquidambars, with their erect stems covered with parasites, also rattans and *Rubiaceæ*, the latter of numerous species, some of them exhaling a very fœtid odor. Along the upper limits of the liquidambars about 4,000 feet above the sea, lofty trees are still plentiful; here may be seen *Podocarpus cupressus*, with its lofty straight stem, a tree allied to the yew, and furnishing the best timber in Java; the Dammar pine, rhododendrons, laurels of numerous species, chestnuts, oaks, and several others, magnolias, myrtles, tobacco, maize, potatoes, and other vegetation common to the temperate zones. About 7,000 feet high the vegetation changes its aspect, and mosses appear, which, with heaths, are the principal plants found on the loftier elevations. Before leaving the natural vegetation the famed poison-tree, the chettik or upas (*Antiaris toxicaria*), may be named as a noted Javanese plant. The vast forests likewise claim notice; they are 791 in number, and cover a very extensive surface in 13 of the provinces, and consist mainly of teak. To prevent the waste which was going on, the government has placed them under superintendence,

and draws from them a large amount of revenue.

Animals.— Including domestic and marine animals 100 kinds of mammalia inhabit Java. In the west part the one-horned rhinoceros is not uncommon; and in the higher districts the royal tiger, panther, and tiger-cat keep the inhabitants in constant alarm by their depredations. The babiroussa and two kinds of wild hog form the large game of the island. There are only two species of the ape kind, but they people the forests in countless numbers. Two kinds of lemurs inspire the inhabitants with superstitious fear by their mysterious nocturnal habits; and this island may be esteemed the native seat of the largest bats, some of which measure five feet across the wings. They may be seen suspended from the branches in hundreds during the day, and at night they devastate the orchards and gardens. Two civets are common, and supply a perfume of which the Javanese are passionately fond; the wild ox abounds in the woods; and the buffalo is the only animal used in agricultural labor. The horses are small, but vigorous, and, as in India, are not used for agricultural purposes. Two species of wild dogs and six species of deer are found here. Among the domestic animals are the buffalo, ox, horse, goat and sheep. The ornithology of Java is rich and varied, both in genera and in species. About 300 species of land birds have been found on the island, among them the peacock, partridge, quail, 10 different species of pigeon, 11 species of heron, two of cuckoo, the woodpeckers, the black and crimson oriole, the hornbill, eagle, owl, the brilliant looking, and appropriately named minaret flycatcher, the "swift" (q.v.), and the minor bird so apt in learning to mimic human speech is common. Almost all the known generic groups of rapacious birds are found here in great numbers, and gallinaceous fowls are plentiful. A variety of reptiles are found on the island, among them the python. Insects cover the grounds and plants in countless numbers; but few are distinguished for brilliancy or variety of color, or are remarkable in form. Fish are plentiful in the rivers and along the coast; but those of the rivers are of inferior quality for food. Excellent oysters are abundant on the north coast, and prawns, from which a condiment called trasi is prepared and considered delicious by the natives. Crocodiles from 20 to 30 feet in length inhabit the water courses.

In 1895 there were in Java in all about 2,643,000 buffalos; 2,572,000 oxen and cows; and 485,500 horses.

Occupations and Productions.— The Javanese are almost entirely occupied in agriculture. There is a small class of fishermen on the north coast, and a few artisans in the towns, but the great bulk of the people live directly or indirectly by the cultivation of the land, in which they have made greater progress than any other Asiatic nation except the Chinese and Japanese. The chief crop is rice, of which with the aid of irrigation, industriously and almost universally applied, two crops are raised in a year. Lands that cannot be irrigated are used for growing pulses, oil-giving plants, cotton, sugar-cane, and tobacco; and on the mountain slopes, at an elevation of 2,000 or 3,000 feet, coffee is cultivated. "In the most fertile parts of Java," says Crawfurd, "and these from the neighborhood of the high mountains are usually also the most picturesque, the scenery is at once agreeable and magnificent, and certainly for grandeur and beauty excels all that I have seen even in Italy, that country which in summer bears the nearest resemblance to Java. In such situations we have mountains 10,000 feet high, cultivated to half their height, the valleys below having all the appearance of a well watered garden, in which the fruit trees are so abundant as to conceal the closely packed villages." The mechanic arts among the Javanese are not so far advanced as their agriculture. About 30 crafts are practised among them, of which the principal are those of the blacksmith or cutler, the carpenter, the sheath maker, the coppersmith, the goldsmith, and the potter. Bricks and tiles are largely made. The carpenters are skilful in house and boat-building. They make vessels of all sizes from 50 tons down to fishing canoes, and under European superintendence build large ships. The ordinary dwellings of the people are built of a rough frame of timber, thatched with grass or palm leaves, and with walls and partitions of split bamboo. The Javanese excel all other nations of the Malay archipelago in the working of metals. They are especially skilful in the manufacture of the national weapon, the kris or dagger, which is worn by every man and boy above 14 years as part of his ordinary costume, and by many ladies of high rank. They make also excellent gongs of brass, and these with other musical instruments of the same metal have long been exported to the neighboring countries. The only native textile material woven by the Javanese is cotton, of which they make only a stout durable calico, and this is purely a domestic manufacture, carried on exclusively by the women. From raw silk imported from China, the silkworm not being reared in Java, a coarse cloth is woven by the women. Paper of the nature of the ancient papyrus is a manufacture peculiar to the Javanese.

The greater part of the agricultural lands of Java is claimed by the Government of the Netherlands and the private estates are principally in the residencies in the western part of the island. The government or the private landowners can enforce one day's gratuitous work out of seven, and in some cases more, from all the laborers on their estates. In 1882 the greater part of the enforced gratuitous labor for the government was abolished in return for the payment of one guilder (40 cents) per head yearly. In 1900 the natives had under cultivation 7,073,036 acres. Prior to 1891, the government raised sugar; but since 1891 the sugar is all raised on private properties and on lands hired by the natives, or on lands held on emphytentic tenure from the government. In 1900 the number of sugar estates was 191 and in 1901 the yield of sugar was 766,238 tons. The yield of cinchona for 1900 was 1,415 tons; of tobacco, 5,435 tons; of tea, 1,659 tons; of indigo, 180 tons.

Trade and Commerce.—The trade of Java is now large, and what was once a burdensome colony has become one of the principal sources of wealth to Holland. The great bulk of the

foreign trade is carried on through the ports of Batavia, Samarang, and Surabaya. The principal exports are sugar, coffee, cinchona, indigo, nutmegs, mace, cloves, cinnamon, pepper, tea, rice, cocoa, tapioca, cochineal, cubebs, arrack, tobacco, hides, india rubber, and tin. The exports, in 1900, of sugar, and coffee, nearly all of which was sent to Holland, amounted to nearly $55,000,000. A large amount of rice is sent to Borneo and China. The principal imports are cotton yarns and cloth, machinery, iron, coal, and woolen goods.

Education.— The Europeans and the natives have separate schools with a slight difference in their methods of government. Ample provisions are made by the government for the education of the natives. There are public and private schools, about 20 schools for girls only, and one normal school for the training of teachers for the natives, and two for the training of teachers for the schools for Europeans and those assimilated with them. There is an agricultural college, a museum, and a fine botanical garden at Buitenzorg, and a gymnasium at Batavia. In science the people have made little progress, possessing only a rude notion of astronomy and a slight knowledge of arithmetic. Their architecture at present day hardly deserves the name, though the country abounds with remarkable remains of temples built many centuries ago by the ancestors of the present inhabitants. Of the other fine arts, music is the one in which they have made the greatest progress. They are passionately fond of it, and have generally good taste. Their melodies are wild, plaintive, and interesting, and more pleasing to the European ear than any other Asiatic music. They have wind and string instruments, but their best and most common instruments are drums and gongs.

Religion.— All religious denominations are allowed perfect freedom in Java. The Javanese are Mohammedans, which faith was established by Arab conquerors in the 15th century and has almost displaced Brahminism and Buddhism, the ancient religions of the country. In 1896, in Java and Madura, there were 19,193 native Christians. In 1900 there were about 100 missionaries working among the natives.

Banking.— The "Java Bank," established in 1828, has a capital of $2,400,000 and a reserve of about $480,000. The government of the Netherlands has control over the administration. Two fifths of the amount of credits, notes, and assignats must be covered by bullion or specie. In March 1901, the notes in circulation amounted to $22,534,000, and the bank operations to $18,637,200. There are postal savings-banks and other savings-banks have been established. The legal coins are the same as those of Netherlands.

Weights and Measures.— The legal weights and measures are the same as those of Netherlands (q.v.).

Ethnology.— The native population of Java comprises two distinct nations, the Sundese and the Javanese. The Sundese occupy the western end of the island, and are greatly inferior in number to the Javanese, and less advanced in civilization. They speak a distinct language. Both nations are of the Malayan race. They are generally about two inches shorter than the men of the Mongolian and Caucasian races, with round faces, wide mouths, high cheek bones, short and small noses, and small, black, deep-seated eyes. The complexion is brown with a shade of yellow, and is never black. The hair of the head is thick, black, lank, and harsh, and is either scanty or altogether wanting on other parts of the body. A few short, straggling hairs compose the beard. The people are not active, and make but poor runners or wrestlers. They are described as a peaceable, docile, sober, simple, and industrious people. Mr. Crawfurd, author of 'A Descriptive Dictionary of the Indian Islands,' who lived several years in Java, says: "From my own experience of them, I have no difficulty in pronouncing them the most straightforward and truthful Asiatic people that I have met. The practice of running amuck, so frequent with the other cultivated nations of the archipelago, is of very rare occurrence with them." They are patient, enduring, and easily led when convinced that the orders given are not contrary to the ancient laws and customs of the country, which are held in religious reverence. They are very susceptible of affronts, which they are not slow to avenge with the kris, which is invariably worn, and they are frequently likewise armed with the sabre or pike. The mass of the Javanese take only one wife, but people of quality and wealth take advantage of the latitude allowed by the Koran, and practise polygamy. All, without distinction, are passionately fond of gaming, more especially of cock-fighting.

Population.— Java is one of the most densely peopled countries of the world. The population in 1900 was 28,745,698. The population of the principal towns in Java, January 1900, was:

	Europeans	Natives	Chinese	Arabs	Other Orientals	Total
Surabaya...	8,906	121,886	13,035	2,791	326	146,944
Batavia....	8,893	77,700	26,817	2,245	232	115,887
Samarang..	4,800	70,426	12,372	724	964	89,286

The whole population of Java is legally divided into Europeans and persons assimilated with them, and natives and persons assimilated with them. The Europeans and those assimilated with them are generally living under the laws which prevail in Netherlands, while the natives and those assimilated with them observe the customs and laws of India. The division of the population into the two classes mentioned is in accordance with the code which specifies the limits and conditions for legislation in Dutch East India. The governor-general, together with the council, has power to make individual exceptions to the general rule.

Government and Revenue.— The most important feature of Javanese society is the village, which forms a complete body politic, with considerable powers of self-government. Its officers are elected by the people, and are charged with the collection of the taxes and the maintenance of public order. The general government of the island is entrusted to a governor-general, appointed by the king of Holland. He is commander-in-chief of the army and navy, and possesses nearly absolute power. Justice is administered to the European inhabitants by a supreme court at Batavia, and by three provincial courts at Batavia, Samarang, and Surabaya. There are besides these other courts for the Asiatic population. In 1832 Gen. Johannes Graaf Van den Bosch introduced into Java a system of government known as the

"culture system." In principal, it was based upon the officially superintended labor of the natives, directed so as to produce not only a sufficiency of food for themselves, but a large revenue for Netherlands. This obligatory labor was applied to the culture of coffee, sugar, indigo, pepper, tea, tobacco, and some other products; but at present the labor of the natives is required only for the culture of coffee which is marketed by the Government. By the terms of a bill which passed the legislature of the Netherlands in 1870, the obligatory cultivation of the sugar-cane is now totally abolished.

Java, including the island of Madura, comprises 17 residencies, each governed by a resident, assisted by assistant residents, and other officials. Before receiving government appointments, these officials must first have had examinations. The resident and his assistants, together with a number of native officials, exercise almost absolute control over the province in charge. The native officials are remunerated for their services by salaries or by a per cent on the amount of taxes collected. No law can be enacted or enforced by any governor-general which will conflict with the "Regulations for the Government of Netherlands India," laws passed in 1854 by the king and states-general of Netherlands.

The revenues are derived from the government monopolies of railroads, salt, opium, and from the sale of government products obtained under the "culture system." Other revenues are obtained from taxes on houses and estates, sale of government lands, custom duties, licenses, personal tax, and from a number of indirect taxes. The greatest expenditures are for the general administration, about one third, and for the army and navy another third.

Defense.— The army and navy of Java form a part of the defense of the whole Netherlands India. The army is colonial, and the regular army of Netherlands is not allowed on duty in any part of Dutch East India. The commissioned officers are Europeans, except a few prominent natives to whom honorary offices have been given. One half the non-commissioned officers must also be Europeans. There is a school attached to every battalion, and a military academy on the island of Java, at Meester Cornelis, a place near Batavia.

History.— Ancient Javanese history is written in the still existing magnificent remains of temples and other public buildings, which are plentifully scattered over the island. These attest that the worship of Brahma and Buddha once prevailed in the island under the Hindu empire of Modjopahit, the dismemberment of which was consummated by the Arabs 1478 A.D., by the destruction of a vast capital of that name. Islamism had previously supplanted the rival worships, and had driven their last adherents into the neighboring island of Bali. The island then fell under the dominion of numerous petty chiefs, and was found in that state by the Portuguese, the first European settlers on the island, who arrived in 1511. They were followed in 1595 by the Dutch, who soon eclipsed them. Though their views were at first directed wholly to commerce, the Dutch merchants, like the British East India Company, soon found it necessary to assume the position of a governing power, and treated accordingly with the native princes, with whom they were frequently at war. In 1811 Java was taken from the Dutch by the British, who, however, restored it after the Peace of 1816, since which time it has remained in their hands. Up till 1825 various portions of the island were still under native princes, who paid tribute to Holland; but in that year a revolt took place, which resulted in the whole island falling under the Dutch sway; although two provinces have been left, but only nominally, under the government of Javanese princes—Surakarta and Jokjokarta. Both princes have a court, nobles, ministers, etc., but are the mere instruments of the Dutch government, by whom they are allowed handsome pensions. Since the close of this war the island has been rapidly increasing in population and prosperity. On 20 Sept. 1859 the Dutch legislature totally abolished slavery in Java. The natives never had slaves, and there never were but a few thousand on the island.

Language and Literature.— It is not certain whether the name of Java be connected with the Sanskrit Javana and Yavana, both of which, beside being related to Ἰωνία as names of Greece, also signify (especially the latter) Bactria, Arabia, and other foreign countries, and, moreover, swift, horse, etc.; or whether its etymon be of a different origin. As regards the affinities of the Javanese language, Roorda considers it as a branch of the Malay. Crawfurd derives it from the vernacular of the aborigines, to whom he attributes the primitive culture of the Malayan islands. Domeny de Rienzi supposes it to have arisen from the language of the Bugis of Celebes, by an admixture of Malay and Sanskrit. Humboldt connects it, both as to words and grammar, with the Tagala, the most developed Malayan tongue of the Philippine Islands, as well as with other Malay idioms and with Sanskrit. Others see in it a type of the unmixed tribes of Oceania. It certainly shows all these affinities, and contains also some Arabic elements. The Javanese is the most cultivated of all Polynesian languages, owing to the very early intercourse of the island with the continent of India, whose Aryan as well as Dravidan influence is attested by the presence of Malabaric words along with those from the Sanskrit, not only in Javanese, but also in the idioms of Sumatra, Madagascar, etc. Both religious and political revolutions have served to modify the condition of the languages. There are four dialects, according to Raffles, on the three islands which form the linguistic group in question, namely: (1) The tongue of the mountaineers of Sunda, in the western part of Java, east of Tagal, probably vernacular through this whole region before the introduction of Mohammedanism, now spoken by about one tenth of the population of the island; it contains many Malay and some Sanskrit words, stands in the same relation to the principal language as the Welsh does to the English, and is best spoken at Bantam, sluggishly at Bogor and Chianjore, and verging to the Javanese at Cheribon. (2) The Javanese proper, east of the last named city, extending through the rest of the island, especially along its north shore; its words are long at Tagal, shorter at Samarang, full, short, and strong at the courts of Sura-

karta in the centre, and Jokjokarta in the south; it approaches the Madurese at Surabaya, and the Balian at Banyu-Vangi. (3) The dialect of Madura and Sumanap, which has many Sunda words, with more of Malay, and with peculiar endings. (4) That of Bali, little different from the general Javanese. This island preserves the ancient letters as well as Brahminism, both expelled from Java in the 15th century. A sort of jargon, analogous to the *lingua franca*, is spoken at Batavia, being a medley of Dutch, Portuguese, Javanese, and Malay. Along with the preceding there are also peculiar styles or idioms of speech, varying in accordance with social position and age, as the *madhjo* (intermediate), between equals; the *bâsa* or *bohoso-ngoko* (language popular), to inferiors; the *bâsa-kramo* (language superior), urbane, court idiom, about three fourths of it Sanskrit, used by poets as the speech of gods, heroes, and ghosts. As to locality, there are also two vernacular idioms, namely, the *bâsa-dalam* of the interior, and the *bâsa-luar*, spoken along the shores. The Kavi (learned, wise, poet) is the ancient sacred language of Java, and consists of about six parts of Sanskrit, less altered than in the Pali, to four of Javano-Malay. It owes its origin to Brahminic immigration, about the beginning of our era. It is to the Javanese what Sanskrit is to the Hindostanee, and Pali to the Indo-Chinese languages. Declining in the 14th century, it took refuge in Bali, and was imperfectly known by the Panambahan at Sumanap at the time when Raffles was in Java. Passages in the Kavi are sometimes quoted on peculiar occasions, as for instance in fables and dramas; the term itself is employed as a title of works, etc., such as *Sekar-kavi*, flowers of poetry, whence *Sekarini*, a Kavi metre; *Rama-kavi*, the Javanese Ramayana; *Kavindhra*, principal singer or poet (named *ma-kathā*, narrator, in Tagala). A few specimens of words may show the relation of the Javanese to the common Malay, where the difference, if not specially noted, is sometimes more in the accent than otherwise: *langit*, heaven; *tanah*, earth (Mal. also *benua*, region); *ayer* (Jav. also *banyu*), water; *laut* (Jav. *lahut*), sea; *dhina*, (Mal. *hāri*), day; *bengi* (Mal. *mālam*), night; *vūlan* (Mal. *būlan*), moon; *terang* (Mal. *trang*), light; *mati*, to die; *lulat* (Mal. *kāsih*), to love; *dara*, virgin; *dhēva* (Mal. *tuhan*), god, lord; *mangan* (Mal. *mākan*, *santap*), to eat; *bāpa*, *pak* (Mal. *pā*, politely *ayah*), father; *ma*, *bok* (Mal. *mā*, *amā*, politely *ibu*, *bonda*), mother, etc. Compounds and derivatives abound, but the latter are more frequently formed by suffixes than by prefixes, in which the Tagala is very rich. There are many contractions into *tr*, *ngl*, *ngr*, with the dropping of short vowels, together with the alteration of the initial sound (similarly to the Celtic), and other variations which obscure the etymic origin, thus: Sans. *nātha*, master, lord, becomes *tata*, order, to reign; Jav. *neda*, to eat, *teda*, food; *nulis*, to write, *tulis*, scripture; *nitik*, to prove, *titik*, proof. The prefix *n* denotes verbs, *t* substantives; other changes are: *nyatur*, to tell, *chatur*, tale; *nyerrat*, to write, *serrat*, writing, etc. The doubling of the first syllable makes verbs, as *tutulung*, to help, from *tulung*, aid; *gagriya*, to dwell, from *griya*, house. The insertion of *in* is the sign of the passive voice. Substantives are also made by prefixing *pem* (*pen*, *pe*), denoting an agent; thus: *pem-pekto*, carrier, from *pekto*, to carry; *pen-dahar*, eater, etc.; by prefixing *ka*, a sign of the past participle; *ka-bekto*, Lat. *allatum;* by suffixing *n* (*en*, *an*): *bakt-en*, the carrying, *dahar-an*, Lat. *cibus;* and by both prefix and suffix: *ka-dahar-an*, an eatable. Articles, gender, and the dual number are wanting. In the plural, cases are denoted by particles, and also by reduplication, as in the Japanese. The genitive relation is shown by the precedence of the noun or by inserting *ing*. The other relations of case are indicated by means of verbs. The adjective is unchanged after the substantive. Pronominal forms are fewer than in Malay: *kita*, we in Malay, means I in Javanese. The numerals are: (1) *sidshi*, (2) *loro*, (3) *telu*, (4) *papat*, (5) *limo*, (6) *nem*, (7) *pitu*, (8) *volu*, (9) *songngo*, (10) *sepuluh*, (11) *savelas*, (12) *volas*, etc. Ordinals are formed by prefixing *ping* or *ka-ping*. The figures of numbers are modified letters. The person, number, tense, mood, and voice of verbs are indicated by certain particles. Many verbs and nouns are expressed by the same word, others are distinguished as stated above. The suffixes of the imperative are *o*, *ono*, *en*, *enno*. The following are examples of a verb in various forms: *ningngalli*, to see; passive, *dhipun*, *tingngalli*, *katingallan*, etc.; *kula*, *tingngalli*, I have seen; *badē kula tingngalli*, I shall see; *tinningngallam*, to see one another; *sampeyan tingngalli*, see; *kula tingngallana*, that I may see, etc. The construction is as follows:

Rama kahuta kang vonten ing surga, vasta andika dadi clapienno.
Father our who art in heaven, name thy be hallowed.

As regards the shape and employment of letters, the graphic system is derived from the Devanagari, but not as regards their order, which is as follows: *'ha, na, tcha, ra, ka, ḍa, ṭa, sa, va, la, pa, da, dja, ya, ṉya, ma, ga, ba, ṭa, ng'a.* These 20 *Akshara* (letters) are consonants with an adherent *a* in the general language, or *o* at the courts of princes, which, when not suppressed, gives to the syllabarium the epithet of *lagana*. As many *Pasangan* (consonants) are vowelless, three of them are annexed, the others subscribed to other letters. This peculiar succession of letters must have originated prior to that of the organic scheme of the Devanagari, and it is explained by its signifying: "There were two messengers, disputing, equally courageous, till both died." The *Akshara-Buddha*, being ancient, differ in form from the later *Aksharagede*. Some Kavi letters are almost like those of the Sanskrit, while the more recent resemble the square Pali. The vowels are called *Sandang'an* (connection), namely, *a*, *i*, *u*, *ē*, *ĕ* (almost French *muet*), *o*, either used as initials or (except *a*) attached to the consonants instead of the inherent *a*. The diacritic signs are analogous to those of the Devanagari. There are also characters for the quasi-vowels *lc* and *re*. The writing runs from left to right, each letter being connected with the others in words, and these following one another without any space left between them. Tradition assigns the introduction of writing as well as of Brahminism

and political institutions to Aji Saya Baya. Palæography finds a rich harvest in Java, its subjects being distributed in four classes: (1) inscriptions in ancient Devanagari near the ruins of Brambanan and Sinagasari; (2) those in square Kavi letters, from which the cursive are derived, mostly on stone and metal; (3) those in a dialect resembling the language of Sunda; (4) the *Chandra-Sangkala* (light of royal times or dates), which consist in selecting such words, symbolic of numbers, as may also express a fact that is to be recorded. Thus, for instance, the date of the destruction of Majapahit, a fact most important in Javanese history, is thus inscribed (1400, reading from right to left):

Sirna (0) *ilang* (0) *kertāning* (4) *bumi* (1)
Lost and gone (is) (the) work, (pride of the) earth (land.)

The date of certain long graves at Gresik, near the tomb of the princess of Chermai (1313), is thus written:

Kāya (3) *vulan* (1) *pūtri* (3) *īku* (1).
Like (to the) moon princess (that) was.

The literature, which is in Kavi, dates from about the commencement of our era, and is rich, especially in legends concerning cosmogony. The subjects of the works are mostly either of a mythical or ethical character. Prominent among the former are: the *Kānda* (Sans. *Khandata*, fragment, section) *Pepakem* (book), or *Sejarah* (history); *Manek-Maya*, a mythical genesis, in which Buddhism predominates; *Vivaha-Kavi* (matrimonial poem), about a *Rasaksa* (evil spirit) who courts a *Vidaduri* (nymph); *Rama-Kavi*, the Javanese *Ramayana; Parikespit*, "Arjuna's Grandson;" *Mintaraga*, a poem on Arjuna in the Indra mountain. This kind of composition comes down to the time of Aji Saya Baya. Of the ethical order are the *Niti Sastra Kavi*, in the purest style, of about the 13th century; and *Srūti*, which already alludes to Islam. But the *Brata Yudha* ("Holy War") is an epos mostly on the deeds of Arjuna; being an episode of the Mahabharata, in 712 stanzas, with varying rhymes. The *Sastra Menava* is a Javanese imitation of the ordinances of the Indian Menu. Indeed, most of the Kavi works are such imitations. Whether mere versions of Sanskrit works have been made or still exist is not precisely known; but there are many Javanese versions from the Kavi. Javanese literature abounds in romantic compositions, mostly of elegiac form. Among these, the adventures of the popular hero Pandji are most prominent. Dramas, and especially puppet shows, called *vayang* (shadows), and with figures of either leather or wood personating heroes, are popular.

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Java Almond. See KANARI.

Java Fowls. See POULTRY.

Java Sea, a body of water with Borneo on the north, Celebes on the east, the island of Java on the south, and Sumatra on the west. It borders on a number of other islands, all small. The direct route from Singapore to Australia is through Java Sea; and it is crossed by two approved routes to China, one by Pitt's Passage and the other through the Straits of Macassar.

Java Sparrow, a species of Oriental weaver-bird (*Munia oryzivora*), called rice-bird or paddy-bird by the British in India and China, where it has become naturalized from its original home in Java. It has a poor song but is kept in cages for its beauty and liveliness, and is sold by bird-dealers all over the world. Its colors are slate-blue and black, with conspicuous white cheeks and a swollen rosy bill.

Javary, zhā-vä-rē', a river which has its rise in the northwestern part of Bolivia, flows northwest, then north and northeast into the Amazon River. The greater part of its course of 350 miles, it forms the boundary line between Brazil and Peru. It is navigable from the mouth to the Anahuacas Mountains. By treaty between the governments of Brazil and Bolivia, the source of the Javary is the demarkation of the boundary line between the countries.

Jav'elin, a short and light spear thrown from the hand, and in ancient warfare used by both horse and foot soldiers. The *pilum* of the Romans was a weapon of this description, and was used either to throw or to thrust with. The shaft was 4½ feet long, and the barbed iron head was of equal length, but as it extended half way up the shaft, the whole length of the weapon was nearly 7 feet. The shaft, made of some tough wood, often cornel, was an inch in diameter. The use of the javelin was not confined to the Roman legionaries, for many barbarous tribes, and especially the Goths, employed this weapon in their military operations.

Jaws, Anatomy of the. The upper jaw is formed by the union of the two superior maxillæ; these bones each form part of the cheek, the outer wall of the nasal cavity, the hard palate, and the lower part of the eye-socket. The lower jaw is formed of one bone, the inferior maxilla, which presents a horseshoe-shaped body, and vertical plates of bone ascending from the body posteriorly. The top of these vertical plates is widened into a knob-like end for articulation with the skull.

Dislocation of the jaw may take place during excessive laughter or yawning. The articular knob slips forward and the jaw is held open. Reposition is accomplished by placing the thumbs on the back teeth and making forcible downward and slightly backward pressure until the bone is felt to snap into place.

Fracture of the upper jaw is uncommon except when the face is crushed in. Usually in fracture it is the body of the lower jaw near the front that is broken. Besides the usual signs of fracture (q.v.) the attitude may be character-

istic; the patient is unable to shut the jaw; and the difference in the line of the teeth may show clearly. Repair of the fracture is facilitated by fastening the upper jaw with a sling-bandage carried around the head, and keeping it so fastened until union is established. During this time the patient is forced to eat liquid foods almost entirely.

Jaxartes, jăk sär'tēz. See Syr Darya.

Jay, John, American statesman and jurist: b. New York 12 Dec. 1745; d. Bedford, Westchester County, N. Y., 17 May 1829. His father was a wealthy merchant of Huguenot stock, and his mother a daughter of Jacobus Van Cortlandt. His father,—early discovering, to use his own words, that Jay was of "a very grave disposition, and took to learning exceedingly well"—sent him to a school in New Rochelle something like Dotheboys Hall in 'Nicholas Nickleby.' Three years at school were followed by study under a tutor until he entered King's College at 14. He was graduated in 1764, the subject of his oration being the blessings of peace, of which he was to have still keener appreciation. Two weeks later, on payment of £200, he entered the office of Benjamin Kissam, a prominent lawyer of New York, as an apprentice bound to serve five years, the last two years to be devoted to the study of the law. Admitted to the bar in 1768, he soon attained prominence in the profession, forming a partnership with Robert R. Livingston, afterward chancellor of the state, and secretary of foreign affairs. In 1773 he began his public career, as secretary to the Royal Commission to determine the boundary between New York and Canada; and for the following 28 years his public services were constant, varied and of supreme importance to the country so fortunate in being his birthplace. All his duties in the many fields covered by him during his splendidly successful life were performed in a manner indefatigable, zealous and faithful, and with marked ability.

Bound by no ancestral ties to England, and having married in 1774 a daughter of the famous Whig, and Revolutionary Governor of New Jersey, William Livingston, many would suppose that in the conflict impending between the colonies and mother country, Jay's voice, like those of James Otis and Samuel Adams, would have been from the first "still for war." But he was constitutionally so calm and conservative that he was unwilling to be too precipitate in determining upon a change in the mode of government. When, however, the colonists decided that their only safety lay in separation, Jay was found to be as staunch and aggressive a patriot as any, and represented the citizens of New York on the committee to settle the question arising out of the Boston Port Bill. Jay drafted the suggestion of that committee that "a Congress of Deputies from the Colonies in general" be convoked — in fact, the convocation of the Continental Congress. He was a member of that congress, and met with it in Philadelphia on 5 Sept. 1774. Congress at once appointed a committee to "state the rights of the colonies in general," of which Jay was made a member. This committee designated him to draft an address to the people of Great Britain, which was so satisfactory that it was at once reported to Congress, and adopted by it. Jefferson, without knowing who was the author, pronounced it "a production certainly of the finest pen in America."

Jay was also sent to the 2d Continental Congress, but in the interim devoted himself to shaping the public mind in the direction of obedience to Congress and in hostility to enforcement of Parliamentary taxation. When the 2d Congress convened, the signal shot — "heard round the world" — had been fired at Lexington, and Congress, realizing that a condition of war existed, deputed Jay to draft an address to the people of Canada, which was prepared and adopted, and circulated in that country. He also wrote an address to the people of Jamaica and Ireland by request of Congress, but the second petition to the King that he prevailed upon Congress to make was written by Dickinson. Other important and effective work by him in that general direction might be cited, but I shall be content with the assertion I deem supported by the facts, that as a creator and molder of public opinion at that particular juncture Jay stands unrivalled; and all this was in the main accomplished through the wise use of his pen, the efficacy of which was strongly presented by John Adams when he wrote regarding it to Jefferson, "I never bestowed much attention to any of those addresses, which were all but repetitions of the same things; the same facts and arguments; dress and ornaments rather than body, soul or substance. I was in great error, no doubt, and am ashamed to confess it, for these things were necessary to give popularity to the cause, both at home and abroad." Jay's contribution to the debates in Congress, like all his public work, showed that he followed in all things and upon all questions the path illuminated by the light of his well balanced judgment, and his conscience, thinking not of personal popularity, but simply of the right. He served actively upon the committee that carried on negotiations with foreign powers friendly to America and inimical to England. Indeed, during the year 1775 he was a member of so many committees, each having different and important objects, that it is difficult to understand how he was able to accomplish so much important and laborious work.

If it be asked why so good a patriot as Jay was not a signer of the Declaration of Independence, the answer is, that in 1776, while a member of the Continental Congress, Jay was also elected to the New York Provincial Congress, and the Continental Congress having directed the colonies to each adopt a government, Jay, on the call of his colony, proceeded to New York to take part in the formation of the local government, where he was forced to remain while the Declaration of Independence was being signed. During 1777, and while the war was going on in the vicinity of New York, the Provincial Congress, then styled the Convention of the Representatives of the State of New York, was laboring with exceeding difficulty, the members, as is recorded, performing "all the various and arduous duties of legislators, soldiers, negotiators, committees of safety and ways and means, judges, juries, fathers and guardians of their own families, flying before the enemy, and then protectors of a beloved commonwealth." Yet amid all this turmoil and unrest a constitution was drafted by Jay which was, in the main, adopted as drafted, and was published upon 22 April 1777, by being read in front of

the court-house in Kingston. A committee was at once appointed, Jay being a member, to organize a new government; and a council of safety was created to act until the legislature should meet. Robert R. Livingston was appointed chancellor and Jay chief justice, and the judicial department of government was temporarily organized.

Jay was urged to be a candidate for governor at the first election under the Constitution, but declined. General Clinton was elected over his opponent, General Schuyler, and took the oath of office, it is said, while "clothed in the uniform of the service, standing on the top of a barrel in front of the Court-House in Kingston." On 9 September following, Chief Justice Jay delivered an address to the grand jury at Kingston, which is to be found in the first volume of his correspondence and public papers. The address is a much prized document of revolutionary times, and was, undoubtedly, intended to reach and affect a much larger constituency than the grand jury to whom it was delivered. Of course, in those unsettled days, with the struggle between the old and the new countries raging, but little litigation of importance came before the supreme court, so that during Jay's chief justiceship the work of the court was mainly confined to criminal trials, and the court never sat in banc. During 1778 he was active in the Council of Revision, of which he was a member ex-officio. The legislature in 1779 appointed Jay to Congress without requiring him to vacate the office of chief justice, it being resolved that owing to serious questions between certain States "a special case" obtained under the Constitution. Shortly afterward Congress elected him its president. Later in the year, however, he resigned the office of chief justice, designing, he said, to recoup his failing fortunes. But his desires in that direction were not to be gratified. More than 20 years elapsed before the public he had served so well would submit to be deprived of his services.

In October, 1779, Jay resigned the presidency of Congress to accept the office of minister to Spain. His instructions in part were to secure if possible a commercial treaty with Spain similar to that existing with France, to acquire a port in Spanish dominion on the Mississippi, and to negotiate a loan of $5,000,000. That his mission was not entirely successful, and was personally disagreeable, was due to the fact that Spain disliked the new nation because it occupied lands formerly held by Spain, and it was apprehended that with increasing strength it might reach out and take more — fears that we know now were not groundless. While minister to Spain, Jay was appointed, with Franklin, Jefferson, Adams, and Laurens, commissioner for a general peace. Their instructions rested on the mistaken theory that France would aid in procuring for us the best possible terms. In June, 1782, Jay joined Franklin, then minister to France, in Paris, and promptly but cautiously entered upon an investigation which disclosed that France had other interests to serve than those of the United States. Possessed of the situation, he boldly entered upon negotiations with England's representative without even consulting his only colleague in Paris, whom he regarded as necessarily embarrassed by his position as minister to France, and his instructions. With firmness, and yet with great tact, he conducted the negotiations alone until joined by Adams, who enthusiastically approved of his action, and so advised Mr. Franklin, who, after consultation, agreed that the negotiations should be concluded without consulting the French court. The result of these most interesting negotiations with England was a treaty by which the United States gained more than Congress had ever ventured to propose. And Jay's part in this great triumph of diplomacy is well summed up in a letter written by his fellow commissioner John Adams to Jonathan Jackson, "a man and his office were never better united than Mr. Jay and the commission for peace. Had he been detained at Madrid, as I was in Holland, and all left to Franklin, as was wished, all would have been lost." When he returned New York gave him the freedom of the city in a gold box, and he found that he had been appointed by Congress secretary of foreign affairs. This office he filled with his usual ability, settling international questions, and advocating the building of a navy, and the organization of a federal government under a constitution. His papers in the 'Federalist' evidence both his activity and forcefulness in this direction, and his influence contributed in no small degree in bringing New York to the support of the Federal Constitution.

It is said that after the first election of Washington to the presidency he offered Jay the choice of any office in the government, and that he chose that of chief justice of the Supreme Court of the United States, which he justly regarded as the most exalted position next to the presidency; but be that as it may, Washington appointed him to that position, and in his letter to Jay, advising him of the nomination, said, "I not only acted in conformity with my best judgment, but I trust I did a grateful thing to the good citizens of these United States." The opportunity to contribute largely toward the development of the law in this country did not come to him, however. Had it, his success in other fields and his well poised mind assure us that Washington's judgment would have been triumphantly vindicated. Only a few causes came before the court during his incumbency, and the record of those, with a single exception, are preserved only in the minutes of the clerk, but his every step was in the right direction, whether taken while holding a circuit or sitting in banc with associates, and had effect in shaping the foreign policy of the United States as well as in establishing the dignity and independence of the Federal judiciary. He continued to hold the office until he resigned in 1795; but in the meantime and in 1792 the Federalists supported him unsuccessfully as against Governor Clinton for the governorship of New York, and in 1794 President Washington urged him to go to Great Britain as special envoy to settle differences growing out of the failure of that country to keep the obligations of the Treaty of 1784; differences which had aroused a strong war spirit all over the land. It was easy to foresee, as Jay forsaw, that the outcome of the situation would in all probability be unpopular with the people, but he did not hesitate to meet the responsibility that Washington believed he could meet better than any other man, partially because of the reputation he had established in England while negotiating the Treaty of Peace of 1784. A treaty

JOHN JAY.

CHIEF JUSTICE OF THE UNITED STATES SUPREME COURT, 1780-1795.

resulted, known on this side of the ocean as "Jay's Treaty," which settled the eastern boundary of Maine, recovered for illegal captures by British cruisers $10,000,000, secured the surrender of the Western forts still garrisoned by the British, and contained an article about the West India trade. With the exception of the latter article the treaty was approved by the President and ratified by the Senate. But many were not satisfied, and they denounced him with tongue and pen, and even burned him in effigy in Boston, Philadelphia and at his own home, New York. How different was the homecoming from that after the negotiation of the other treaty, when the freedom of the city was presented to him in a gold box, and each one seemed to vie with every other in extending a welcome. In a letter to a friend, Jay said at that time, "Calumny is seldom durable, it will in time yield to truth"; and he bore himself at that time as one having full confidence that he had acted both wisely and skilfully, and expected the people to realize it in time.

He found on his return that he had been elected governor of New York — before the public had knowledge of the terms of the treaty, of course. Before the close of that term, and in April 1799 he was re-elected by a majority so large as to constitute a personal triumph. During this term the statute was passed providing for the gradual emancipation of slaves within the State, then numbering about 22,000. The six years of his incumbency of the office of governor were crowded with interesting legislative and executive events in which he performed his part with that staunch devotion to the public interests which ever characterized his efforts throughout his career as a servant of the public, as is well illustrated by his refusal to be a party to the scheme of certain leaders of the Federalists to secure the electoral vote of New York for the ensuing election. The unexpected result of the spring elections of 1800 assured the Republicans of a substantial working majority on joint ballot, and hence of the Presidential electors under the law as it then stood. It was generally conceded that New York would determine the choice of the next President. Although the Federalists had, in March prior to the elections, defeated the attempt of the Republicans to redistrict the State, and had insisted that it was necessary that the State should act as a unit in the choice of Presidential electors, the leaders changed their position after the election had gone against them, and insisted that the electors should be chosen by districts. Alexander Hamilton wrote Governor Jay on 7 May advising that he call an extra session of the Legislature to enact such a statute before July first, the end of the legislative year. Philip Schuyler also wrote a letter strongly urging that such a course furnished the only means of saving the "nation from more disasters." But Jay, although a staunch Federalist, who had received the votes of New Jersey and Delaware, five votes from Connecticut and one from Rhode Island for the Presidency in the preceding electoral college, refused to take such action, and endorsed on Hamilton's letter these words: "Proposing a measure for party purposes which I think it would not become me to adopt." He refused a renomination for the office of governor on the ground that he now intended to retire from public life, and his purpose was unshaken by President Adams announcing to him his nomination and confirmation a second time as chief justice of the United States.

For 28 years he had been a good and faithful public servant. To him indeed had public office been a public trust, in which he had toiled faithfully and intelligently, having only in view his duty and the public good, unmoved by desire for great emolument or popularity. Naturally conservative he carefully examined every situation before acting, but when he had determined the proper course to take he acted promptly and boldly, and without regard to the effect of his course upon himself. His perfect self poise had its effect upon associates and subordinates, and the value he placed upon it may be inferred from his letter of instructions to William Carmichael in which he said, "Command yourself under every circumstance; on the one hand avoid being suspected of servility, and on the other let your temper be always even and your attention unremitted." This great patriot gave to the public service the day of his vigorous manhood, the best years of his life, covering the period of the struggle for independence and the formation of our complex system of government, the years when his country most needed the faithful service of her sons. He set aside every personal interest, laboring with fidelity and unselfish effort, and showing himself willing to "spend and be spent" for his country. Having borne his portion of travail at the birth, and done his part in the nurture of the early infancy of this great nation, he retired at last to his farm at Bedford, Westchester County, where he lived a restful life, indulging his agricultural, philanthropic and religious tastes, and enjoying the confidence, esteem and affection of the people until he went to his last rest at the age of 84 years, leaving behind him

> "A name that shall live through all coming time,
> Unbounded by country, by language, or clime."

Consult: 'Correspondence and Public Papers of John Jay' edited by H. C. Johnston (1890–3); William Jay, 'Life of John Jay' (1833); Whitelocke, 'Life and Times of John Jay' (1887); Pellew, 'John Jay' (1890).

Alton B. Parker,
Late Chief Judge of the Court of Appeals of the State of New York.

Jay, John, American diplomatist: b. New York, 23 June 1817; d. there 5 May 1894. He was the son of William Jay (q.v.) He was graduated from Columbia in 1836, studied law in New York, was admitted to the bar in 1839, became a prominent opponent of slavery, was secretary of the Irish relief committee in 1847, and was counsel for several fugitive slaves. He organized the meetings at the Broadway Tabernacle, New York, in 1854, and took a leading part in the organization of the Republican party at Syracuse 27 Sept. 1855. From 1869 until his resignation in 1875 he was United States minister to Australia, in 1877 was appointed chairman of the so-called Jay commission for the investigation of the New York customs-house administration, and in 1883 was appointed the Republican member of the New York State civil service commission. He was long corresponding secretary of the New York Historical Society, and published several pamphlets, among them: 'The Dignity of the Abolition Cause' (1839); and 'The American Church and the American Slave-trade' (1860).

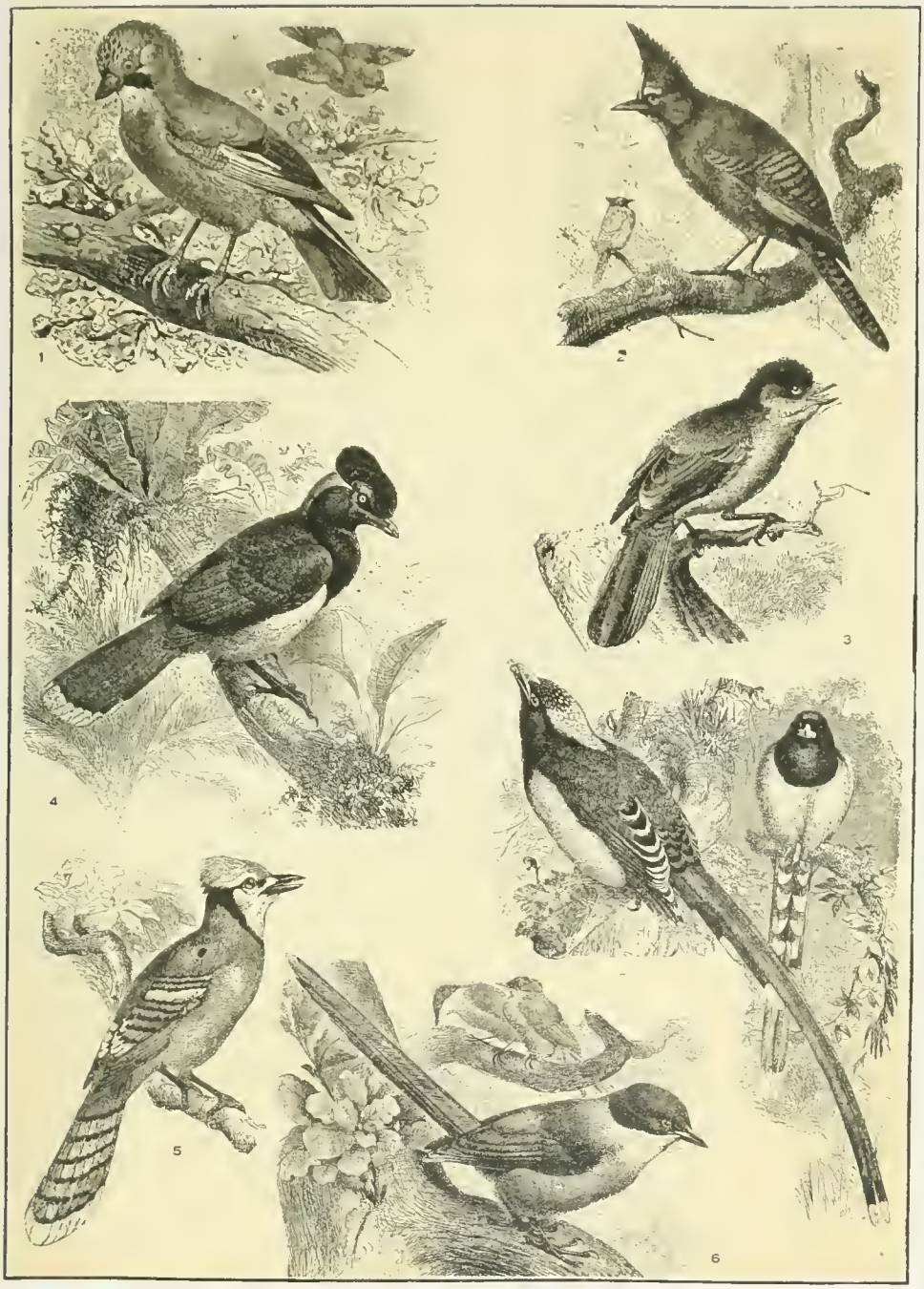
Jay, William, English Congregational clergyman and writer: b. Tisbury, Wiltshire, 8 May 1769; d. Bath, 27 Dec. 1853. After studying for the Congregational ministry, he officiated at Hope chapel, near Bristol, and became pastor in 1789 of Argyle chapel, Bath, where he remained till 1852. As a preacher he not only enjoyed a high celebrity in his own denomination, but won the applause of critics like John Foster, Sheridan, and Beckford. His published sermons are esteemed as well for their catholic spirit as their practical earnestness and simplicity of style. They have passed through many editions, and besides them he wrote 'Essay on Marriage'; 'Lectures on Female Scripture Characters' (1854); 'Morning and Evening Exercises' (1854). His autobiography, in the form of letters, appeared in 1854.

Jay, William, American jurist: b. New York, 16 June 1789; d. Bedford, N. Y., 14 Oct. 1858. He was the son of John Jay, statesman and jurist (q.v.). Graduated from Yale in 1808, he studied law with J. B. Henry at Albany, was obliged by defective eyesight to withdraw from the profession, and became interested in various philanthropic movements, including the anti-slavery cause. He was a founder of the American Bible Society (1816), which he greatly promoted and long defended against High Church attacks led by Bishop Hobart. In 1818–21 he was judge of common pleas in New York, and in 1835–7 corresponding foreign secretary of the American Anti-Slavery Society, in the drafting of whose constitution he had assisted. He wrote much on anti-slavery, and was recognized as a leader of the more conservative of the Abolitionists. Among his publications were: 'The Life and Writings of John Jay' (1833); 'An Inquiry into the Character and Tendency of the American Colonization and American Anti-Slavery Societies' (1834): 'A View of the Action of the Federal Government in Behalf of Slavery' (1837); 'War and Peace' (1848).

Jayhawker, a name originating in Kansas during the slavery and anti-slavery warfare; applied to a few Free State men who organized a system of retaliation against pro-slavery outrages. Gov. Lane of Kansas, in 1861, declared that "the people of Kansas were neither thieves, plunderers, nor *jayhawkers.*"

Jays, a group of birds forming with the magpies a sub-family (*Garrulinæ*) of the *Corvidæ*, or crow family. They are readily distinguished from the true crows (*Corvinæ*) by their relatively short wings, long conspicuous tails, and usually showy plumage, in which blue colors are prominent. They are generally smaller than the crows, have weaker bills, and feet better adapted to the more completely arboreal life which they lead. Jays are found throughout the greater part of the world, but America leads in number and variety of species. North America has four genera and ten species with many additional local varieties. A familiar representative is the bluejay (*Cyanocitta cristata*), which is numerous throughout the eastern half of the United States and Canada. It is about one foot long, of which the tail is nearly half; the head conspicuously crested; purplish-blue above with a slight tinge of the same color on the generally gray underparts; the wings and tail are a nearly saturated blue in the males, duller in the females, cross-barred with black and with white markings especially conspicuous on the end of the tail; a rich black collar encircles the neck. The bluejay eats all kinds of nuts, fruits, large insects, and at times the eggs and young of other birds; it seldom leaves the trees in search of food, and when on the ground hops instead of walking like the crow. Except in Canada it is resident, and it breeds throughout its entire range. The nest, a large structure of twigs, grass, leaves, etc., is built in trees, bushes, or old buildings. Five is the usual number of eggs. Like the magpie this jay is known to collect and hoard various glittering or brightly colored objects, but is chiefly noteworthy on account of the variety and quality of its notes which range from the harshest cries to full flute-like tones. On the Pacific Coast this species is replaced by the darker and duller Steller's jay (*C. stelleri*). The Canada jay, or whiskey jack (*Perisoreus canadensis*) is, as its name indicates, a northern bird, found within the United States only along the northern border, and occasionally breeding in northern Maine. This is a dull-colored gray bird, without a crest, and with soft, lax plumage. It is well known to hunters and lumbermen whose camps it haunts with great boldness; and in manners and voice resembles the bluejay. It nests very early in the spring. Related species are the Oregon jay (*P. obscurus*) and the Siberian jay (*P. infaustus*) of boreal Eurasia. Several species of crestless deep-blue "Florida" jays (*Aphelocoma*) inhabit Florida and the west and the southwest. The brilliant green jay (*Xanthura luxuriosa*) is an example of the gorgeous tropical jays which just enter the United States in Texas. Consult the works: Wilson, Audubon, Nuttall and American ornithologists generally; for western species in particular, Coues, 'Birds of the Northwest' (1874), and 'Birds of the Colorado Valley' (1878).

Jay's Treaty, 1794. The Articles of Confederation provided that the States might nullify at will any provisions of whatever commercial treaty Congress might negotiate; of course therefore no nation with much commerce to be disturbed by our competition would make such treaties with us. Our chief commerce was with Great Britain; and that country would make no commercial treaty whatever with us, even for years after the Constitution had given Congress power to enforce its treaties. There were two main reasons for this: first, that Great Britain had valuable commercial monopolies (especially in the West Indies) for which she thought we could return no equivalent; second, she was angry over the *sequelæ* of the peace of 1783. She had agreed to surrender the border forts on the Great Lakes, the St. Lawrence, and Lake Champlain, and carry off no negroes, on condition that Congress "recommend" to the States to restore confiscated Tory property, and agree to confiscate no more. Congress did so twice emphatically, but the States paid no attention to it; the British government, though it knew very well how much the recommendation meant, made this an excuse to retain the forts and refuse payment for 3,000 negroes carried off; this in turn hardened the States to refuse compliance with the treaty, and the forts being



1. European Jay (Garrulus glandarius).
2. Mexican Long-crested Jay (Cyanocitta diademata).
3. Canada Jay (Perisoreus canadensis).
4. Blue-capped Jay (Cyanocorax chrysops).
5. American Bluejay (Cyanocitta cristata).
6. Spanish Jay (Cyanopica cooki).
7. Red-billed Jay (Cissa erythrorhyncha)

made a basis for Indian outrages winked at by the British commandants enraged the country still more. The Republicans, who sympathized with the new French Republic and hated Great Britain, held the House; the Federalists, whose sympathies were exactly opposite, the Senate by a small majority. On 16 Dec. 1793, Jefferson made a famous report on a House resolution, recommending retaliatory duties; and after an acrid debate the Republicans pushed through a non-intercourse resolution, only defeated even in the Senate by Vice-President Adams' casting vote. But Washington threw his weight into the scale of peace, and nominated Chief Justice John Jay as envoy extraordinary to negotiate a commercial treaty. With Lord Granville he drew up one on 19 Nov. 1794, which removed the chief American grievance by surrendering the forts, but refused compensation for the negroes and referred all other claims to commissioners; and as to commerce, allowed direct but not coasting trade between the United States and the British East and West Indies (the latter in vessels of not over 70 tons), but denied the United States the right to export sugar, molasses, coffee, cocoa, or cotton to Europe — in other words, to become an intermediary for the British colonies to evade the British commercial monopoly; and limited even this provision to two years after peace with the powers then at war with Great Britain. There were also clauses which impliedly recognized British right of search and impressment, and power to make anything contraband. The treaty was ratified by the Senate in secret session (8 June 1795), but when published excited an uproar of public indignation; Jay was burned in effigy, and even Washington vilified incredibly. The Virginia legislature and the Federal House practically passed votes of censure; but the people gradually came to recognize that it was the best thing to be had, hard as were the terms; the commercial bodies in the States openly commended it; Hamilton wrote his «Camillus» letters in its favor; and after a bitter struggle for many weeks in the House to refuse compliance with the Senate action, the treaty won by 51 to 48.

Jean Paul. See RICHTER, JEAN PAUL FRIEDRICH.

Jeanne d'Arc, zhän därk. See JOAN OF ARC.

Jeannette, jĕn-nĕt', Pa., borough in Westmoreland County; on the Pennsylvania railroad; about 22 miles southeast of Pittsburg. The natural gas which supplies the borough has contributed somewhat to its development. It is situated in a fertile agricultural region, which is also a coal mining section. The government is vested in a burgess, who holds office three years, and a council. Pop. (1890) 3,296; (1900) 5,865.

Jeannette Expedition, an enterprise, projected 1879 by James Gordon Bennett of the New York *Herald*, who sent out an Arctic expedition from San Francisco in the steamer Jeannette, under command of Lieut. De Long, U. S. N. The Jeannette was early caught in the icepack, drifted for nearly two years, and never escaped from its grip. After the wreck of the Jeannette the crew embarked in two cutters and a whaleboat. Lieut. Danenhower and a portion of the Jeannette's crew reached New York in May 1882. The bodies of De Long and his men were finally discovered in the snow, with evidences that all had perished from cold and hunger. See POLAR RESEARCH.

Jebb, SIR **Richard Claverhouse,** English Greek scholar: b. Dundee, Scotland, 27 Aug. 1841; d. 9 Dec. 1905. He was educated at the Charterhouse, London, and Cambridge University, and in 1869 became public orator there. In 1875 he was called to fill the Greek chair in Glasgow University, which he resigned in 1889, on being appointed Greek professor at Cambridge. He several times visited the United States, and in 1874 married the widow of a general in the United States army. He was lecturer at Johns Hopkins University, Baltimore, in 1892. His best known works are: 'The Attic Orators' (1876); 'Modern Greece' (1880); a 'Life of Richard Bentley' (1882); 'Homer: an Introduction to the Iliad and Odyssey' (1886); 'Lectures on Greek Poetry' (1893); 'Humanism in Education' (1899); and an addition of Sophocles, with notes and translation. After 1891 he represented Cambridge University in Parliament. He was knighted in 1900.

Jefferson, jĕf'ĕr-sŏn, **Charles Edward,** American Congregational clergyman: b. Cambridge, Ohio, 29 Aug. 1860. He was graduated from Ohio Wesleyan University (Delaware, Ohio) in 1882, from the School of Theology of Boston University in 1887, was ordained to the Congregational ministry in 1887, and became pastor of the Broadway Tabernacle, New York. Among his writings are: 'Quiet Talks with Earnest People in My Study'; and 'The Broadway Tabernacle of the Past and Future' (1901).

Jefferson, Joseph, American actor: b. Philadelphia 20 Feb. 1829; d. Palm Beach, Fla., 23 April 1905. He was privately educated and was early upon the stage, among his first public appearances being that as a miniature of T. D. Rice in one of the latter's «Jim Crow» entertainments at Washington, D. C. In 1843 he became a member of a band of strolling players that gave primitive entertainments through Mississippi and Texas, and followed the United States army into Mexico. On his return to the United States he appeared at the Arch Street Theatre, Philadelphia, directed the performances at Peale's museum in that city, became known as an excellent stock actor, and in 1851 played Marroll in 'A New Way to Pay Old Debts' to the Sir Charles Overreach of Junius Brutus Booth. His prominence began with his creation of Asa Trenchard in 'Our American Cousin,' which eliminated from the stage the traditional caricature of Yankee character. He then appeared in the parts he afterwards made famous: Newman Noggs in 'Nicholas Nickleby'; Caleb Plummer in 'The Cricket on the Hearth'; Dr. Pangloss in 'The Heir at Law'; Dr. Ollapod in 'The Poor Gentleman'; Mr. Golightly in 'Lend Me Five Shillings'; Salem Scudder in 'The Octoroon'; Bob Acres in 'The Rivals'; and, above all, Rip Van Winkle in the play of that name. Dissatisfied with his own dramatization of Irving's sketch, in which he had appeared at Washington in 1860, Jefferson had the play re-written by Dion Boucicault, and in Boucicault's version, with slight changes,

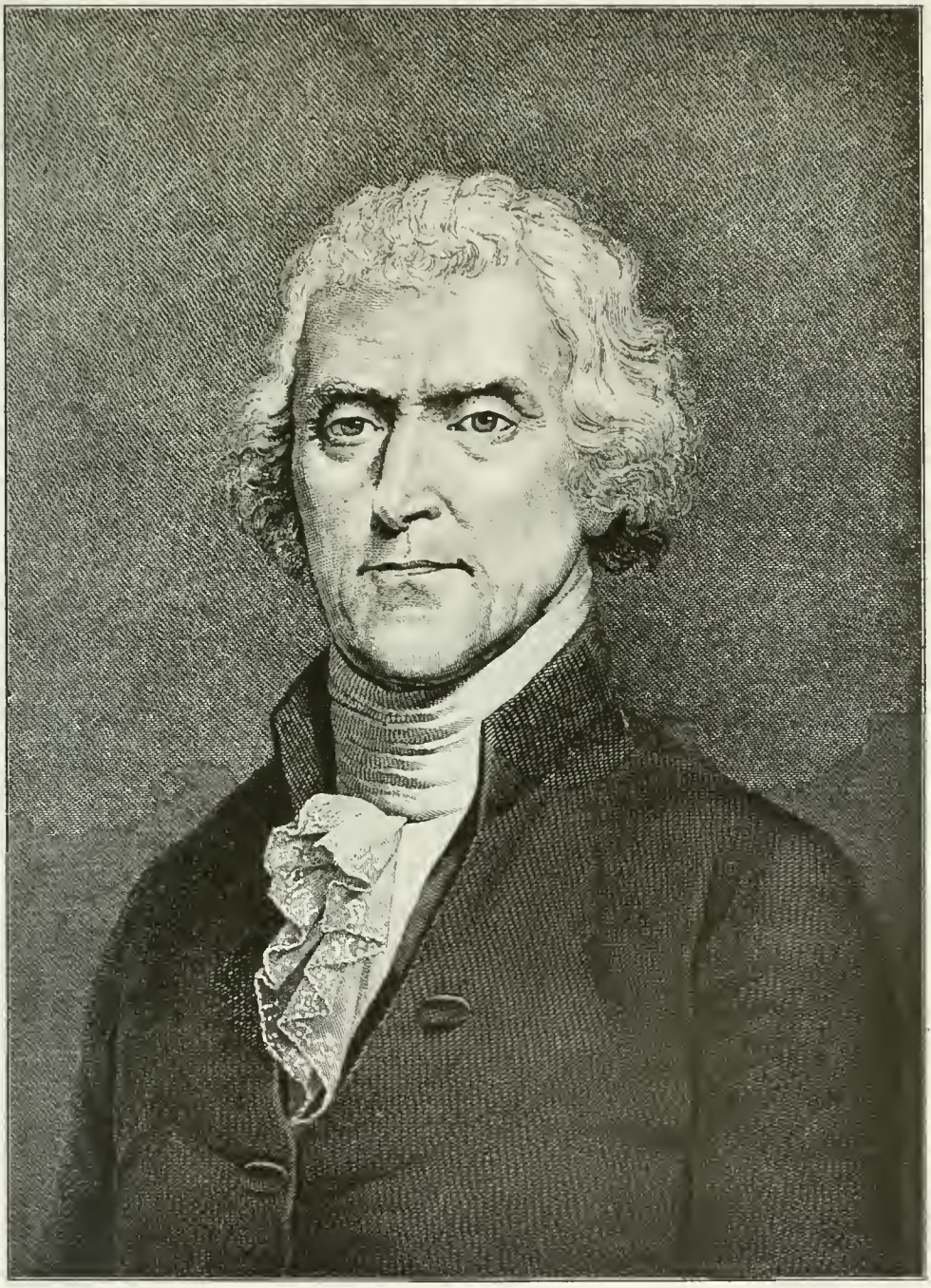
afterward acted. The drama ran for 170 nights at the Adelphi, London, in 1865, and in the United States was so successful that for years Jefferson appeared there in nothing else. Jefferson's Rip established itself as one of the classic creations of the stage, and outside of Shakespeare probably no character ever attained so wide and permanent a recognition among the American public. In the later years of his life he played but a few weeks annually in a repertoire of favorite parts. He also made a considerable reputation as an artist by his impressionist landscapes in oils. His acting method was distinguished by ease, verisimilitude, and perfection of finish. In the plays used by him he, for artistic purposes, introduced several admirable changes and additions. He published an interesting 'Autobiography' (1890); and a 'Reply to Ignatius Donnelly on the Shakespeare-Bacon Argument.' Consult the 'Autobiography,' and Carroll, 'Twelve Americans' (1883).

Jefferson, Thomas, American statesman, third President of the United States: b. Shadwell, Albemarle County, Va., 13 April 1743; d. Monticello, Albemarle County, Va., 4 July 1826; student at William and Mary College, Williamsburg, Va., 1760–2; student of law 1762–7; member of House of Burgesses 1769–74; member of Virginia Conventions 1774 and 1775; of the Continental Congress 1775–6; of Virginia Legislature 1776–9; governor of Virginia 1779–81; member of Congress 1783–4; minister to France 1784–9; secretary of state 1790–3; Vice President 1797–1801; President 1801–9; in retirement at Monticello 1809–26.

Early Life.— Thomas Jefferson was the son of Peter Jefferson, a planter of Albemarle County, Va. His mother was Jane Randolph, daughter of Isham Randolph, who was a descendant of William Randolph of Turkey Island, the progenitor of that family so well known in Virginia history. Jefferson's birthplace was Shadwell, about four miles from the city of Charlottesville. At this homestead he resided until it was destroyed by fire in 1770; thereupon Jefferson selected a low mountain about two miles from Charlottesville, where he built that now famous mansion, "Monticello." Albemarle County, Va., has the proud distinction of being the section in which Jefferson was born, reared, lived, died and lies buried. Jefferson's early education, as was usually the case with Virginia planters, was entrusted first to a private tutor, from whom he learned Latin, Greek, French, and mathematics. At 14 his father died, and after two years in a school conducted by the Rev. James Maury, he entered in 1760 William and Mary College, at that time the best institution of learning in America. The student Jefferson is described as tall and raw-boned, with reddish hair and grayish hazel eyes. He was not then regarded as handsome, though in after years he was considered as probably the most attractive in appearance of the great Virginia statesmen. As a youth he was noted for his intelligence, and while at college, he was in constant association with such men of culture as George Wythe (q.v.), the eminent lawyer; Professor William Small, the profound scholar, and Governor Francis Fauquier (q.v.), the gay and accomplished gentleman. With these gentlemen, many years his senior, he was accustomed to discuss the deepest questions of philosophy and government. In Williamsburg, Jefferson was one of the leaders in all social functions, and always attended the balls given in the Apollo Room of the Raleigh Tavern. Probably his first year at college was spent among too many festivities, but during his second year he is said to have been a most diligent student, often devoting 15 hours a day to his books. After two years of college work, he commenced the study of law under George Wythe, but did not apply for admission to practice before the general court of Virginia till 1767. Jefferson was now 24 years of age; he had a large farm of 1,900 acres (soon increased to 5,000 acres) to which he gave his personal supervision. Though he devoted much time to this farm, he succeeded so well as a lawyer that his profession soon paid him $3,000 annually.

A Revolutionist.— In 1769 he was returned by Albemarle County a member of the House of Burgesses, an honor which his father had had before him. This was Jefferson's beginning as a statesman. He had stood in 1765 in the hallway of the House of Burgesses when Patrick Henry (q.v.) offered his famous Resolutions against the Stamp Act, and from Patrick Henry he imbibed the spirit of revolution. Just as soon as he became a member of the Burgesses, he joined the party of resistance to England. He was by nature a bold and fearless thinker, and when a mere boy he had had engraved on a seal as his motto, "Resistance to tyrants is obedience to God," a principle to which he held throughout his long and eventful life. Jefferson was present when the House of Burgesses passed the resolutions of 1769. He was one of those who signed the agreement not to import goods from England. He was also a member of the House of Burgesses when, in 1773, it established a Committee of Correspondence between Virginia and the other colonies. Some think that the resolutions for such a committee were drawn by Jefferson, though they were offered in the house by his kinsman, Dabney Carr (q.v.). Of this committee Jefferson was a member. He served again in the House of Burgesses in 1774, and was one of those who voted for the resolution appointing a day of fasting and prayer because of the oppressive measures which England had passed against the city of Boston. When the governor dissolved the assembly, Jefferson met with those discontented members who called for a general congress of the colonies and asked the freeholders of Virginia for a convention to consider the state of the colony. To this convention Jefferson was returned by the people of Albemarle. The convention of 1774 was the first extra-legal assembly to meet in Virginia. Jefferson was unable to be present, having been taken ill on his way to Williamsburg. However, his influence was felt through a document called "The Summary View of the Rights of British America," which was intended to be a series of instructions to the Virginia delegates to the First Continental Congress. The instrument marked him as a revolutionist, and as an advocate of independence from England, for in it he distinctly claimed that the colonies had a right to govern themselves without interference from the English Parliament. His views were too radical for the Virginia convention to give them its official stamp.

Jefferson was also elected a member of the



THOMAS JEFFERSON,

THIRD PRESIDENT OF THE UNITED STATES

convention of 1775, which met at St. John's Church, Richmond, and when Patrick Henry by his eloquence carried the colony into open rebellion against the mother country, Jefferson was appointed a member of the committee to devise a plan for organizing the militia of the colony. Shortly after this he became a member of the Second Continental Congress. When he entered that body, he was 32 years of age, being one of the youngest three members. Here he was placed on such important committees as those which drafted a paper to explain the rebellious attitude of Massachusetts at Lexington and Concord, and to reply to Lord North's "Conciliatory Policy." On each committee he showed such a strong republican tendency that his suggestions were not accepted. The members of the Continental Congress of 1775 were not far-sighted enough to see that independence was the only course. Finally, in the spring of 1776, there came to the Virginia members of Congress instructions from the Virginia convention of 1776 that the united colonies should be declared free and independent States; and accordingly Richard Henry Lee, called the American Cicero, moved that a Declaration of Independence should be adopted. In accordance with the motion, a committee was appointed and the members were elected by ballot. Jefferson's facility for writing was so well known to the Congress that he received the highest number of votes and was named as chairman of the committee over such men as John Adams, Benjamin Franklin, Roger Sherman and Robert R. Livingston. To him as chairman fell the task of drafting that immortal document which stands in the history of the world as the most revolutionary political paper ever written. On 4 July 1776, the instrument, practically as offered by Jefferson, was unanimously adopted and to it were placed the signatures of all the members of Congress then present, except one. The principles set forth in that document mean a government by and for the people, and show that Jefferson was far ahead of his day; for it is only at the dawn of the 20th century that we are beginning to comprehend the great and universal truths that Jefferson made known to the world. (See Declaration of Independence.) Jefferson retired from Congress in 1776, and, on returning to his native State, entered the Virginia legislature with the hope of revising and modifying her laws so that they might accord with republican government. For three years he served in the House of Delegates. During this time he succeeded in breaking down the laws of primogeniture and entail, in practically disestablishing the English Church, and in passing one of the best laws that the world has ever seen for public education providing an ideal system from the primary school to the university. Through his influence the legislature appointed a committee to revise thoroughly the laws of Virginia. The committee was composed of Edmund Pendleton, George Wythe and Jefferson. After two years, the revision, chiefly done by Jefferson, was submitted to the General Assembly, but it was not adopted *in toto*. Finally, however, in 1785, while Jefferson was in France, his faithful friend and political follower, James Madison, secured the passage of nearly all of Jefferson's work. It was at this time that the legislature approved the famous Statute for Religious Freedom, by which the complete separation of Church and State was accomplished, except the taking away of the *glebe* lands, a thing which was done in 1802. Jefferson wished even more radical changes in Virginia, such as the equalizing of representation on population instead of having two representatives from each county. He also desired that the suffrage should not be restricted to land owners, but that it should be extended to all men who might be subject to military duty. He likewise advocated more local self-government in the counties and towns of the State. He even went so far as to advocate the emancipation and the deportation of the slaves from Virginia. These measures were too radical for the Virginia Assembly, and were rejected. It is interesting to note, however, that all of them have since been accomplished save the deportation of the negroes.

Governor of Virginia.— Jefferson was governor of Virginia from June 1779 to June 1781. These were trying times; Virginia was invaded by British troops under Cornwallis, and Jefferson lacked money and resources with which to defend properly the State. His administration has often been criticised, some claiming that he was a mere doctrinaire and not a practical man; but close scrutiny shows that he did all that then lay in his power.

In Congress and at the French Court.— In 1783 Jefferson entered the Congress of the United States. To this body he proposed in 1784 a plan for the government of the Northwest Territory which Virginia so generously gave to the Union. One clause of this plan provided for the prohibition of slavery in that territory after 1800, and for this reason the plan was not adopted. In 1787, however, Congress enacted a bill for the government of the Northwest much like the original draft of Jefferson. From him Congress had the plan of our present decimal monetary system. In 1784 Jefferson was sent to France to join Benjamin Franklin and John Adams in negotiating commercial matters with foreign countries, and in 1785 he succeeded Franklin as our minister plenipotentiary to the French court. Through his efforts many unjust impositions on American commerce were removed by the French government.

Secretary of State.— In October 1789 he returned to America, and the following year became secretary of state in Washington's cabinet, in which position he opposed Hamilton (q.v.), who favored the exercise of extensive powers by Congress. Jefferson believed in a real federal relation between the States, and in a restricting of the congressional powers to purely constitutional authorizations. The final line of cleavage came when Congress passed a bill to establish a national bank. Hamilton submitted to Washington a paper asserting that such a step was legal, while Jefferson made a vigorous written protest showing that the bill was unconstitutional. Washington approved the measure, thus accepting Hamilton's views as correct. The Bank Bill, along with similar congressional acts, caused the establishment of two distinct parties — the Federalist or Loose Construction Party, headed by Hamilton, and the Anti-Federalist or Strict Construction Party, with Jefferson as its leader. Jefferson's followers were usually called the Democratic-

Republicans. (See BANKS AND BANKING, AMERICAN.)

In December 1793 Jefferson resigned from the cabinet and returned to Monticello, where he remained for four years, studying farming. His estate at this time contained 10,647 acres of land, worked by 154 slaves, and stocked with 34 horses, 5 mules, and 249 cattle. Among the negroes he had a sort of industrial (manual-training) school, and taught them to be cabinet-makers, bricklayers, masons and smiths.

Vice President.— From his retirement at Monticello, Jefferson was called to become Vice President in 1797, a position which he held till 1801. During these four years, he bitterly opposed the so-called monarchical tendencies of the Federal party as seen in the Alien and Sedition Acts (q.v.), and he boldly asserted the compact theory of State sovereignty in the Kentucky Resolutions of 1799. The Kentucky Resolutions and Virginia Resolutions of 1798-9 (the latter framed by Madison after a copy of the Kentucky Resolutions sent him by Jefferson), made the platform, so to speak, of the Democratic-Republican party which elected Jefferson as President in 1801.

President.— From 4 March 1801 to 4 March 1809 Jefferson was President. He was the first President to be inaugurated in Washington City. He believed in rotation in office, and in pursuance of this idea, removed a number of Federalists from their positions. His great act, however, was the purchase of the Louisiana Territory from France for the sum of $15,000,000. This vast territory was acquired for two reasons: (1) In order that the United States might have control of the Mississippi River, and the port of New Orleans; and (2) that the United States might not be hampered by European countries in the development of a republican form of government. As secretary of state in Washington's cabinet, Jefferson had practically asserted what was afterward known as the Monroe Doctrine, when he claimed that the United States should see that no European countries, other than those already holding possessions, secure a foothold in America. In 1801 Jefferson viewed with alarm the transfer of the Louisiana Territory from Spain to France, for he feared that, with France added to Spain, England and Russia, in control of colonies in America, republican government would have a hard struggle. Jefferson was accused of inconsistency for having sanctioned the Louisiana Purchase (q.v.), for if he had applied the strict construction principle of the Constitution here as in such acts of Congress as the establishment of the national bank, this Territory could not have been purchased, there being no provision in the Constitution allowing territorial expansion. But Jefferson's political sagacity kept him from refusing this great opportunity, and his wish of expansion caused him to advocate earnestly the purchase of Florida from Spain. It was 13 years later before his desire was accomplished. The second administration of Jefferson was not so successful as the first. It opened with a war against the Tripolitan pirates who were plundering American commerce. The outcome of this war was to increase our influence among the nations of the world. The last years of the second term were marked with difficult complications arising out of the Napoleonic wars. Napoleon tried to prevent the United States from trading with England, and England retaliated by attempting to cut off all commercial relations between the United States and France. Many American vessels were seized by both England and France. Adding to this indignity, England claimed the right to search American vessels for English seamen, and an English war vessel actually fired on an American man-of-war, killing three of the crew and wounding 18. Jefferson tried to meet the restrictions on American commerce by the Non-Importation Bill and the Embargo Act. To enforce the measures all of the New England ships would have been shut up in American harbors. The New England merchants preferred to run the risk of losing their ships to keeping them without traffic; therefore they began to abuse the President and his policy. The result was that Congress felt forced to repeal the Embargo Act. Jefferson always claimed that had the embargo been enforced the United States would have gained its rights without the second war with England in 1812. (See EMBARGO IN THE UNITED STATES.)

Private Citizen.— On 4 March 1809, Jefferson retired from the White House, and spent the remaining 17 years of his life at Monticello. In these latter days he was known as the "Sage of Monticello," and to his home came people of prominence from all parts of the world to consult with him on great questions of politics and economics. Often his housekeeper had to provide beds for 50 guests. The demands which were made on his hospitality were so great that he died a bankrupt. During this period of his life he did all that he could to encourage better methods in agriculture, to reform the government of Virginia, and to develop in it a better system of education. The crowning event of his life was the establishment of the University of Virginia (q.v.) in 1819. He died on 4 July 1826, just 50 years from the day that has made him famous in all history, and by a singular coincidence his old rival and political antagonist, John Adams, passed away on the same day. Jefferson asked that three things be inscribed on his tomb: "Author of the Declaration of Independence; of the Statute for Religious Liberty in Virginia, and Founder of the University of Virginia,"— three acts which have made him famous.

Jefferson's Principles.— Jefferson stands in history for: (1) Republican government and the sovereignty of the people; (2) Opposition to privileged orders of nobility and the entail system; (3) Universal education and local circulating libraries; (4) Separation of Church and State; (5) Freedom of thought and speech; (6) Local self-government; (7) Economy in government and small public debt; (8) A policy of peace; (9) Political equality and universal suffrage; (10) Strict construction of the Constitution and the sovereignty of the States; (11) Well-trained militia and small standing army; (12) Metallic money, either gold or silver, as a standard, and no paper legal tender; (13) Opposition to bounties and monopolies; (14) Emancipation and deportation of slaves; (15) Expansion of the United States to include Louisiana, Florida, Cuba, and Canada; (16) Maintenance of Indian reservations; (17) Judiciary beyond the control of the legislative or executive branches of government; (18) Small navy; (19) Opposition to nepotism; (20) Rotation in

office; (21) Opposition to all secession movements, North or South. This review will show that Jefferson probably gave to the world more broad principles of government than any other man. Wherever republican forms of government exist there the name of Jefferson will always be uttered with reverence and respect.

Bibliography.— Ford's 'Writings of Jefferson' (1892-9); Randall's 'Life of Jefferson' (1888); Morse's 'Life of Jefferson' (1883); Forman's 'Life and Writings of Jefferson' (1900).

J. A. C. CHANDLER,
Of Richmond College, Richmond.

Jefferson-Burr Imbroglio, ĭm-brō'lyō, a disputed Presidential election which resulted from a defective clause in the Constitution and caused its amendment in 1800. By its original provisions, the person who received the highest number of electoral votes should be President, the next highest Vice-President. Each set of electors had informally agreed that to save the pride of the leading candidates (Jefferson and Burr, Adams and Pinckney) each pair should have equal votes, and with one exception never reflected that this meant a tie; one Rhode Island Federalist elector cast his second vote for John Jay instead of Pinckney, and there is an unproven charge that Burr intrigued for an extra vote over Jefferson. They, however, received 73 each, and the Federalist House had to choose between the two Democratic candidates. Rules were adopted for the balloting, among the chief being that the Senate should be admitted, that the balloting should be in secret session, and that the House should not adjourn till a choice was made. The Federalists in caucus decided to vote for Burr; perhaps partly to spite the Democrats — Jefferson being their great national leader and the great Federalist terror, and the man the Democrats had intended to vote for as President — and partly because Burr as a New York man would consult Northern commercial interests, which the Virginian Jefferson might antagonize. They were right in this; Burr would not have laid the Embargo. Their solid vote would have elected Burr by one (nine out of 16 States); but they could not hold their members, three of whom bolted and voted for Jefferson to satisfy public feeling in their districts. Thus Jefferson had eight States, Burr six, and Vermont and Maryland were divided. But the Burr electors in the last two secretly agreed with Bayard of Delaware, who had also voted for Burr, that if there were likely to be bad blood and danger from prolonged balloting, they would stop it by voting for Jefferson. The casting vote thus lay with Bayard, who justly commanded confidence; but as the agreement was not known, the situation seemed much more perilous than it was. The balloting lasted a week without change. Some of the Federalists plotted to have it last till John Adams' term expired, and then let the others fight it out, or leave it by special act to Chief Justice John Marshall (Federalist), as a sort of regent trustee. The Democrats countered by resolving either to have Jefferson and Burr jointly (one of them certainly being President) call a special session, or to seize the capital by a militia force, call a convention, and revise the Constitution. Finally, after 34 ballots, the confederate electors decided that if Jefferson would give a guarantee for the civil service, he should have the election after one more ballot; he gave the guarantee, and was elected on the 36th ballot by 10 to 6 (States). Burr became Vice-President; that the attempt to put him at the head was mainly due to real fear for commerce is made probable by the fact that every New England State except the one (Vermont) which had no commerce, voted for him to the last. This affair resulted in the passage of the Twelfth Amendment (see CONSTITUTION OF THE UNITED STATES), which obliged the electors to specify their choice for the offices on distinct ballots, and enlarged the range of choice to three candidates in case of tie.

Jefferson, Texas, city, county-seat of Marion County; on the Cypress Bayou, and on the Missouri, K. & T. and the Texas & P. R.R.'s; about 20 miles from the eastern boundary of the State and 142 miles east of Dallas. It was settled in 1850 and incorporated in 1866. It is situated in an agricultural and stock-raising region with rich iron ore deposits in the vicinity. Some of the principal industrial establishments are furnaces, machine-shops, foundries, sawmills, cottonseed-oil mills, and large storage houses. The shipments are chiefly articles manufactured in the city, vegetables, grain, cotton, live stock, and fruit. The principal buildings are a government building, the city and county buildings. An iron bridge across the Bayou and good roads assist in making Jefferson the trade centre for a large part of Marion and Cass counties. Pop. (1900) 2,850.

Jefferson, Wis., city and county-seat of Jefferson County, at the junction of the Rock and Crawfish rivers, 50 miles west of Milwaukee; and on the Chicago & Northwestern railroad. It was settled in 1837 and is governed by a mayor and a council elected every two years under a charter of 1893. It has pork-packing plants, flour-mills, tanneries, brick and tile works, carriage and wagon factories and other industries. The city owns and operates the waterworks and the electric-lighting plant. Pop. (1900) 2,584.

Jefferson City, Mo., city, capital of the State, and county-seat of Cole County; on the Missouri River, and the Chicago & A., and the Missouri P. R.R.'s; 125 miles west of Saint Louis. It is the farming and manufacturing trade centre for Cole and adjacent counties; has manufactories of flour, shoes, clothing, beer, brooms, bricks, farming implements, carriages and wagons, and iron foundries. It is the seat of Jefferson City College, the general western offices of the Standard Life Insurance Company, Lincoln Institute, State Capitol building, State penitentiary, State armory, governor's mansion, Supreme Court building, United States courthouse, and the Carnegie Public Library. It has gas and electric light plants, 2 national banks, daily, weekly, and monthly periodicals, and an assessed property valuation exceeding $800,000. Jefferson City was settled in 1826 and was first incorporated in 1839. A mayor and council elected every two years administer the affairs of the city. Pop. (1890) 6,742; (1900) 9,664.

Jefferson River, Montana, a stream about 200 miles long, formed by the union of the Beaver Head and Wisdom (or Big Hole) rivers in Madison County. It unites with the Madison and Gallatin to form the Missouri.

Jeffersonton, Engagement at. Early in October 1863 the Army of the Potomac, under command of Gen. Meade, lay around Culpeper Court House, with the advance of two corps on the Rapidan. Gen. Lee, who was south of the Rapidan, determined to flank Meade's position, seize the Orange and Alexandria Railroad north of the Rappahannock, and intercept his retreat upon Washington. Informed of the movement, Meade withdrew his army to the north side of the Rappahannock, 11 October, his rear-guard of cavalry having a sharp engagement with the Confederate cavalry at Brandy Station. Believing that the Confederate army was moving upon Culpeper, Meade turned about and on the 12th, threw three infantry corps and a cavalry division south of the Rappahannock, with instructions to push forward and find and strike Lee, if at Culpeper. When they reached Brandy Station the Confederate army was nowhere in that neighborhood. At this time Gen. Gregg's division of Union cavalry was guarding the upper fords of the Rappahannock and Hazel rivers; on the morning of the 12th Col. Gregg's brigade crossed the Rappahannock near Sulphur Springs; his pickets at Jeffersonton being driven in, he marched for that place, found it in possession of the enemy, drove them from the town, and occupied it. That morning Fitzhugh Lee's cavalry division, leading the Confederate advance from near Madison Court House, crossed Hazel River at Starks' Ford and pressed on toward the Rappahannock. The 11th Virginia cavalry drove Gregg's skirmishers into Jeffersonton and attacked the two regiments in the town, but was driven out after losing several men. The 7th and 12th Virginia were now sent to the left and right, encircling the town, a combined attack was made, and Gregg was utterly routed and driven across the Rappahannock, with a loss of about 400 men, most of them captured. The Confederate loss was about 40 killed and wounded. When Meade heard of the engagement, and that Lee was crossing the Rappahannock at Warrenton Springs, he hastily recrossed the river, withdrew to Auburn and Catlett's Station and, on the 14th, to Centreville, Lee following closely and attacking his rear at Auburn and Bristoe Station during the day. Consult: 'Official Records,' Vol. XXIX.; Walker, 'History of the Second Army Corps.'

E. A. Carman.

Jef'fersonville, Ind., city and county-seat of Clark County; on the Ohio River, and the Baltimore & O. S. W., the Pittsburg, C. C. & St. L. and several other railroads; 50 miles southwest of Evansville. It is opposite Louisville, Ky., with which it is connected by railroad bridges. It contains the Southern State penitentiary, high school, public library, prison library, United States quartermaster's supply depot, and has waterworks, gas and electric lights, street railways, large car works, 2 national banks, daily, weekly, and monthly periodicals, and an assessed property valuation of about $1,700,000. Being at the head of the Ohio falls excellent water power is obtained here and the city has numerous industries, among them extensive works for freight and passenger cars and for building river steamboats. The mayor and council are elected biennially; the police commissioners are appointed by the governor of the State. Pop. (1890) 10,666; (1900) 10,774.

Jeffrey, jĕf'rĭ, **Francis,** Lord, Scottish judge and critic: b. Edinburgh 23 Oct. 1773; d. Craigbrook Castle, near Edinburgh, 26 Jan. 1850. He was educated at the University of Glasgow, and Queen's College, Oxford, and was admitted to the Scottish bar in 1794. He assisted in establishing the 'Edinburgh Review' in 1802 with Sydney Smith, Lord Brougham, and others, and after two numbers had been issued became its editor, a position which he held till June 1829. In 1831 he was made lord-advocate, and sat for several years as member of Parliament for Edinburgh. He was made a lord of session in 1834, and continued during a period of 16 years to be one of the ablest and most popular judges of the supreme court in Scotland. Consult: Cockburn, 'The Life of Lord Jeffrey' (1852); Gates, 'Three Studies in Literature' (1899).

Jeffreys, jĕf'rĭz, **George,** Lord, English judge: b. Acton, near Wrexham, Wales, 1648; d. London 19 April 1689. He was called to the bar in 1668, and soon after was chosen recorder of London. He was appointed, successively, a Welsh judge and chief justice of Chester, created a baronet in 1680, and became chief justice of King's Bench in 1683. He was one of the advisers and promoters of the arbitrary measures of James II.; and for his sanguinary and inhuman proceedings against the adherents of Monmouth on the famous 'Bloody Assize,' was rewarded with the post of lord high chancellor (1685). After the abdication of King James the chancellor, who had disguised himself as a seaman, was detected by a mob and carried before the lord mayor, who sent him to the lords in council, by whom he was committed to the Tower, where he died. Consult: Woolrych, 'Memoirs of the Life of Judge Jeffreys' (1827); Campbell, 'Lives of the Lord Chancellors,' Vol. IV. (1849–57); Macaulay, 'History of England,' Vols. I. and II. (1856); Irving, 'Life of Judge Jeffreys' (1898).

Jeffries, jĕf'rĭz, **John,** American physician: b. Boston, Mass., 5 Feb. 1744; d. there 16 Sept. 1819. He was graduated at Harvard in 1763, studied medicine at London and Aberdeen, and returning to Boston in 1769 he entered upon a lucrative practice, which continued until the evacuation of the town by the British troops, whom he accompanied to Halifax. After serving as surgeon-general of the troops in Halifax, he was appointed in 1779 surgeon-major of the forces in America. In the succeeding year he established himself in London in the practice of his profession, but also occupied himself much with scientific studies, and in the prosecution of his experiments in atmospheric temperature undertook 7 Jan. 1785, a remarkable voyage in a balloon from Dover cliffs across the British channel, landing in the forest of Guiennes in France. This was the first successful attempt at aërostation on an extended scale, and Jeffries in consequence received many attentions from the learned societies of Paris. In 1789 he returned

to Boston, where he practised his profession until the close of his life. He announced a course of lectures on anatomy in Boston in 1789, but so great was the prejudice against the practice of dissecting, that on the evening of the second lecture a mob broke into his anatomical room. The course thus interrupted was never resumed, and the single lecture delivered by Jeffries is said to have been the first public one on anatomy given in New England.

Jehovah, jẹ-hō'vạ, the most sacred name applied to God among the Jews, though the Hebrew word in the English Bible is generally translated by LORD (in small capitals). The case is similar with the Greek version (the Septuagint), which renders this word by *Kyrios,* and with the Latin Vulgate, which translates it by *Dominus,* both these words signifying Lord. The proper form of the name is now generally believed to be *Yahveh* or *Yahweh.* Why there should be any doubt about the matter is explained by the fact that in Hebrew only the consonants were written, giving the form *Yhvh,* and the name itself was never uttered, the Jews in reading substituting another divine name, usually *Adonai.* The exact meaning of the word is doubtful, but as a form of the Hebrew verb "to be" some explain it as, He who is, was, and will be, or the Eternal and Unchangeable, and it seems certainly to imply existence. The awe which the Hebrews cherished for this name led them to avoid pronouncing it, as they still do. The monotheistic conception of the Jehovah of the Israelites differs from all other theological conceptions of that age. No image of him was allowed. He was the invisible protector and king of Israel, worshipped by obedience to his commandments, and an observance of the ceremonies established by the law. As is well known, in some parts of the Pentateuch *Elohim* is used almost exclusively, in others *Jehovah,* and this has led many to imply a corresponding difference of authorship. Others deny that this is at all a necessary deduction, maintaining that either name might be used by the same writer according to the conception of the Most High that was in his mind at the moment, Elohim being the abstract expression for absolute Deity, apart from the special notions of eternity, unity, holiness, etc.

Jehovist, jẹ-hō'vĭst, sometimes called JAHWIST, a hypothetic author of the Pentateuch, who used the word Jehovah, or Jahweh, as the name of God instead of Elohim, which term denotes the Supreme Being in other passages of the sacred canon. To the writer who employs the latter designation is applied the term Elohist. According to the theories of many modern Biblical critics the present Pentateuch is a compilation from two original records, one made by an Elohist, the other by a Jehovist. The Jehovist history is supposed to be the older of the two (by some critics it is dated 950 B.C.), and to have consisted of an account of Jehovists dealings with the chosen people up to the conquest of Palestine west of the Jordan. It is a religious history of the attainment of the Promised Land. In this history was emphasized the supremacy of Jehovah as the one God, creator of the world, and the national God and Father of the chosen people, in whose affairs He interposes as He appeared to their early forefathers in the shape of a man or an angel. In the Elohist record, which is supposed to cover the same period and to have been written 700 B.C., there is a more modern interpretation of history attempted. The anthropomorphic suggestions of deity are softened, Elohim interposes merely by a voice, speaking to his people in words of encouragement or rebuke. Through the narrative of the hypothetical Elohist there runs also a tone of sadness, there are anticipations of coming disaster and disappointment.

The Jehovistic or Jahwistic editor who combined these two histories is supposed to have lived in the 7th century B.C., while in the 4th century B.C. a third post-exilic writer added to these combined elements the legal codes which swelled the Pentateuch into the Hexateuch.

Jehu, jē'hū, general of the army of Joram, king of Israel. The prophet Elisha sent one of the school of the prophets to annoint him king over Israel, and in a sudden revolution Joram was slain and Jehu reigned in his stead. He was the first of a new, the fifth, dynasty, and reigned 843–815 B.C. On his accession he massacred all the family of Ahab, including his wretched wife Jezebel, and put the priests of Baal to the sword. In order to obtain possession of the kingdom of Judah he slew Ahaziah the king, and 42 of his family. But his reign was not a prosperous or successful one, and by an invasion of the Assyrians he lost all the territory east of the Jordan. His name has been found on the black obelisk discovered by Layard at Nineveh, and now in the British Museum. This obelisk was set up by Shalmaneser II., and the inscription refers to the tribute paid by Jehu to the Assyrian monarch.

Jejeeb'hoy, SIR Jamsetjee, Parsee merchant and philanthropist: b. Bombay 15 July 1783; d. there 15 April 1859. By his energy and business talents he succeeded in achieving for himself the position of the first native merchant in India, and realizing a fortune of nearly a million sterling. The munificence displayed by him toward all benevolent and public objects, without regard to class or creed, was of the most princely kind, his donations from first to last being estimated at about $1,500,000. Among benevolent institutions founded by him are the great hospital at Bombay which bears his name, the establishment in the same city for the education of poor Parsee children, and the *dhurumsallas,* or places of refuge for travelers in various parts of the country. He also constructed the causeway uniting the islands of Bombay and Salsette, the waterworks at Poonah, the bridges at Earla, Parta, and Bartha, and other public works. He was knighted in 1842, and in 1857 made a baronet. A statue was subsequently erected in honor of him in the town-hall of Bombay.

Jejunum, jẹ-joo'nŭm (Latin, *jejunus,* empty), the second portion of the small intestine, succeeding the duodenum, and so named from its generally being found empty after death. The duodenum extends to about 12 inches in length, and the jejunum forms two fifths of the remaining portion of the small intestine. See INTESTINE.

Jekyll, jē'kĭl, **Gertrude,** English horticulturist: b. London 29 Nov. 1843. She holds the

gold medal of the Royal Horticultural Society and has published: 'Wood and Garden' (1899); 'Home and Garden' (1900); 'Wall and Water Gardens' (1901); 'Lilies for English Gardens' (1901); 'Roses for English Gardens' (1902).

Jelliffe, Smith Ely, American physician: b. Brooklyn, N. Y., 27 Oct. 1866. He was graduated from the Brooklyn Polytechnic Institute in 1886, and in 1889 the degree of M.D. was conferred upon him at Columbia University. He is instructor in Materia Medica in Columbia University and has done much original work in botany, pharmacognosy, therapeutics, and nervous and mental diseases. He has published numerous writings on those subjects. Some of his more important works being 'The Flora of Long Island'; a text-book of botany; a text-book of pharmacognosy; and a text-book of nervous and mental diseases; as well as translations from French and German writers on nervous and mental diseases. He is editor of the 'Medical News,' and managing editor of the 'Journal of Nervous and Mental Diseases,' and is also medical editor of the 'Encyclopedia Americana.'

Jelly includes every translucent juice so far thickened as to coagulate when cold into a trembling mass; as the juices of acid or mucilaginous fruit, currants, etc., which, by the addition of one part of sugar to two parts of juice, and, by boiling, have obtained a proper consistence.

1. *Animal Jelly.*— The soft parts, such as the muscles, skin, cartilage or integuments of animals, when boiled in water, yield a solution which on cooling solidifies to a tremulous jelly. Seventy pounds of bones, when treated with 1 pound of water in the form of steam, at a pressure of 4 pounds to the square inch, and simultaneously digested in 5 gallons of water, will yield about 20 gallons of a strong jelly.

Animal jelly seems to be nearly identical in composition with the tissues which yield it, so that we are unable to trace any chemical change, except, perhaps, the assimilation of water during the process of its manufacture. The following analysis shows the average percentage of carbon, hydrogen, and nitrogen in animal jelly:

	Carbon	Hydrogen	Nitrogen
(1)	49.0	7.0	19.4
(2)	50.0	6.5	17.5

2. *Vegetable Jelly.*— When the juice of fruits is heated with sugar, the liquid forms a stiff jelly on cooling. It appears from the researches of Frémy and others that unripe fruits contain a compound of carbon, hydrogen, and oxygen, called *pectose;* as the fruit ripens, this substance is transformed into *pectin,* the change being brought about chiefly by the influence of a peculiar ferment called *pectase,* which is contained in the fruits. As pectin is soluble in water, the expressed juice of ripe fruits contains a large quantity of this substance, which on heating to a temperature of about 105° F. is converted into one or more substances which have not as yet been completely studied, but which have the property of gelatinizing on cooling. The principal of these substances are *pectosic* and *metapectic* acids. This latter acid, when boiled along with another strong acid, whether mineral or organic, is decomposed, one of the products being pectin sugar, a substance which is closely allied to glucose, so that in all probability there is produced in the very process of manufacturing jellies more or less of this sugar, which certainly is not cane-sugar, and which might, therefore, be by some regarded as an adulteration. The processes which, in the living plant, result in the transformation of pectose into pectin may be imitated on a small scale by heating the juice of unripe fruit with the pulp, which contains the ferment pectase, or with a dilute acid which induces the same change as this substance. Alkalies also produce a similar effect. The exact composition of these various pectous substances yet remains a matter of doubt.

Jel'lyfish, the medusa-stage of *Hydrozoa* (q.v.), but more especially the common name of *Scyphozoa* (formerly *Discomedusa*), the second class of the phylum *Cœlenterata* (q.v.). A familiar example is the common large jellyfish of the coast of New England, *Aurelia flavidula.* It sometimes reaches the diameter of 10 inches; its umbrella-shaped body is convex and smooth above, and from the under sides hang down four thick oral lobes which unite to form a square mouth-opening also giving off four tentacles. The margin of the umbrella or disk is fringed and bears eight eyes which are covered by a lobe. Just under the surface are seen the water-vascular canals, branching out from four primary canals radiating from the stomach. When in motion, the disk contracts and expands rhythmically, on the average from 12 to 15 times a minute.

The *Aurelia* spawns late in the summer, the females having yellowish ovaries, while the sperm glands of the males are roseate in hue. The eggs are fertilized in the sea, and the ciliated pear-shaped larva by October sinks to the bottom, attaching itself to rocks or shells, finally assuming a hydra-like shape, with often as many as 24 long slender tentacles. This is the *Scyphistoma* stage in which it remains about 18 months. From this it passes into the *Strobila* stage in which the body divides into a series of cup-shaped disks, each of which is scalloped on the upturned edge. These disks separate one after the other in March, and swim away as miniature jellyfishes called *Ephyræ.* The *Ephyra* is at first about a fifth of an inch in diameter, and becomes a fully formed *Aurelia* in April, reaching maturity in August. Another but less common jellyfish on the coast of New England and in the North Atlantic is the great *Cyanea arctica,* or "blue jelly," which is nearly two feet in diameter, sometimes from three to five, and with very long string-like tentacles, sometimes extending from 20 to 100 feet, which are filled with stinging or lasso-cells (*trichocysts*), so that the animal is poisonous to fishermen and bathers. While these forms undergo a metamorphosis, in fact, an alternation of generation; other kinds, as *Pelagia,* etc., are known to develop directly from the egg, and even the aurelia under exceptional circumstances does not pass through the scyphistoma stage. The jellyfishes are divided into a number of groups. They are most numerous in the tropical seas, comprising forms of great beauty. Consult: Romanes, 'Jellyfish, Starfish and Sea Urchins' (1885); Packard, 'Zoology' (1897); Arnold, 'The Sea Beach at Ebb-tide' (1902).

FORMS OF DISCOMEDUSÆ.

1. Pilema giltschii. (¼ natural size).
2. View of the same from above (the organs seen through the transparent convex disk or "umbrella").
3. View of the same from beneath.
4. Rhopilema frida (⅛ natural size).
5. Brachiolophus collaris (½ natural size).
6. Cannorrhiza connexa.
7. The same, from beneath, (½ natural size).

Jena, yā'nä, Germany, town 12 miles east of Weimar, on the left bank of the Saale. It consists of the town proper and of four suburbs, and is a dull antiquated place. It contains a famous university which was opened in 1558, and attained its highest prosperity toward the end of the 18th century, when it numbered Schiller, Humboldt, Fichte, Schelling, and Griesbach among its teachers, and was attended by above 1,000 students. In 1844 the number had dwindled down to 411; but in 1902 it had about 800. It has 98 professors and instructors, who teach the different branches of law, medicine, philosophy, and theology; and possesses an anatomical theatre, botanical garden, observatory, good physical and chemical cabinets, and a library of 200,000 volumes. Pop. 15,499.

Jenckes, jĕnks, **Joseph**, American inventor: b. Hammersmith, London, England; d. Lynn, Mass., 16 March 1683. About 1645 he came to the Massachusetts Bay colony, and in that year settled at Lynn, where he established the first iron-foundry in the colonies. He was also an inventor, and in 1646 obtained on an improved water-wheel the first recorded patent in America. He secured a patent also for an improved grass-scythe, and originated other improvements and inventions in machinery and tools. In 1654, under contract with the Boston selectmen, he built the first fire-engine in this country. In 1652 at the Lynn iron-works he cut the dies for the Massachusetts coinage, the first executed in America. Among these coins were the so-called "pine-tree" shillings, deriving their name from that emblem on the obverse side.

Jenkin, jĕng'kĭn, **Henrietta Camilla Jackson**, English novelist: b. Jamaica about 1807; d. Edinburgh 8 Feb. 1885. In 1832 she was married to Charles Jenkin, an English naval officer. Her novels were lively studies of character and popular in their day, among the best being: 'Cousin Stella' (1859), a portrayal of West-Indian life and manners; 'Who Breaks, Pays' (1861), in which the flirt is admirably pictured; 'Skirmishing' (1862); 'Two French Marriages,' issued in New York as 'A Psyche of To-day' (1868); 'Within an Ace' (1869).

Jenkins, jĕng'kĭnz, **Charles Jones**, American jurist and statesman: b. Beaufort County, S. C., 6 Jan. 1805; d. Summerville, Ga., 14 June 1883. He was graduated from Union College, Schenectady, N. Y., in 1824, and after the study of law began practice in Augusta, Ga. He was a member of the Georgia legislature in 1830 and after a short service as attorney-general of the State was a member of the legislature 1836–50, and a leader of his party there. He was State senator 1856–60, and was a judge of the Georgia supreme court 1860–5. He became provisional governor of his State in 1865, holding office till 1868, and presided over the Constitutional Convention of 1877. Consult: Jones, 'Life of C. C. Jenkins' (1884).

Jenkins, John Edward, English political and social writer: b. Bangalore, India, 28 July 1838. He was educated at McGill University, Canada, and the University of Pennsylvania, and sat in Parliament for Dundee 1874–80. He became famous by the publication of his 'Ginx's Baby, his Birth and Misfortunes' (1870), a clever satire aimed at the clumsy handling of the problem of English pauperism. Among later works of his which have circulated widely are: 'Lord Bantam' (1871); 'Little Hodge' (1872); 'Jobson's Enemies' (1879–82); 'A Paladin of Finance' (1882).

Jenkins, John Stilwell, American biographer: b. Albany, N. Y., 15 Feb. 1818; d. Weedsport, N. Y., 20 Sept. 1852. He was a lawyer by profession, and at one period edited the Cayuga 'Times.' Among his works are: 'Generals of the Last War with Great Britain' (1841); an abridgment of Hammond's 'Political History of New York' (1846); 'Alice Howard' (1846); 'Life of Silas Wright' (1847); 'History of the Mexican War' (1848); 'Heroines of History' (1853).

Jenkins, Thornton Alexander, American naval commander: b. Orange County, Va., 11 Dec. 1811; d. 9 Aug. 1893. Entering the United States navy as a midshipman in 1828, he served therein during the war with Mexico. Appointed to investigate European lighthouse systems he framed the law passed in 1852 under which the existing lighthouse board is managed. He saw active service during the Civil War and was chief of the bureau of navigation 1865–9. From 1869 to 1871 he was naval secretary of the lighthouse board and commanded the East India squadron 1871–3. In 1870 he was appointed rear admiral and retired from active service in 1873.

Jenkins Ferry, Battle of. During the winter of 1863–4 the Union forces of Generals Steele and Blunt held the line of the Arkansas River, with headquarters at Little Rock; the Confederates, under Gen. Sterling Price, held that of the Washita, with headquarters at Camden, which was strongly fortified. On 23 March 1864 Steele started from Little Rock southward with about 8,000 men to co-operate with Gen. Banks' expedition up Red River, the objective point of both being Shreveport, La. Gen. Thayer, with 5,000 men, left Fort Smith on the 21st to join Steele at Arkadelphia, and Col. Powell Clayton, with a small cavalry force, marched from Pine Bluff in the direction of Camden, which was Steele's first objective. Steele reached Arkadelphia on the 28th, was joined near Elkins' Ferry, on the Little Missouri, by Thayer, and, after several severe skirmishes, in which the Confederates were defeated, flanked Price out of Camden, 15 April, and occupied it. Here he was fully informed that Banks had been defeated on Red River and was retreating, and his own position became very precarious. Gen. E. Kirby Smith, who had been opposing Banks, marched rapidly with three divisions of infantry — 8,000 men and 14 guns — to join Price and crush Steele. Steele was too strongly entrenched at Camden to be attacked, but he was greatly harassed and nearly surrounded by the gathering Confederates, his forage-trains, with their guard, were cut off and captured, and, the loss of a large supply-train at Marks' Mills, 25 April, with nearly an entire brigade and a battery, determined him to fall back to the Arkansas River. He left Camden on the night of the 26th, crossed the Washita, and had hardly begun his movement northward when Smith and Price pressed him vigorously and kept up a running fight, which was particularly sharp on the 29th, when Steele reached Jenkins' Ferry, on the Saline River. The river was swollen,

and Steele had crossed only part of his army when his rear brigade, commanded by Gen. S. A. Rice, was fiercely attacked by Price, and yielded some ground. But the brigade rallied, and, supported by a part of Engelmann's that had not yet crossed the river, engaged in a sanguinary fight lasting the greater part of the day. Three times the Confederates charged and were repulsed, and the Union line advancing, the Confederates fell back and did not renew the fight. Steele now crossed the river without further molestation, and moved leisurely to Little Rock, which was reached 2 May, and Thayer's division was sent back to Fort Smith. Price was so badly defeated that he made no effort to follow Steele north of Saline River. The Union loss at Jenkins Ferry was 63 killed, 413 wounded, and 45 missing. The Confederates report a loss of 86 killed, 356 wounded, and 1 missing. The Union loss during the entire campaign (23 March–2 May) was 102 killed, 601 wounded, and 1,072 missing, a total of 1,775. Consult 'Official Records,' Vol. XXXIV.; The Century Company's 'Battles and Leaders of the Civil War,' Vol. IV. E. A. Carman.

Jenks, Edward, English publicist: b. Clapham, Surrey, 20 Feb. 1861. He was educated at Dulwich College and Cambridge University, and was dean of the faculty of law in the University of Melbourne 1889–92, and Queen Victoria professor of law in University College, Liverpool, 1892–6. He is now reader in English law at Oxford, and widely known as a writer on English law, his published works comprising: 'Constitutional Experiments of the Commonwealth' (1891); 'The Doctrine of Consideration in English Law' (1893); 'The Government of Victoria (Australia)' (1893); 'History of the Australasian Colonies' (2d ed. 1896); 'Outlines of English Local Government' (1895); 'Law and Politics in Middle Ages' (1897); 'A Short History of Politics' (2d ed. 1900); 'Edward I.' (1902); 'Parliamentary England 1660–1832' (1903).

Jenks, Jeremiah Whipple, American political economist: b. St. Clair, Mich., 2 Sept. 1856. He was graduated from the University of Michigan in 1878, and subsequently studied in Germany, at the University of Halle. He then studied law and was admitted to the Michigan bar. In 1886 he became professor of Greek, Latin, and German in Mount Morris College, Ill.; in 1886–9 was professor of political science and English literature at Knox College, Galesburg, Ill.; in 1889–91 professor of political economy and social science at Indiana University; and in 1891 became professor of political economy and politics at Cornell University. In 1899–1901 he was expert agent for the United States Industrial Commission on investigation of trusts and industrial combinations, and was also expert for the Department of Labor on the same subject. In 1902 he was commissioner of the United States War Department to the Philippines and other Oriental nations to investigate the condition of labor and other economic subjects. In 1903 he went to Mexico to consult with the minister of finance in regard to a change of the financial system. He has written: 'Henry C. Carey als Nationalökonom' (1885); 'The Trust Problem' (1900); 'Trusts and Industrial Combinations' (1900); a part of the report of the Industrial Commission; and 'Report on Certain Economic Questions in the English and Dutch Colonies in the Orient' (1902); besides many magazine articles. He is recognized as one of the foremost authorities on the trust question, and his writings are marked by scholarly and accurate investigation, combined with unusual simplicity and clearness of statement.

Jenks, Tudor, American editor and author: b. Brooklyn, N. Y., 7 May 1857. He was graduated from Yale in 1878, from the Columbia Law School in 1880, studied art in Paris in 1880–1, practised law in New York in 1881–7, and in 1887 became a member of the staff of the 'St. Nicholas Magazine.' His writings include many magazine contributions in prose and verse, and 'The Century World's Fair Book' (1893); 'Imaginations, or Truthless Tales' (1894); 'The Boys' Book of Explorations' (1900), and 'Galopoff, the Talking Pony' (1901).

Jenner, jĕn'ĕr, **Edward,** English physician, discoverer of vaccination as a preventive of the smallpox: b. Berkeley, Gloucestershire, 17 May 1749; d. there 26 Jan. 1823. Having adopted the medical profession, he visited London to attend the lectures of the celebrated anatomist John Hunter, in whose family he resided for two years. Returning to the country, he settled at Berkeley, to practise the various branches of his profession. His investigations concerning the cowpox were commenced about 1776, when his attention was excited by the circumstance of finding that some individuals to whom he attempted to communicate the smallpox by inoculation were not susceptible of the disease; and on inquiry he found that all such patients, though they had never had the smallpox, had undergone the casual cowpox, a disease common among the farmers and dairy-servants in Gloucestershire, who had some idea of its preventive effect. Other medical men were aware of the prevalence of this opinion, but treated it as a popular prejudice; and Jenner seems to have been the first who ascertained its correctness, and endeavored to derive from it some practical advantage. He discovered that the *variolæ vaccinæ,* or cowpox, as the complaint has been since termed, could be propagated from one human subject to another by inoculation, rendering all who passed through it secure from the smallpox. In 1798 he published a short treatise—'An Inquiry into the Cause and Effects of the Variolæ Vaccinæ'—and in July 1798, Cline, surgeon to St. Thomas's Hospital, introduced vaccination into that institution. The practice was adopted in the army and navy, and in the country generally, and soon spread to other countries, and honors and rewards were conferred on the author of the discovery. In 1802 a parliamentary grant was made to him of the sum of £10,000, and five years later a second grant of £20,000. Besides the treatise already mentioned, and 'Further Observations on the Variolæ Vaccinæ or Cow-Pox,' Jenner also published various letters and papers on the same subject, as well as on others. A famous paper of his on the cuckoo appeared in the 'Philosophical Transactions' in 1788. Consult: Baron, 'Life of Jenner'; Creighton, 'Jenner and Vaccination' (1889); Crookshanks, 'History and Pathology of Vaccination' (1890). The

last-named work contains reprints of the 'Inquiry,' the 'Further Observations,' and other papers by Jenner. See VACCINATION.

Jenner, Katherine Lee Rawlings, English novelist: b. Hayle, Cornwall. She was married to Henry Jenner, and has published: 'A Western Wildflower' (1882); 'In London Town' (1884); 'Katharine Blythe' (1886); 'An Imperfect Gentleman' (1888); 'Love or Money' (1891); 'When Fortune Frowns' (1895); 'In the Alsatian Mountains.'

Jenner, Sir William, English physician: b. Chatham 1815; d. London 12 Dec. 1898. He was educated at University College, London, became in 1848 professor of pathological anatomy, and in 1857 of clinical medicine in that institution, and in 1861 physician to the queen. In 1862 he was appointed professor of the principles and practice of medicine in University College; in 1868 was created a baronet, and in 1872 a K.C.B., in recognition of his services during the severe illness of the Prince of Wales, now Edward VII. In 1881 he was elected president of the College of Physicians. He wrote various papers on specific diseases, and was the earliest to establish the difference in kind between typhus and typhoid fevers.

Jennings, jĕn'ĭngz, **Samuel,** American colonial Quaker preacher: d. 1708. In 1680 he came from Buckinghamshire, England, to Burlington, N. J., and was governor of West Jersey in 1683. Becoming entangled in religious controversy he opposed the Quaker schismatic, George Keith, and in London in 1694, supported the action of the American Friends in regard to Keith. On returning to America he often made preaching tours through the various colonies, and after the recall of the English governor, Lord Cornbury, aided in restoring public order in the affairs of West Jersey.

Jennings, Sarah, DUCHESS OF MARLBOROUGH. See MARLBOROUGH, DUKE OF.

Jephson, jĕf'sŏn, **Arthur Jermy Mounteney,** English writer of travels. He commanded a detachment under the explorer, Stanley, in the Emin Pasha relief expedition, was queen's messenger 1895–1901, and has been king's messenger from the latter date. He has published: 'Emin Pasha and the Rebellion at the Equator'; 'Stories Told in an African Forest'; 'The Story of a Billiard Ball' (1897).

Jephthah, jĕf'thą, in Jewish history one of the judges of Israel (Judges xi., xii.). He was a son of Gilead, and was driven from home by his brothers, but when the Ammonites made war against Israel was summoned to defend his countrymen. Jephthah after trying conciliatory measures without success, put himself at the head of the Israelites, and defeated the enemy. He had made a vow that if he was victorious he would sacrifice to God as a burnt-offering whatever should first come to meet him from his house. He was met by his daughter, his only child, whom he accordingly sacrificed to the Lord (Judges xi. 29, 40). The way in which the vow was kept has given rise to much controversy, some authors maintaining that Jephthah put his daughter to death; others that he devoted her to perpetual virginity; others that he actually sacrificed her as a burnt-offering, and that, though prohibited by law of Moses, these human sacrifices occasionally took place.

Jep'son, Edgar, English novelist: b. London 28 Nov. 1864. He was educated at Oxford and has published: 'Sibyl Falcon' (1895); 'The Passion for Romance' (1896); 'The Keepers of the People' (1898); 'On the Edge of the Empire' (1900); 'Lady Noggs, Peeress' (1904).

Jerboas, jĕr-bō'ąz or jĕr'bō-ąz, small rodents of the family *Dipodidæ*, found in the sandy plains of Africa, Russia and southern Asia, and represented by a few species in North America. Their most prominent peculiarity is the great length of the hind legs, especially in the metatarsal portion, so that they look like miniature kangaroos. They walk ordinarily on their two hind feet, but when alarmed escape danger by long leaps. They are fawn-colored, as a rule, with long slender tails, large ears, big eyes, and nocturnal habits. They dwell in underground burrows and tunnels, many of which, more or less connected, are likely to be found together. Their food is mainly vegetable, but they also eat insects, eggs, etc.; they hibernate in cold climates, do not store food, and are the prey of foxes, jackals, wildcats, serpents, and Arab children. The most familiar species of jerboa is the Egyptian form (*Dipus ægypticus*), found in North Africa in arid places. The jumping-hare of South Africa (*Pedetes capensis*), and its ally, the jumping-mouse of North America (*Zapus hudsonius*), are also well-known examples of the family. The latter is a reddish "mouse," white underneath, which abounds all over the temperate parts of the country, and is easily recognized by its bounding gait. It is one of the longest and soundest of winter sleepers, preparing for its dormancy a warm ball-like nest of grass lodged in a bush or among strong weeds. Gerbils (q.v.) of Africa and India are often confused with jerboas, but are a group of true mice. Consult Lydekker, 'Royal Natural History,' Vol. III. (1895).

Jeremiah, jĕr-ę-mī'ą, the second of the four major prophets of the Old Testament, the son of Hilkiah, of the priests that were in Anathoth, a town about three miles from Jerusalem. He flourished during the darkest period of the kingdom of Judah, under Josiah, Jehoiakim, Jeconiah, and Zedekiah, having been called to the prophetic office in his youth, in the 13th year of the reign of Josiah 626 B.C. He continued in it till the 11th year of Zedekiah, when Jerusalem was taken by Nebuchadnezzar (588 B.C.). His task was to deliver messages and warnings to a corrupt people and to foretell the destruction of the nation. In Judah were two political parties — the one favoring an Egyptian alliance, the other a Chaldæan. Jeremiah repudiated both at first, but was driven over to the latter and unpopular party. He became the leader of this minority in contending with three features of popular infatuation — religious apostasy; neglect of justice; and false patriotism, which led the people frequently to break faith with Babylon, by bursting into revolt. He characterized Nebuchadnezzar as the servant of God, and prophesied the approaching burning of the temple. A cry for his life arose from the priests and prophets, and he escaped with difficulty. At last Jerusalem with its temple and palace was consumed with fire. Jeremiah was favorably

treated by the Babylonian conqueror, and offered a home at Babylon, but preferred to stay among the people left in Judah. One section of this party thought they saw in Egypt a safe place of refuge from the power of Nebuchadnezzar, and led the people together with Jeremiah to Tahpanhes, where, according to Christian tradition, the prophet was stoned to death by his countrymen, who were incensed by his rebukes. According to the Rabbinical tradition, however, he and Baruch made their escape on the conquest of Egypt by Nebuchadnezzar.

Jeremiah, Lamentations of, the title given by the Septuagint translators, by the Vulgate and English Bible, to a book of songs and dirges which is placed next to the book of the prophecy of Jeremiah. The book is divided into five chapters each of which contains a complete composition. In I., II. and IV. the death of the Jewish nation is bewailed with the utmost abandonment of grief. The form of each elegy is poetry of the most strictly artificial kind. The metre is that of the Kinah (q.v.), the metre employed in dirges from immemorial time in the east. As if to run down the whole gamut of sorrow each verse begins with a different letter of the Hebrew alphabet, arranged, generally, in the usual order.

The whole work may be thus briefly analyzed. Elegy 1: Lamentation over the city after the people have been swept off into captivity. Help is asked from Jehovah. Elegy 2: The destruction of the city mourned over. Jehovah again called upon as alone able to save. Elegy 3: Sufferings of "Jehovah's servant," a personification of the whole pious multitude, described. Elegy 4: Contrast between former gladness and the present misery, which is attributed to national transgression. Elegy 5: A final appeal for help in prayer to Jehovah.

The date and authorship of the Lamentations are matters of dispute. Few modern critics attribute them to Jeremiah. They show traces, however, of that prophet's language and sentiment, but internal evidence is not conclusive. Some think that they are referred to in 2 Chronicles xxxv. 25. Consult: 'Commentaries' of Payne Smith; Cheyne; Plumptre; and Löhr, 'Die Klagelieder Jeremias' (1894).

Jeremiah, The Prophecy of, a book of the Old Testament containing the utterances of that prophet. The writings of Jeremiah, or certain of them, were taken down by his pupil and friend Baruch. They must therefore have been originally spoken without being previously written out, although it is possible that the scribe or secretary took them down at his master's dictation. The roll of Baruch contained all that Jeremiah had spoken for 23 years; probably, therefore, many of the prophecies may have been sketched merely as outlines. The substance of these impassioned appeals is imbued with firm belief in God's unfailing covenant with Israel and with David. Although Jeremiah is not so often quoted by New Testament writers as is Isaiah, yet there is abundant evidence in their writings that they read him, and he is not only a prophet of denunciation and warning but also of Messianic hope and promise. He shows, moreover, an intimate acquaintance with Deuteronomy, the utterances of his prophetic predecessors, and the book of Psalms.

The books seems naturally to be divided into five parts, the first of which contains six discourses, each of the last three introduced by the formula of sanction, "The word which came to Jeremiah from the Lord." Each of these discourses includes sketches, outlines or skeletons of different prophecies each by a distinct formula of sanction. Take for instance, the first discourse (1 ch. to 20 ch.), the first sketch would be in the first chapter, verses 4 to 10, introduced by the formula, "The word of the Lord came unto me saying." There are at least four of these brief sketches in the first chapter.

The second part of the book consists of 15 prophecies, which are fuller and completer than those of the first part, each with its formula of sanction. They include poems, appeals, allegorical object-lessons, historic narratives, and one letter. The third part is a connected narrative in classic Hebrew, different in style from that of the first 20 chapters. The fourth part contains poetic invectives against Egypt, Philistia, Moab, Ammon, Edom, Damascus, Hazor, Elam and Babylon. The fifth part is a supplementary, adding details to the description of Jerusalem's downfall.

Jerfalcon, jĕr'fâ"kn, or **Gyrfalcon,** a large and bold falcon of the Scandinavian mountains (*Falco gyrfalco*), represented by closely allied species or varieties in Iceland, Greenland and the Hudson Bay region, whose plumage is prevailingly white, with more or less blackish markings, especially about the face. It is one of the largest, strongest and most impetuous of its race; and has always been highly prized by falconers, among whom, by ancient laws, its use was restricted to men of ducal and princely rank. The bird is a rare winter wanderer to the United States from arctic Canada, where it breeds, and survives the winter mainly by killing ptarmigan.

Jericho, jĕr'ĭ-kō, a once important city of ancient Palestine, near the foot of the mountains, on the west side of the Jordan plain, northeast of Jerusalem. Its name means "city of palms." The site is marked by mounds of sun-dried bricks, and called Tel es-Sultan; gardens and a fine spring are found there. The palms and balsams for which Jericho was formerly famed have disappeared. At the conquest of Palestine by Joshua, Jericho was the key to the country and was miraculously captured, destroyed by fire, and its rebuilding forbidden under a curse. It is now a poor village, much visited by tourists. It has two hotels, a Russian monastery and church.

Jerked Beef, beef cut into strips of about an inch thick, and dried in the sun. This method of preserving meat has been largely adopted in South America and Australia. Cut from the animals when in good condition these strips of flesh dry in the sun before decomposition commences, and will keep for any length of time. In the United States, jerked beef is common in the southwest, where the Indians prepared buffalo, deer and bear meat by cutting in strips and curing in the sun.

Jeroboam (jĕr-ō-bō'am) **I.,** the first king of Israel, the northern kingdom. Having conspired against Solomon, he was obliged to escape to Egypt, where he remained until the monarch's death. He then returned to lead an insurrection

against Rehoboam, which ended in the formation of the kingdom of Israel, composed of the 10 revolted tribes. These tribes worshipped at Bethel and Dan, instead of going to Jerusalem. Jeroboam reigned from about 937 B.C. to 915 B.C.

Jeroboam II., king of Israel. He was the son of Joash. He reigned from about 782 B.C. to 741 B.C. His reign was evidently an active one. He was a skilful warrior, and regained territory which had been captured by the king of Aram in previous reigns. It was during Jeroboam's time that Hosea and Amos announced their prophecies.

Jerome, jĕ-rom' or jĕr'ōm, **Saint** (EUSEBIUS HIERONYMUS SOPHRONIUS), a father of the Latin Church: b. Stridon, between Styria and Hungary, about 331. His parents educated him with care in literary studies and he read the Greek and Roman classics at Rome under the famous grammarian Donatus. He did not escape uncontaminated by the licentiousness of the capital; but soon became inclined to the Christian faith. The catacombs and tombs of the martyrs first excited his devotion. His travels on the Rhine and in Gaul made him acquainted with several Christian preachers, and he was eventually baptized. After a long residence at Aquileia he went in 373 to Antioch in Syria, where he passed through a spiritual crisis and renounced pagan learning, and in 374 retired to the deserts of Chalcis. There he spent four years as a hermit in the severest mortifications and laborious studies. He left his solitude again to be ordained priest at Antioch, but soon after went to Constantinople to enjoy the instruction of Gregory Nazianzus. In Rome, where he became literary secretary to Pope Damasus, he made his appearance as a teacher. His exposition of the Holy Scriptures found favor with the Roman ladies. Marcella and Paula, rich patricians, are celebrated for the learned and ingenious theological epistles he wrote them, and for their rare monastic piety. Paula accompanied him to Palestine in 386, where he founded a convent at Bethlehem; here he remained till his death in 420. His writings show his active participation in the controversies of his day, and his letters give a very vivid idea of the condition of society at Rome. They are full of satiric strictness on the corrupt clergy, and are often as biting as Juvenal or Martial. Many of them are profoundly touching and full of fervent piety; others are lampoons traversed with vehement invective with the spirit of Plautinian ribaldry. His Biblical labors are highly valuable; his Latin version of the Old Testament from the original language is a marvellous achievement, and it may be said that ecclesiastical Latin, originated with Jerome's Vulgate. His principal claim to the gratitude of the Church is that he was the founder of Latin monasticism. Consult Largent, 'Saint Jerome' Sanders, 'Etudes sur Saint Jerome' (1903).

Jerome, Jerome Klapka, English humorist: b. Walsall 2 May 1861. He was at first a clerk in a railway office, afterward actor, schoolmaster, and journalist by turns. After many discouragements he succeeded in making a popular hit with his book, 'On the Stage — and Off' (1885), largely autobiographical; and his 'Idle Thoughts of an Idle Fellow' (1889) and 'Three Men in a Boat' (1889) made him famous in America as well as at home. He edited the 'Idler' with Robert Barr (q.v.) (1892–7); 'To-Day' (1892–7); and has published several successful comedies: 'Sunset' (1888); 'New Lamps for Old' (1890); 'Miss Hobbs' (1900); etc.; and also 'John Ingerfield and Other Stories' (1894); 'Sketches in Lavender' (1897); 'Observations of Henry' (1901); 'Paul Kelver' (1902); etc.

Jerome, William Travers, American lawyer and politician: b. New York, 18 Apr. 1859. He entered Amherst College, but failing heart compelled him to leave. He graduated from the Columbia Law School in 1884. In 1888 he was appointed assistant district attorney, in which position he saw much of the political corruption prevailing in the city. In 1890 he was active in the Municipal League, which opposed Tammany; in 1893 was assistant counsel of the Lexow Committee, in 1894 a member of the committee of 70, and manager of the campaign which resulted in the election of Mayor Strong. In the same year the mayor appointed him judge of the court of special sessions. In 1901 he was active in the Fusion campaign against Tammany; and in 1902 was elected district attorney of New York County; immediately after his election he established headquarters in the East Side of New York, in order to be within easy reach of the people who most needed his assistance; in this official position he has done very effective work in the breaking down of the system of protection of vice and maladministration of justice. In 1905 he was again elected district attorney on an independent ticket by 16,255 plurality.

Jerome of Prague, Bohemian religious reformer: b. Prague about 1370; d. there 30 May 1416. He was educated at the universities of Prague, Paris, Oxford, Cologne, and Heidelberg; and was in faith and sufferings the companion of the famous John Huss, whom he excelled in learning and eloquence, and to whom he was inferior only in moderation and prudence. His reputation for learning was so great that he was employed by Ladislaus II. of Poland to organize the University of Cracow; and Sigismund of Hungary caused Jerome to preach before him in Buda. He took a zealous part at Prague in the contest of his friend Huss against the authorities, and not unfrequently proceeded to violence, causing the monks who opposed him to be arrested, and even had one thrown into the Moldau. He publicly burned in 1411 the bull of the crusade against Ladislaus of Naples, and the papal indulgences. When Huss was imprisoned in Constance he could not remain inactive, and hastened to his defense. But attempting to return to Prague the Duke of Sulzbach caused him to be arrested in Hirschau and carried in chains to Constance. After an imprisonment of half a year he consented on 11 Sept. 1415 to recant the heresies with which he and Huss were charged. But this recantation did not deliver him, and after languishing a year, he solemnly retracted his recantation. On 30 May he was burned at the command of the council, and his ashes thrown into the Rhine.

Jerrold, jĕr'ōld, **Douglas William**, English dramatist and humorist: b. London 3 Jan. 1803; d. Kilburn Priory, near London, 8 June 1857. He was a midshipman in the navy 1813–15, and

then quitting the service, was bound apprentice to a printer in London. By hard study he made himself master of Latin and Italian, besides acquiring an extensive knowledge of general literature, and at first attempted dramatic criticism. The bent of his genius, however, lay mainly in the direction of dramatic writing. Numberless pieces were produced by him before he was 20, but the first which won decided popularity was 'Black-eyed Susan,' represented for 300 successive nights at the Surrey Theatre in 1829. Among Jerrold's subsequent dramas were the 'Rent-day'; 'Nell Gwynne'; 'The Housekeeper'; Prisoner of War'; 'Bubbles of a Day' and 'Time Works Wonders,' the last named one of the most successful comedies on the English stage. He founded and conducted successively the 'Illuminated Magazine' and 'Douglas Jerrold's Shilling Magazine,' also acting as a most important member of the literary staff of 'Punch.' To this he contributed 'Mrs. Caudle's Curtain Lectures'; 'Punch's Letters to his Son'; the 'Story of a Feather.' He wrote several novels, among which are 'The Mad Mode of Money'; and 'Chronicles of Clovernook' (1846). A selection of his essays edited by his grandson, Walter Jerrold, appeared in 1903. Though a powerful master of satire, he never allowed his wit, whether as an author or in private life, to be tinged with malevolence. Consult: W. B. Jerrold, 'Life and Remains of Douglas Jerrold' (1859).

Jerrold, Walter Copeland, English author and journalist: b. Liverpool 3 May 1865. Since 1890 he has been connected with the editorial staff of the London 'Observer,' and beside editing several reprints from the works of his grandfather, Douglas Jerrold (q.v.); Thackeray's prose works, etc., has published: 'Michael Faraday: Man of Science' (1891); 'Gladstone: England's Great Commoner' (1893); 'Oliver Wendell Holmes' (1893); 'The Triumphs of the Printing Press' (1896); etc.

Jerrold, William Blanchard, English journalist and miscellaneous writer, son of Douglas Jerrold (q.v.): b. London 23 Dec. 1826; d. there 10 March 1884. He edited Lloyd's newspaper for a long period and published: 'Cool as a Cucumber,' a novel (1851); 'Swedish Sketches' (1852); 'Life of Douglas Jerrold' (1858); 'At Home in Paris' (1866); 'Up and Down in the World' (1866); 'Paris for the English' (3d ed. 1868); 'The Cockaynes in Paris' (1871); 'The Best of all Good Company' (1871); 'Life of Napoleon III.' (1874–84).

Jersey Cattle. See Dairy Cattle.

Jersey (jėr'zĭ) **City,** N. J., the most important suburb of New York since the annexation of Brooklyn, the second largest city in New Jersey, and seat of Hudson County. It occupies about five miles of the Hudson River frontage opposite lower New York: Paulus Hook, its starting point, is exactly opposite the Battery. It lies on a peninsula between the Hudson and New York Bay on one side, and the Hackensack and Newark Bay on the other; and is limited on the south by Bayonne, which takes up the lower end of the peninsula, and on the north by Hoboken. It has several ferry lines to different portions of New York, some of them operated by the great railroads which have their terminals here — all the roads from the south and west: the Pennsylvania, Erie, Baltimore & Ohio, Lehigh Valley, Delaware, Lackawanna & Western, New York, Susquehanna & Western, Central of New Jersey, and the West Shore line of the New York Central. The Morris Canal ends here. Jersey City is also the terminal of several of the most important steamship lines between New York and Europe. Its area is 12,228 acres, or 19.1 square miles.

The city lies on a flat meadow about a mile wide from the river back to a sharp bluff; the business section occupies the former, the residence district the latter, with some very handsome streets of costly dwellings — though Grand Street in the business section is a notably beautiful residence street. The municipal improvements are of a high and thorough grade: paving (nearly all the streets are paved, largely with granite and asphalt), sewerage, water supply, etc. The trolley service extends to all the neighboring section of New Jersey. The parks are few and very small, less than in almost any other large American city; but along the ridge in the western part extends the magnificent Hudson County Boulevard, 19 miles long (the entire length of that county from Bayonne up, and five miles of Bergen County), 100 feet wide, and with a noble view of the river and upper New York, as well as the country west. The city hall with the soldiers' monument, the public library, and the Fourth Regiment armory, are among the conspicuous buildings. The intellectual facilities of the city are good, aside from its proximity to New York. It has 27 public schools, besides 10 Roman Catholic parochial schools, and for higher education a public high school, Hasbrouck Institute (1856), St. Peter's (Roman Catholic) College (1878), St. Aloysius Academy, and the German-American School. There is a public library with over 100,000 volumes; and a historical museum rich in colonial documents. The hospitals are the City, St. Francis, and Christ; there are several homes and asylums, and some convents.

The immense commercial and shipping interests of the city, though second only to those of New York, have no separate statistics, the customs report being included in that of the latter city. Its position on the great river, with Newark Bay in the rear and the entrance of Kill van Kull on the south, give it a most favorable commercial position, which has been improved by properly equipped wharves. The Pennsylvania and Erie roads have large grain elevators here. Among the leading industries are those of slaughtering and meat-packing: Jersey City is the meat depot of New York, and has two huge abattoirs, one on the river front and the other on the Hackensack meadows in the northwest. Its slaughter-house products in 1900 amounted to $5,708,763. Its other manufactures are enormous, the total amounting to $77,225,116 in 1900. They are exceedingly varied, no one having a great predominance except the tobacco manufacture, over $6,000,000 a year; other important branches are iron and steel goods, locomotives, boilers, and heating apparatus; bridges, ships, and windmills; planing-mill products, cars, carriages, boxes, and cooperage; brass, copper, and zinc goods, electrical and scientific apparatus; pottery and glass; lead-pencils, and famous crucibles used in all chemical laboratories and smelting works; watches,

jewelry, and musical instruments; sugar, and confectionery; mineral waters and patent medicines; soap and candles (a natural annex to the abattoirs), and perfumes; compressed gas; chemicals, paints, and roofing materials; paper, and window-shades; rubber goods; silk thread and goods; oakum; fireworks; printing and writing inks, and varnish; and hundreds of others. There are four national banks, and several State and private banks, with loan and trust companies.

The city has a two-year mayor and a council with only one chamber, called the board of aldermen; most of the other officials are appointed by the mayor, only the city clerk being appointed by the aldermen, and the street and water board elected. The assessed valuation in 1902 was $100,550,026; the total public debt, excluding the water debt, $16,205,325; the sinking fund is above $3,000,000. The expenditures are about $8,000,000 a year. The largest single item is $460,000 for schools.

The population in 1850 was 6,856; 1860, 29,226; 1870, 82,546; 1880, 120,722; 1890, 163,003; 1900, 206,433; 1905, 232,699. Of these 3,704 were colored, 58,224 foreign-born, 19,314 Irish, 18,820 German, 4,642 English, 3,832 Italian.

The site of the city was used only as farming land till into the 19th century despite its remarkable position. In 1802 the entire population was 13 in one house with outbuildings; this was on Paulus Hook, the point opposite the Battery, named after the Dutchman Michael Pauw, who formerly owned it. Here in the Revolution the American fortifications had been taken by the British, and retaken and destroyed in a most brilliant action by "Light Horse Harry" Lee. In 1804 the "associates of the Jersey Company" bought the land, and laid it out in streets, incorporating it as a village with a board of selectmen. In 1820 it was incorporated as the "City of Jersey," still with a board of selectmen; in 1838 it was reincorporated as Jersey City, with a mayor and aldermen. Repeated annexations have brought it to its present territory: Van Vorst in 1851, Hudson City and Bergen in 1869, Greenville in 1873. It obtained a new charter in 1889. Consult: McLean, 'History of Jersey City' (1895); Eaton, 'Jersey City and its Historic Sites' (1899).

Jersey, Island of, the largest and most important of the Channel Islands, lying in the English Channel, and belonging to Great Britain. It is 12 miles long and from 4 to 7 miles wide, and has an area of 45 square miles. The distance to the coast of France is about 12 miles. The interior is mostly table-land and is well-wooded. The principal town is Saint Helier. The island is famous for a breed of cattle. Pop. (1901) 52,796.

Jersey Prison Ship, a notorious, unseaworthy ship, lying in New York harbor from 1776 to 1783, and used by the British as a prison for captured American sailors. Over 11,000 are said to have died of cold, starvation, and inhuman treatment.

Jer'seyville, Ill., city and county-seat of Jersey County, on the Chicago & A. and the Chicago, P. & St. L. R.R.'s., 66 miles southwest of Springfield. It was settled in 1839, incorporated in 1867, and adopted a new city charter in 1897. It has a public library and court-house, and being the centre of a rich agricultural district, has an established trade in produce, fruit, grain and live-stock. The waterworks are owned by the city. Pop. (1900) 3,517.

Jerusalem (Greek *Hierousalem.* Old Hebrew pronunciation, *Yurushalem.* Tel-el-Amarna tablets, *Uru-sa-lim*; Assyrian monuments, *Ur-sa-li-im-mu.* Meaning certainly "city of Salim"; meaning of *Salim* disputed — probably an Assyrian god; usually assumed as Hebrew "peace," but the name antedates Hebrew. The Greek and Latin *Hierosolyma* is a corruption, from the erroneous supposition that the first syllable is Greek *hieros,* sacred. Hadrian renamed it *Ælia Capitolina,* and its official name was long *Ælia,* even Arabicized into *Iliya;* the Greeks called it *Kapitolias.* Arabic name, *Beit el-Makdis,* or simply *el-Mukaddas,* modern vernacular *el-Kuds,* "the sanctuary," or *el-Kuds esh-sherif*).

The "Holy City" is 33 miles from its port of Jaffa on the Mediterranean, 15 from the Dead Sea, 18 from the Jordan, 19 from David's first capital, Hebron, and 34 or 35 from the old kingdom of Samaria: the pregnant Hebrew history was transacted in the space of a county. It is 126 miles from Damascus. The position of the dome of the Church of the Holy Sepulchre is lat. 31° 46′ 45″ N., lon. 35° 13′ 25″ E. The city lies in the midst of an infertile, ill-watered district, once (under good government) made prosperous by irrigation, now blighted by Turkish possession. The rainfall is about 23 inches. The climate is hot and irregular — rising to 112° and not sinking below 25°, with an annual mean of 62° — but not malarious; the city is unsanitary and plague-stricken, but from dirt, lack of sewerage, bad water, and unhygienic habits. The only natural water-supply (the drainage sinking in the soft limestone) is from the Virgin's Spring (Gihon), an intermittent natural siphon on a dolomite floor, in a rocky cave 12 feet deep in the face of the eastern ridge; this was carried by a rock and masonry conduit to the rock and masonry Pool of Siloam, 52 x 18, and thence to another, the Old Pool; a shaft within the walls led down to a rock channel communicating with the spring. At present the water-supply is from rain-tanks or "pools," in and out of the walls. The remaining one of three old aqueducts, which carries water when in repair, was built by Pilate. There is little trade except that of local shops for supplying tourists; and the manufacture is chiefly of souvenirs, as olive-wood and mother-of-pearl articles. Indeed, as a commercial location it never possessed any merits, and its greatness was due to original political situation, and partly to its very defects. It is connected with Jaffa (west), Bethlehem and Hebron (south), and Jericho (north) by carriage-roads; and in 1892 a narrow-gauge railroad to Jaffa, with a circuitous course of 54 miles, was opened by a French company.

Jerusalem lies on several hills, rising from a steep plateau (see below), and the floor and slopes of a valley between the two main divisions. The modern city, much less extensive than the old in its best estate, is a rough quadrangle surrounded by a very irregular wall, built in the 16th century by Solyman I., on the lines of the Crusaders' fortifications. It has nominally eight gates, two on each side; the

Jaffa and Abd-ul-Hamid on the west (the latter very recent), the Zion and Dung on the south, the Golden (closed up) and St. Stephen's on the east, and the Damascus and Herod's on the north. The city is unevenly divided, by the main street running from the Damascus gate south to near the Zion gate, and that running east from the Jaffa gate to the Haram-esh-sherif, into four "quarters" in which the great religious divisions are segregated: the Mohammedan, much the largest, on the northeast, adjoining the original holy places; the Christian next, on the northwest, where is the Church of the Holy Sepulchre; the Armenian on the southwest; the Jewish on the southeast. The streets are crooked, narrow, ill-made, and dirty, and the city has few except historical attractions; the stream of tourists, however, has developed civilized conveniences such as hotels, banks, mercantile establishments, etc. Several Jewish colonies have been settled in the environs; and since 1858 a quarter has grown up outside the walls on the northwest, approached by the Jaffa Gate, and containing consulates, Christian churches, schools, charitable institutions, etc., but not more sanitary than the old. The city is the capital of an independent sanjak, or Turkish administrative district, immediately subject to the government at Constantinople, and has an executive and a town council with representation of the great religious divisions. It is the seat of Roman Catholic, Greek Catholic, and Armenian patriarchs; the smaller Eastern churches have resident bishops; and till 1887 a joint Protestant bishopric was supported by England and Prussia, with alternate bishops, but on the death of the then incumbent Prussia withdrew from the arrangement, and England continues it alone. The population of the city at the last returns was as follows: Jews, 41,000; Mohammedans, 10,000; Christians, 12,800 — made up of 6,000 Orthodox Greeks, 4,000 Roman Catholics, 1,400 Protestants, 800 Armenians 200 Uniat Greeks, and small bodies of Syrians, Copts., etc. Total, over 60,000.

The intense historical interest is centred on memorials of the time or localities of David and Solomon, and of the life and death of Christ. Of the former, the supreme interest is in the Haram-esh-Sherif, the site of the temple, and palace of Solomon and of the later temples. It is a walled area about 527 x 330 yards, with an elevated platform in the centre reached by steps; in the centre is the beautiful Kubbet es-Sakhra, or Dome of the Rock — a wooden octagon with sides of 66 feet 7 inches, decorated on the outside with marble and porcelain tiles, each of the four sides which face the cardinal points having a square gate surmounted by a vaulted arch. Just east of this is the Chain Dome, or David's Place of Judgment. Other domes of interest are near; but the next most notable structure in the Haram is the mosque El Aksa, at the south end. Within it are also a beautiful 15th-century fountain, a pulpit of the same date, a modern mosque called the Throne of Solomon, and the fortress of Antonia. Of the Christian monuments, the most noteworthy is the Church of the Holy Sepulchre, in the Christian quarter, originally built by Constantine the Great over the supposed place of the Ascension; after long oscillation of views, and for a time a general abandonment of the site as the true one, opinion is again favoring its authenticity. Most of the present structure, however, dates only from the 19th century. There is a rotunda, with a dome 65 feet in diameter, above a small Chapel of the Sepulchre; a number of church buildings, said to include the site of Golgotha or Calvary; and 22 chapels. The Via Dolorosa, along which Jesus is said to have carried the cross to Calvary, follows the present street Tarik Bab Sitti Maryam from St. Stephen's Gate. Several modern churches and other institutions are also worth visiting; but the thronging Scriptural associations — besides those mentioned above, the Mount of Olives, the Pool of Bethesda, the Vale of Hinnom, etc. — overshadow all else.

Topography and History.—About a mile north of Jerusalem, the main north and south watershed ridge of Palestine turns to the west; while a spur called Olivet, having three pinnacles, runs first southeast 1½ miles, and then south 1¼ miles. The space between the two is occupied by a plateau sloping southeastward, and separated on each side from the bounding ridges by a ravine 300 to 400 feet deep, with steep and often precipitous sides. The eastern ravine, separating it from Olivet, is the "brook" Kedron or Kidron (Cedron), which was always a dry bed; the western is the Wady el-Rabābi (probably the vale of Hinnom), which after skirting it on the west, turns east along the southern scarp of the plateau and joins the Kedron. Through this plateau from north to south runs a broader and much less deep and precipitous valley, the Tyropœon ("cheese-makers' place") 100 to 150 feet deep, thus dividing it into two uneven sections: the east ridge is continuous, and its northern part was the first occupied; the western part, the "new city," is divided by a lateral branch of the Tyropœon into two summits, a north and a south, connected by a narrow saddle separating also Tyropœon from el-Rabābi. The general height may be stated as about 2,500 feet; the eastern ridge is 2,440 feet at the north, and descends southward; the western north summit is 2,490 feet, south summit 2,520. The accumulation of 3,000 years' rubbish, however, has greatly modified the contours of the hills and ravines, obliterating some minor ones altogether. The average depth over the rock levels is 30 to 40 feet, and in the valleys 70, in one case reaching 120.

This plateau, surrounded on three sides by steeply scarped bluffs and crested with hills, was a natural fortress; but it had two defects — it commanded nothing in particular, and its water-supply (one spring intermitting for hours or even a day or two, and that at the foot of a bluff) was very scanty. Probably at the first, as many times since, army after army marched around it, and left it untouched as of too little military significance. We first hear of it on the Tel el-Amarna tablets (about 1400 B.C.), when it is seemingly a little hill fort with a small garrison, possibly with a village also, and the capital of the "land of Jerusalem," apparently a small territory along the watershed. The king, Abd-Khiba, is a vassal of the king of Egypt, and begging assistance against the Khabiri (Hebrews?). Later it is a minor "Jebusite" citadel: Hebron, Bethlehem, Bethel, Gibeah, Jericho, are all more important. But when David undertook to form a consolidated Hebrew kingdom, Jerusalem had the transcendent merit that it lay on the border between Judah and the northern tribes, not historically identified with either; it

THE MOSQUE OF OMAR, JERUSALEM.

was also fairly on the central line of communication, and convenient for action against the Philistines and the desert tribes at once. He made terms with the Jebusites and occupied the hill-fort of Zion on Ophel, near the only available water-supply. Possibly a village grew up on the eastern slope of the hill; but it was small, for the whole levy of Palestine was but 30,000 men (*2* Sam. vi. 1), and other places held the trade. Solomon greatly increased the size of the town, and built a stone temple for Yahweh and a great palace. Under Rehoboam the place was captured by Shishak of Egypt; under Amaziah by Jehoash, and its walls partly leveled. During the palmy times of the northern kingdom it was held of small account except by the Judahites: it was only one of many places of pilgrimage down to Hezekiah's time, and the northern prophets ignore it and speak of Bethel, Gilgal, and Beersheba. With the fall of its northern neighbor, for the moment its importance and wealth increased; especially it became the one undefiled shrine, never mixed with rites of the native religions, the centre of Jewish religious life, the one place where sacrifice might be offered. In the later days of the monarchy the town spread beyond the east ridge into the Tyropœon; a second town and a trading quarter grew up. For a long time after its destruction by Nebuchadnezzar in 586 the history is scant and dubious. It suffered heavily under the Persian empire; under Artaxerxes Ochus the temple *may* have been destroyed. Alexander's sacrificing in the temple is mythical; and in 320, Appian says, Ptolemy Soter destroyed the city. Then there was a time of peace and prosperity, culminating in the high-priesthood of Simon II. (219–199 B.C.); after a series of struggles between the Ptolemies and the Seleucids, in which the former took and garrisoned the place and the Jews helped drive out the garrison, the Seleucids obtained Palestine by treaty in 197. When Antiochus Epiphanes undertook to Hellenize Palestine in 169, he took the city, destroyed the walls, plundered the temple, and erected an altar to Zeus in place of that to Yahweh. Judas Maccabæus rebuilt the temple and the walls; again razed by the Greeks, they were again rebuilt by Jonathan. Under the Hasmonæan dynasty it extended to the western ridge; there was a new palace and royal quarter of great splendor; the city became the metropolis of the Jewish world, and the one great pilgrim shrine. Then it became tributary to Rome, but at least still a kingdom governed by its own sovereigns; such it was when Jesus was born; but it shortly after became a province governed by a Roman procurator. The Roman system and Jewish feeling were incompatible, aside from any actual misgovernment; and a grand national revolt took place, which in 66 A.D. gained possession of Jerusalem. Vespasian was appointed to repress it; and in 70 A.D. his son Titus, after one of the most frightful sieges in history, with unimaginable horrors, took it, burned the temple, and leveled the city to the ground. Josephus says the city's population was 1,000,000, and Tacitus (probably from Josephus) 600,000; both are absurd, and Josephus' figures are always Oriental. From 30,000 to a maximum 45,000 may be estimated. It remained a ruin for many years. In 131 Hadrian visited the site and ordered it rebuilt; apprehending a restoration of pagan worship, the Jews broke out in rebellion under Bar-Cochba; and Hadrian, not caring to set up a new centre of Jewish propaganda, made it a Roman colony called Ælia Capitolina, and forbade Jews to enter it on pain of death. Thence till the time of Constantine nothing is known of it; except as a Jewish shrine it was nothing. When the empire became Christian, Constantine's mother, Helena, induced him to cherish the seat of Christ's ministry and death; and he built the Church of the Holy Sepulchre (see above). Pilgrims flocked to Jerusalem from all parts, and it became the shrine of Christendom. Captured by Khosru of Persia in 614, it was retaken by Heraclius in 628; but in 637 was taken by the Moslems under the caliph Omar. The line of Arabian caliphs of different dynasties was succeeded by the Seljuk Turks. The Christians were oppressed, the sacred places defiled; to crown all, the overland caravan trade was cut off. Religious feeling and mercantile interest together roused Europe to the crusades, and Jerusalem was taken by Godfrey of Bouillon in 1099, becoming the capital of a Christian monarchy. This maintained a precarious existence till 1187, when the great Saladin put an end to it.

Among the many excellent works on the subject see, for topography and ancient history, the article Jerusalem in the 'Encyclopædia Biblica,' by W. R. and G. A. Smith and Col. Conder; also for topography, Col. Conder in Hastings' 'Dictionary of the Bible.' See also Warren and Conder's 'Jerusalem' (1884, Palestine Exploration Fund), containing a large portfolio of plates; Wilson's 'Ordnance Survey of Jerusalem' (1868), the basis of all modern work; De Vogue's 'Temple de Jérusalem' (1864); Le Strange's 'Palestine under the Moslems' (1890, Palestine Exploration Fund), the only book based on Arabic writers; Besant and Palmer's 'Jerusalem, the City of Herod and Saladin' (4th ed. 1899); and the 'Quarterly Statement' of the Palestine Exploration Fund.

Jerusalem Oak. See GOOSEFOOT.

Jerusalem Plank Road, Engagement near. After the battle of Cold Harbor (q.v.), 1–3 June 1864, Gen. Grant crossed to the south of James River, made unsuccessful assaults upon the Petersburg intrenchments, 15–18 June, and then determined to invest the city partially by a line of works toward the South Side Railroad, and by the evening of the 21st the Fifth corps rested its left on the Jerusalem Plank Road. The Second corps, followed by the Sixth, was moved across the road with the intention of seizing the Weldon Railroad at a point near Globe Tavern next day, and with the expectation of seizing also the South Side Railroad, and cutting Lee's communication with Lynchburg. At night the Sixth corps was in rear of the left of the Second. The orders for the 22d were that the Fifth corps should hold fast its position in front of the Confederate intrenchments, while the Second and Sixth swung to the right, and forward on its left, each division intrenching as it came into line. In the movement the corps commanders at first were directed to keep up connection, then they were ordered to move without regard to each other, each taking care of his own flanks. The Second and Sixth corps moved chiefly through densely wooded thickets; the Second on the right and near the Confederate works; the Sixth at right angles to the Second

toward the Weldon Railroad. Gibbon's division of the Second corps had swung in on the left of the Fifth and intrenched, Mott's division was intrenching, and Barlow's division, on the left, was not yet in position, when the last named was attacked. Gen. A. P. Hill had been sent down the Weldon Railroad to oppose Meade's attempt upon it. He had the three divisions of Wilcox, Mahone, and Bushrod Johnson. Leaving Wilcox to oppose the Sixth corps, which had not come up on the left of the Second, Hill, about 3 P.M., passed Mahone and Johnson through the opening between the two corps and struck Barlow in flank and rear, driving him back in confusion to the position from which he had advanced in the morning, and taking many prisoners. Mott's division, on Barlow's right, fell back precipitately, and then Hill struck Gibbon's left brigade in front, flank and rear, causing it to give way and abandon a battery of four guns. So sudden and unexpected was this attack upon Gibbon that the greater part of several regiments were captured with their colors. Gibbon made an unsuccessful effort to recover the lost portion of his line. Hill returned to his intrenchments, leaving some force on the railroad, and toward evening the Second corps was thrown forward; but it was not until next morning that it occupied the ground from which it had been driven, the Sixth corps, forming on its left, thrown back facing the Weldon Railroad, and about a mile from it. The Union loss on the 22d, confined almost entirely to the Second corps, was nearly 2,000, of whom about 1,700 were prisoners. The Confederate loss is unknown. Consult: 'Official Records,' Vol. XL.; Humphreys, 'The Virginia Campaign of 1864–65'; Walker, 'History of the Second Army Corps.'

E. A. CARMAN.

Jervis, jĕr'vĭs, **John Bloomfield,** American civil engineer: b. Huntington, N. Y., 14 Dec. 1795; d. 12 Jan. 1885. He was employed as axeman on the route of the Erie Canal in 1817; in 1819 became a resident engineer of the middle portion of the canal; was chief engineer of the Delaware and Hudson Canal and Railroad Company, 1825–30; and chief engineer of the Croton Aqueduct, 1836–43. In later life he was consulting and chief engineer of the Cochituate water works, Boston, and of several important railways. He built the Croton dam, the High Bridge at New York, and other notable structures. The town of Port Jervis (q.v.), N. Y., was named for him. He published: 'Railway Property'; 'Construction and Management of Railways'; 'Labor and Capital.'

Jesse, jĕs'ĕ, in the Bible stands at the head of the house of David, who was his son. While Saul was persecuting David he took refuge in the land of the Moabites, where Ruth the Moabitess, his grandmother, had lived. In the genealogy of Jesus Christ as given in the Gospels of SS. Matthew and Luke he is mentioned as one of the ancestors, as Christ in the New Testament is hailed "Son of David." This fact has suggested some of the most interesting creations of mediæval art, and what is called a "Jesse window" is a stained glass church window in which Jesse is depicted as the root of a tree which bears as its fruit David and other heroes and saints of the Old Testament, with the infant Jesus in the arms of his mother on the highest branch.

Jesse, Richard Henry, American college president: b. Epping Forest, Lancaster County, Va., 1 March 1853. He was graduated from the University of Virginia in 1875, was dean of the academic department of the University of Louisiana from 1878 till its union with Tulane University in 1884, in which institution he was professor of Latin till 1891. Since January 1891 he has been president of the University of Missouri.

Jes'sop, Augustus, English Anglican clergyman and author: b. 20 Dec. 1824. He was educated at Cambridge and after taking orders in the English church was curate of Papworth St. Agnes, Cambridgeshire, 1848–54; head master of Helston Grammar School, Cornwall, 1855–9; and head master of King Edward VI.'s School, Norwich, 1859–79. He has been rector of Scarning, Norfolk, from 1879, and is an honorary canon of Norwich Cathedral. As a writer he became widely known by his 'Arcady for Better for Worse' (1881), studies of agricultural life in Norfolk; and among other works of his are: 'Studies by a Recluse'; 'Trials of a Country Parson'; 'The Coming of the Friars' (1885); 'John Donne.'

Jest Book, a compilation of witty sayings and practical jokes. The oldest known English jest book is 'A Hundred Mery Talys' (about 1525). The best known collection is 'Joe Miller's Jest Book, or the Wit's Vade Mecum' (1739).

Jesuit (jĕz'ū-ĭt) **Relations and Allied Documents, The,** a series of 72 volumes on the travels and explorations of the Jesuit Missionaries in New France (1610–1791). The original French, Latin, and Italian texts, with English translations and notes; illustrated by portraits, maps, and facsimiles, and edited by Reuben Gold Thwaites. A republication of great magnitude and importance. The very great value of the work is that of original materials of the most interesting character for the history of North America from 1611, the date of the first landing of Jesuit missionaries on the shores of Nova Scotia. The reproduction of documents takes them in chronological order. The execution of the work by translators, editors, and printers (at Cleveland, Ohio) is every way admirable; and its completion will make a monumental addition to American historical libraries.

Jesuits, a religious order of the Catholic Church whose members, like those of similar societies, solemnly bind themselves to aspire to perfection by leading a life of chastity, by renouncing the possession of all personal property, and by obedience to lawful superiors in all that does not contravene the law of God. A certain number of them add a special vow of obedience to the Pope. They are called the Society or Company of Jesus, the latter designation expressing more correctly the military idea of the founder, which was to establish, as it were, a new battalion in the spiritual army of the Catholic Church. There are no female Jesuits, nor are there crypto or secret Jesuits. Romances are mostly responsible for such myths. Nor does the Society form, as is sometimes fancied, a sort of sect within the Church. R. W. Thompson, ex-secretary of the United

States navy, in his 'Footprints of the Jesuits' asserts that they are such, and independent of the pope, and in one instance he accuses them of being idolaters. As a matter of fact the Society of Jesus has always inculcated ardent devotion to the pope, the most uncompromising orthodoxy and an intense Catholic spirit. The descriptions of Jesuits as crafty, unscrupulous men constantly engaged in dark plots against all who stand in their way, are inventions of their enemies and have no foundation in fact. Finally they are not monks, as they are sometimes described. Technically they are classed among churchmen as clerics, living according to a rule and are properly regular clerics.

The special object of the Society beside the personal sanctification of its members is to propagate the Christian faith chiefly by teaching and preaching. Their teaching is restricted mainly to the higher studies, and includes literature, mathematics, science, philosophy, theology, and the cognate branches. Their preaching addresses itself to all classes, but, by predilection, and at stated periods in a Jesuit's life, by express injunction, it concerns itself with catechizing the ignorant, and instructing the inmates of hospitals and penal institutions, while it addresses itself also to more cultured and spiritual audiences. One special and characteristic feature of its ministry is known as the "Spiritual Exercises" or "Retreats" which it may be regarded as having introduced, or revived in the modern church, and are now a universal ascetic practice with the clergy and religious communities as well as with a considerable number of the laity. A "Retreat" is a withdrawal from worldly occupations for a more or less protracted period in order to scrutinize the state of the soul and to take means to amend one's life, or to strive for higher Christian perfection. The method of these "Exercises" is laid down in a small manual written by the founder of the Society. The book itself, which is at first sight fragmentary, and only suggestive in its character, is not easily understood or explained except by those who are trained to interpret it.

The Society was founded by Ignatius Loyola, a Spanish nobleman, who after being disabled in fighting for his country, betook himself to the solitude of a cave near the little town of Manresa, Spain, where he passed some months in prayer and severe bodily austerities. Later, desirous of working more effectively for the salvation of his fellow men, he determined to become a priest, and for that purpose studied in the universities of Alcala and Salamanca, and finally in Paris, where he gathered about him six companions, among whom were Francis Xavier, the future Apostle of Japan, Peter Faber, whom, with Ignatius and Xavier, the Church was to honor subsequently as a saint, and also Salmeron and Laynez, who were conspicuous luminaries at the Council of Trent which was then about to be convened against the doctrines of Luther, Calvin, and others who had just then arisen.

On 15 Aug. 1534 these seven men organized themselves into a society, and pronounced their vows in the crypt of a little chapel in what is now Rue Antoinette, a short distance below the crest of the hill of Montmartre in Paris. It was only six years afterward that Pope Paul III. gave them and the others who had joined them meantime his solemn approval.

The peculiarities of their organization were the occasion of much antagonism at the very outset on the part of some of the most eminent men of the Catholic Church. The Inquisition strongly suspected its purposes and doctrines. The name of the "Society of Jesus" was objectionable to Pope Sixtus V. Unlike other orders they were to be dispensed from reciting the divine office in common, and were to wear no distinctive habit. The length of probation and the general structure of the Society were unusual. The members were first the professed who were relatively few. In them the governing power resided, and they were distinguished by a special vow of obedience to the pope. Then came the spiritual coadjutors, or priests, who did not take the special vow of obedience to the pope. Preparing for either category were the students or scholastics, and lastly there were lay brothers who were to devote themselves to domestic duties. Those who applied for admission were to pass two years of noviceship, and not one as in other religious orders, and were then admitted to what are called simple vows which could be easily dispensed with by proper authority if the subject were subsequently found unfit. Following the noviceship, two years were given to a review of the classical studies; then came three years of philosophy, mathematics, and the physical sciences; five years of college teaching and four years of theology, to end only with another year of seclusion and prayer, after which the candidate was permitted to take the solemn vows which bound him irrevocably to the order as a spiritual coadjutor or professed. The probation of the lay brothers was protracted to ten years. The Jesuit renounces by vow all ecclesiastical dignities, and accepts them only in unusual circumstances and by express command of the pope, under pain of sin in case of refusal. As the establishment of the Society of Jesus coincided with the Protestant Reformation the efforts of the first Jesuits were naturally directed to combat that movement. Under the guidance of Canisius so much success attended their work in Germany and other northern nations, that, according to Macaulay, Protestantism was effectually checked. In England where Elizabeth had inaugurated a movement against her Catholic subjects, and previous to that under Henry VIII. the Jesuits stopped at no danger to go to the rescue of their brethren in the faith; and what they did there was repeated in other parts of the world. "In spite of oceans and deserts, of hunger and pestilence, of spies and penal laws, of dungeons and racks, of gibbets and quartering blocks, the Jesuits were to be found under every disguise, in every country; scholars, physicians, merchants, servingmen, in the hostile court of Sweden, in the old manor houses of Cheshire, among the hovels of Connaught arguing, instructing, consoling, animating the courage of the timid, holding up the crucifix before the eyes of the dying."

Such is the testimony of Macaulay, a Protestant historian. Though many died as martyrs on the scaffolds and in the prisons of England and elsewhere, yet their skill in evading detection as well as their courage in living in the midst of their enemies and their great success in winning converts well explain the hatred with which they were regarded in Protestant countries from the very beginning, while it gives us

the historical origin of the tradition of cunning and deceit which has always been associated with the name of Jesuit.

Under James I. they were accused of complicity in an alleged attempt to blow up both houses of Parliament, and though clearly proven to be innocent of the charge, Father Garnet, who was said to have been cognizant of the plot, was executed, and the accusation is still believed. Guy Fawkes' Day commemorates the event and perpetuates the calumny. It is probably in connection with this occurrence that the supposed Jesuit doctrine of "the end justifying the means" was first accredited to them and the accusation made that "it was their office," as Macaulay assures his readers, "to plot against the thrones and lives of apostate kings, to spread evil rumors, to raise tumults, to inflame civil wars and to arm the hands of the assassin." The first one who is accused of formulating the doctrine of the end justifying the means is Father Wagemann of Innsbruck 1762. Even the murders of Henry III. and Henry IV. of France were ascribed to them, and under Charles II. of England six Jesuits were accused by Titus Oates of conspiracy and put to death. These and other charges have been repeatedly disproved, yet writers of romance, and even writers of history, never fail to find readers credulous enough to accept them as true.

While the Jesuits were propagating the faith in Europe they were sending missionaries to every part of the world to preach the Gospel to heathen nations. Greatest of all these apostles was St. Frances Xavier whom all Protestant writers unite in glorifying and whom the pagans almost worshipped as a deity. His name is still mentioned with enthusiasm among the pagans in Japan and the Occident. The conversions which he effected and the miracles he wrought almost defy belief. It is a testimony to the solidity of his teaching that although Catholicity was apparently obliterated in Japan by a series of bloody persecutions, the French missionaries who entered the country in 1860 found 30,000 Japanese Christians there. In spite of the absence of priests, the doctrines and practices received from Francis Xavier which meant death to profess openly had been handed down from father to son for a period of nearly 300 years. One blot on the reputation of the Society in this field was the shameful apostasy of one of their superiors; but he atoned for his sin by a subsequent martyrdom.

In America the French Jesuits undertook the task of evangelizing the Indians, and at one time had 3,000 civilized and christianized Hurons under their control. In what is now New York, Father Jogues was cruelly tortured and slain on the banks of the Mohawk in 1646. In 1649 Garnier, Daniel and others were shot to death; and at the same time De Brébeuf and Lallemant were burned at the stake while their flesh was slashed with knives and their hearts cut out and eaten by the Indians of Lake Superior. Others died from want and exposure. It was Jogues who discovered Lake George to which he gave the name of Lac du St. Sacrement. Later on Le Moyne came upon the salt springs near Syracuse. Marquette discovered the Mississippi which he named the River of the Immaculate Conception. He explored it as far as the mouth of the Arkansas, and returning home was the first white man with his companions to travel over the territory of what is now the city of Chicago. Wisconsin has erected a statue to his honor. Other Jesuits reached the Pacific coast and established the missions of California which they handed over to the famous Franciscan Junipero Serra when the Society was suppressed. English Jesuits had come over with Lord Baltimore; and before that five Spanish members of the order had been slain by the Indians on the banks of the Rappahannock. The "Relations" of the French Missions have been recently published by an American publishing house and form 72 volumes of missionary and scientific information which the 'Atlantic Monthly' considers the most precious material that could be desired for the history of this country. Similar records have been kept by the Jesuits of other nationalities. Marquette's diary and maps of the discovery of the Mississippi decided the controversy between France and England about the possessions of the western territory.

The missions of South America conducted by the Spanish and Portuguese Jesuits were remarkable in their character and extent. Father Anchieta, a native of Brazil, was particularly distinguished for his missionary success as well as his gift of miraculous powers. Peter Claver devoted himself to the thousands of negro slaves who were brought to the port of Cartagena. Other Jesuits traveled through Chile and Peru. Seventy of them on their way thither were said to be killed by Calvinists who intercepted them at sea. But their most famous work was what are known as the 'Reductions' or Christian Commonwealths of Paraguay. The description of these missions forms one of the most brilliant chapters of Chateaubriand's 'Génie du Christianisme;' but a recent work entitled 'A Vanished Arcadia' by Cunningham-Graham gives a more reliable and scholarly account of what was accomplished there. Voltaire says: 'When in 1768 the missions of Paraguay left the hands of the Jesuits, they had arrived at perhaps the highest degree of civilization to which it is possible to conduct a young people."

"For nearly two hundred years they controlled a district as large as France," writes Cunningham-Graham, "where they had established 32 towns in which there were 160,000 Indians whom they had converted and civilized, teaching them agriculture, the mechanical arts, commerce, and even forming among them a small army of defense. The annual income of the country was about 1,000,000 reales. The missionaries were finally expelled by Charles III. and the country fell back into its primitive condition of a tangled wilderness."

The reasons of their expulsions were first the jealousy of the Spaniards at being excluded from the territory, secondly the anger of the colonists at being prevented from enslaving the Indians, and thirdly the ungrounded suspicion that there were gold mines in the missions. An impression in the royal mind that the Jesuits had reflected on the circumstances of his birth made him an easy instrument in the hands of the enemies of the Society. "Curious as it may appear," writes Cunningham-Graham, "the bitterest opponents of the Jesuits were Catholics, and Protestants have often been their apologists. Buffon, Raynal, and Montesquieu with Voltaire, Robertson, and Southey have written favorably of the internal gov-

ernment of the mission and the effect it produced. When the Spanish general was sent to dispossess them, he set about it with more preparation than Cortes or Pizarro made for the conquest of Mexico or Peru. But there was no resistance, and all the wealth the fathers had was the poor clothes on their backs." The destruction of these missions was probably a part of the prearranged plan for the annihilation of the whole Society.

The missions of Japan which Francis Xavier had inaugurated continued after his death in spite of the fierce persecutions in which many Jesuits perished. He had been unable to reach China and died on a lonely island off the coast. Ricci, Verbiest, Schall and others carried out his project and became the advisers of the emperor as well as his astronomers, mathematicians and mechanicians. The great bronze astronomical instruments carried off by Germany on the occasion of the recent invasion of that country by the allied powers of Europe were the work of the Jesuits of the 17th century. As soon as the mission was started, great numbers of Jesuits came from Europe, half of them generally dying on the passage. In 1661 they possessed 151 churches and 38 residences there, and had written as many as 131 works on religion, 103 on mathematics, and 55 on physical and moral sciences.

Numberless other missions were established elsewhere; de Nobili for instance lived like a Brahman in India to reach that particular caste, and was almost suspected of apostasy for doing so. He is said to have made 100,000 converts. Jesuits overran the whole Indian peninsula and crossed the Himalayas into Tibet. Africa had long before been penetrated, and one of the first members of the Society was Patriarch of Ethiopia. The present explorers of the Dark Continent find remnants of former missions far in the interior. They had gone from Mexico to the Philippines in the earliest days; they had entered Tartary and Lebanon, and when their own efforts were thwarted they induced others to take their places. Thus De Rhodes, a Jesuit expelled from Japan, founded the Société des Missions Etrangères, a body of secular priests who have given a great number of saints and martyrs to the Catholic Church.

While the Jesuits were engaged in missionary work among the uncivilized peoples of the world they erected splendid churches all over Europe, and furnished such orators to the pulpit as Bourdaloue in France, Vieyra in Portugal, and Segneri in Italy. The 'Book of Spiritual Exercises," according to St. Francis de Sales, "has converted as many souls as it has letters." But their apostolic work was not restricted to preaching, and we hear of a single French Jesuit who during his 40 years of ministry had established as many as 146 hospitals for the poor. They founded orphan and Magdalen asylums. They were the confessors of kings and princes and delegates of the Holy See, but they extricated themselves from these honorable charges as soon as it was possible to do so. At the time of the suppression they controlled and directed the majority of the ecclesiastical seminaries of Europe.

The success of the Society in the work of education forms a great chapter in its history. Their method is found in what is known as the 'Ratio Studiorum' or Plan of Studies. It is a complete system of pedagogy and covers the whole field from the lowest class of grammar up to philosophy and theology. The plan was first conceived by Ignatius himself, and subsequently elaborated by one of his successors, Claudius Aquaviva. Compayré, one of the chief pedagogists of the present time, denounces it as a mere system of memorizing. Bacon says of it: "never has anything more perfect been invented." Their colleges at one time covered all Europe, and in the single school of Louis le Grand they had as many as 3,000 students. Kings assisted at its public academic exercises. Among their scholars they can claim some of the greatest men of modern times, as for instance Popes Gregory XIII., Benedict XIV., Pius VII., St. Francis de Sales, Bossuet, Fleury, Flechier, Montesquieu, Malesherbes, Tasso, Galileo, Corneille, Descartes, Molière, Mezzofanti, Muratori, Buffon, Gresset, Canova, Tilly, Wallenstein, Condé, the emperors Maximilian, Ferdinand and others. Even Voltaire was one of their pupils. The disturbed conditions of modern times prevent a similar brilliant showing, but many of the most distinguished Catholic churchmen of to-day have studied in their schools, and notably Leo XIII. who was trained by them from his college classes to the end of his theological course.

Within their own ranks they have furnished great scholars in all branches of philosophy, theology, history, philology, literature, and science. It is sufficient to name such men as Suarez, De Lugo, Bellarmine, Toletus, Lessius, á Lapide, and to note that the treatises of Jesuit writers form the text-books in all the theological seminaries of the Catholic Church to-day. They have written in almost every language and on every conceivable subject, and the mere catalogue of their writers, though not yet complete, already fills more than seven large quarto volumes. Their missionary enterprises were never disjoined from scientific investigation.

Their history is marked by ceaseless activity in launching new schemes for the spread of the Catholic faith, and by absolute fearlessness in opposing error regardless of any consequences to themselves. These two characteristics may explain why even by some Catholics they are regarded as a disturbing element in the church. One of their most noted disputes with churchmen was with the Dominicans on grace, during which the Jesuit doctrine of grace was formulated. The contest lasted for nine years, and although great theological learning was adduced on both sides a truce was imposed by the Pope without any decision being arrived at. Of far greater consequence was their war with the Jansenists. It was chiefly on this occasion that the Society was accused of laxity in their moral code and that their great antagonist Pascal won fame by his 'Lettres Provinciales,' which like the famous 'Monita Secreta' of former times purported to be the private instruction of superiors to members of the order. After this contest their expulsion from France was an easy task, as the Jansenists wielded great political influence and were backed by the irreligious element which was growing rapidly there.

They have been expelled over and over again from almost every Catholic country in Europe, always, however, coming back again to

renew their work when the storm had subsided; and this fact has been adduced as a proof that there is something iniquitous in the very nature of the organization. Worse still in 1773 the entire order was suppressed by a brief of Pope Clement XIV. and all their goods confiscated. They then numbered 24,000 members and had establishments in all parts of the world and flourishing missions, all of which were immediately destroyed, but not one Jesuit uttered a word of complaint or protest. What is remarkable is that while Catholic popes expelled them they were protected by the schismatic Catherine of Russia, and the Protestant Frederick of Prussia, the friend of Voltaire. This very protection was urged as a reproach against them and as a proof of their guilt.

With the exception of the disastrous financial speculation of Lavalette, which was the sin of an individual and not imputable to the entire Society, as commercial transactions were absolutely prohibited by the statutes, the Society is proved to be guiltless both in its partial suppressions and in its total abolition. This is clear from the very brief of Clement XIV. which dealt the blow. In that document all the charges are enumerated, but not one is pronounced to be true. The Society was suppressed as a political necessity and for nothing else. The encyclopædists of France regarded it as their most redoubtable opponent and had vowed its destruction. "Destroy the Jesuits," said Voltaire, "and we shall make an end of the beastly Church." In this work the Bourbon kings had to be enlisted. Madame de Pompadour, the king's mistress, whom the Jesuits had refused to absolve, influenced Louis XV.; the Spanish and Portuguese ministers wrought on the fears of their sovereigns by forged documents containing threats and plans of assassination, and when all was ready the monarchs gave the pope a choice of suppression of the Society or schism. The pope yielded, and is said by Pius VI. and Pius VII. to have lost his mind in consequence. The vindication of the Society came immediately. The very pope who suppressed them approved of their corporate existence in Russia. Pius VI. who succeeded him in the following year readmitted them into Italy, and Pius VII. on the fall of Napoleon re-established the Society in all its integrity on 7 Aug. 1814.

Since its rehabilitation the Society has continued to increase in spite of constantly increasing difficulties. In the beginning of 1902 it counted 15,231 members, of whom 6,743 were priests, and 4,542 scholastics in preparation for the priesthood. The general of the Society is Louis Martin, a Spaniard, who was elected in 1893. In the United States they number about 1,800, with colleges and churches in the principal cities and with flourishing missions among the Indians of the Rocky Mountains and Alaska. In Cuba and the Philippines their schools have achieved remarkable success, and the great meteorological observatories of Havana and Manila were established and are at present controlled by them. The chief houses for studies for the American members of the order are at Woodstock, Md., St. Louis, Mo., and Montreal, P. Q.

In some countries of Europe the same hostility still pursues them. In the revolutions of 1830 and 1848 their houses were closed and the members driven out of the country. In the Kulturkampf inaugurated by Bismarck they were the first victims, and all the efforts of the Centre party have hitherto failed to secure their re-entrance into Germany. Similarly they were the first to be struck in the present religious persecution in France. On the other hand they have been the recipients of countless marks of esteem and affection on the part of Leo XIII., and he has placed the stamp of his approval on the Society by adding very many new names to its already long list of canonized saints and martyrs.

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T. J. Campbell, S. J.

Jes'up, Morris Ketchum, American banker: b. Westport, Conn., 21 June 1830. He was engaged in banking in New York 1852–84, but retired from business in the latter year. In 1881 he became president of the New York City Mission and Tract Society, for which he subsequently erected the DeWitt Memorial Church in Rivington Street, in memory of Rev. T. DeWitt, his father-in-law. He was made president of the Five Points House of Industry in 1872; was a founder of the Young Men's Christian Association, of which he was president in 1872. He was also elected president of the Metropolitan Museum of Natural History in 1881, and of the New York Chamber of Commerce in 1899. To the Metropolitan Museum of Art he has given a collection of native woods valued at $100,000; to the Woman's Hospital in New York city, $100,000; and to Yale University and Williams College, large sums likewise.

Jesup North Pacific Expedition, The, an American organization for archæological research, supported by Morris K. Jesup (q.v.), and conducted under the auspices and direction of the American Museum of Natural History. The work began in 1897 in British Columbia. In that year Prof. Harlan I. Smith began to dig in the Thompson River district. In successive years he worked a little farther east, and also around Puget Sound, and down the west coast of Washington. Results of these explorations have been compared and conclusions drawn as to the class of people who inhabited these regions in prehistoric times. Very interesting differences were found among them. Some were more highly developed than others. In particular, one small section east of the city of Vancouver was found to reveal traces of a people much more highly developed than any others of the section, and interesting in many ways to the archæologist. Some of the regions explored revealed the remains of coast tribes; others of interior tribes. At some points these characteristics merged, producing a different

type. New discoveries of one season explained things not understood in previous explorations. So to gather up missing links and further elucidate the whole region, especially that interesting little people near Vancouver, it was necessary to take up some new territory and thoroughly explore it. Prof. Smith, therefore, went into the Yakima Valley in northern Washington in 1903. On the map this section does not look far from the Thompson River district in British Columbia. And when one reflects how very similar are the white people now inhabiting the two sections and how near the two districts are, it is interesting to find that the prehistoric peoples inhabiting them differed at least as much as the Spanish and the Germans, according to Prof. Smith's conclusions. Not only their culture, but their skulls were different, as known by the skeletons brought back by the expedition. These ancient tribes seemed to have lived, each in its little nook of coast or river valley, for unnumbered ages, never going to see what was on the other side of the mountain; developing each its own little morsel of civilization in its own little way, its life and culture and development modified by the little corner of the earth's surface in which it sat down, seemingly to stay forever. Sometimes shell heaps are found miles in length, and with tree stumps six feet in diameter standing on nine feet of these layers, of which each is only an inch or two in thickness. It took a good many generations of Indians to pile up those successive layers with the shells from their shell-fish dinners. A stump of Douglas fir, over six feet in diameter, stood on a shell heap eight feet below the surface which contained human remains. The tree indicated an age for the top layers of more than 500 years. The material brought back included carved and sculptured pipes, stone mortars, pestles, and sinkers, bone implements used on spears, deer antlers used as handles, stone adzes differing from those found anywhere else, bone needles, shell ornaments, and the like. The expedition also found many paintings and sculptures on rock walls, which were photographed.

Jesus Christ, the founder of the Christian religion. Four documents dating from the second half of the 1st century, the "Gospels," give some account of the life of Jesus, chiefly confined to his brief public work and death. Beyond what they give little is known as to his history. Some of the most important facts are referred to in other writings of the New Testament, especially in the letters of Paul; secular history contains mere references to him; a number of later writings, the so-called "Apocryphal Gospels," purport to give additional information, but they are fictitious and worthless; and beyond a very few sayings which were probably rightly attributed to Jesus, called "Agrapha," tradition has preserved nothing of value which was not embodied in the Gospels. These narratives vary, but are rarely inconsistent: usually they may best be regarded as complementary, and the picture of the life and work of Jesus which may be drawn from them has been accepted as trustworthy throughout Christendom in all centuries, and while on many points confirmation from other sources cannot be expected, the investigations of impartial scholars have rather confirmed its accuracy than invalidated it.

Birth and Parentage.—According to the Gospels, Jesus was born in the family of a carpenter named Joseph, living in Nazareth (q.v.), a small town in southern Galilee. Descent from the line of kings of Judah which began with David is positively claimed for Joseph, and, as some understand the genealogical tables, for Mary, his wife, as well, but during the centuries of national disaster the descendants of David seem to have sunk into poverty and inconspicuousness. While Nazareth was the family home, the birthplace of Jesus was Bethlehem (q.v.), the village of Judea in which David himself was born, a fact which is explained by mention of a census said to have been made under Roman authority while Quirinius was Roman representative in Judea, and to have required that all citizens should be enrolled at the original home of the family. Though no other record of this enrollment has yet been discovered, late discoveries make the fact seem more plausible than it was formerly regarded by some scholars.

The Gospels represent Jesus as born of a virgin, conception having been due to special divine power. The date of his birth cannot be given with certainty as to day, month or even year. Since it must have somewhat preceded the death of Herod (April 4 B.C.), it probably occurred sometime in the year 5 B.C. (possibly 6). It is reported that Mary, in a village strange to her, and at the time overcrowded with visitors, could find no place to lay her new born babe but in a manger. But at the presentation in the Temple for the offering of the sacrifices which Jewish ritual prescribed after childbirth, the infant was joyously hailed by Simeon and Anna, aged saints profoundly possessed by the common Messianic expectation of the nation at that time, and, as shepherds from not far away had come in the night of his birth in obedience to a vision of angels, so, later, the Magi (q.v.) from afar guided by a star sought the child to offer him obeisance and rich gifts. This visit of the Magi, however, made Herod aware of the birth of a child who might grow up to be a dangerous rival of the dynasty which he hoped to found, and it is handed down to us that unable to trace it he ordered the slaughter of all the infants of the village up to the age of two years. But his parents, divinely warned, had taken the child to a safe refuge in Egypt, where they remained till the death of Herod, presumably only a short time. If they returned in the expectation of bringing him up in the ancient home of his line, they were deterred by fear of Archelaus who had succeeded his father as ruler in Judea, and consequently they turned aside to Nazareth where they were secure under the milder rule of Antipas.

Early Manhood.—Of the life of Jesus up to manhood nothing is known, except the mere mention of his visit to Jerusalem when 12 years old. It can be supposed only that he was subjected to the natural influences of a religious Jewish family of the time, of synagogue and of school, of a village at once quiet and yet close to the thronging traffic on one of the great thoroughfares of that age, and finally of the work of a carpenter, for such he is said to have been, till 30 years of age. It was about this time, possibly in the year 26 (or 27) that John the Baptist (q.v.) began his public career, and at once aroused great religious and patriotic fervor in the nation.

The careers of neither John nor Jesus are intelligible without an understanding of the expectant attitude of the Jewish people in the 1st century. The ancient prophets of the nation had centuries earlier foretold a renaissance of the Hebrew kingdom under a descendant of David, through the generations this hope smouldered in the hearts of the people, only fanned to a brighter flame by blasts of persecution and national disaster, and the whole influence of the sect of the Pharisees (q.v.), popular and powerful out of proportion to their numbers, increased its intensity under Herod and his successors. The people were ready to be fired by the proclamation so strikingly made by the gaunt desert-dweller that the fulfilment of the national hopes and dreams was near: "The kingdom of heaven is at hand." The preaching of John was, however, no less moral and religious than patriotic. His message was "Repent"; let the nation prepare by penitence to meet the king coming in his kingdom. This prophetic voice set the country in a blaze. Throngs gathered to listen to the new preaching and by a striking symbol, a plunge in the rushing Jordan, to pledge themselves to the new movement. After a time Jesus joined the crowds which attended the ministry of John. It is impossible to say what connection may have existed between John and Jesus. Not only were their families related, but there may have been constant intimacy. John, however, based his later testimony as to Jesus, not at all on his own knowledge of him, but entirely on the divine revelation which was his commission. Jesus offered himself for baptism, insisting that the reluctant preacher should perform the rite, and thus pledged himself to the Coming Kingdom. While it is not claimed that the wonders which attended the baptism were known to others than John and Jesus himself, the story of the Gospels is that a heavenly voice asserted the Messiahship of Jesus, and that with the appearance of a dove the Divine Spirit came to him. The conviction of his mission to his nation and the world was no new thought to the carpenter of Nazareth, and it was with this thought in mind that he recognized the significance of the Baptist's public appearance, joined his auditors, and submitted to the ordinance which he administered. Yet it is not surprising, on the other hand, that he felt constrained, when his own conviction was confirmed, to seek the desert of Judea that alone he might adjust himself to the new responsibilities and burdens of the mission which he must undertake. Amid the solitude of the barren rocks and gloomy caves of that desolate region he meditated and struggled. Of this period we know only the striking story, necessarily autobiographic in origin, in which he depicts the struggles which he underwent as due to Satan's influence. Temptations thus forced in upon him to selfish use of his power, to sensational fanaticism and to compromise with evil in order to advance his ends, were successively resisted, and at the end of 40 days he came forth the victor in all these spiritual conflicts, ready to enter actively on his ministry.

The Ministry.—Jesus returned to the Jordan where John was still at work, and aided by his testimony associated with himself a little group who instinctively recognized in him a future leader of the nation. He went from there first to his home district, where he and his companions were guests at a wedding at Cana, a little town which has been hallowed in all the Christian centuries by John's report of the changing of the water into the wine needed for the entertainment of the company in the prolonged merrymaking incident to such an occasion. Then, as it was near the Passover time, Jesus, accompanied by his mother and brothers as well as his few followers, after staying a short time at Capernaum, went on to Jerusalem. How long he remained in or near the capital city must continue a matter of inference from a few doubtful phrases, but it seems most probable that he remained in Judea for some months, perhaps from April to December. The chief events ascribed to this period are the first cleansing of the Temple and the night interview with the influential rabbi, Nicodemus, and while the effect on city or nation was not great, it was presumably at this time that Jesus formed the strong friendships in Judea, to which incidental reference is often made afterward. The closing of this portion of his ministry seems to have been due, on the one side, to the hostile jealousy of the dominant Pharisees which would hinder success in Judea, and, on the other, to the imprisonment of John the Baptist which made it possible for Jesus to work in Galilee without what might have seemed competition, and, indeed, made it advisable for him to take up the work which John had been obliged to drop.

On his return to Galilee Jesus soon recalled his disciples, who, if they had accompanied him throughout his work in Judea, had scattered for a time to their homes, and associated himself with them in a companionship which was thereafter unbroken till his death. He made Capernaum the central point of his ministry, returning thither from each of his repeated tours throughout the many scores of cities and villages which then existed in Galilee. Wherever he went the keynote of his preaching was the same as John's had been, "Repent, for the kingdom of heaven is at hand:" but as time passed his instructions, exhortations and warnings swept throughout the whole scale of human experience and touched every note of religious and moral truth. The keynote of his teaching about God was his love, infinite, untiring, eternal. On the ground of this love he proclaimed pardon to every penitent, even though a harlot or an outlaw. But this certainty and freeness of forgiveness was not allowed to diminish the loftiness and imperativeness of the standard of duty which he held up. Indeed, the high moral tone of his teaching, accompanied as it was by a constant and insistent demand for absolute sincerity, and his disregard for all mere forms, without the spirit in particular, his teaching and practice in reference to fasting, ceremonial purifications and Sabbath keeping, combined to set against him the Pharisees and through their influence the leaders and officials of the nation.

Popularity.— For a long time his popularity was great and throngs gathered to see and hear him, attracted in part by the reports of his miracles. Far and wide the stories were told that diseases yielded to his command, that the fevered, the palsied, the blind, the deaf and dumb, the lepers, the demonized, were restored to soundness, and, later, that on repeated occa-

sions he brought the dead to life. But these great works were distinctly secondary. He was first and foremost the Prophet of Nazareth, the Preacher. As such he spoke with peculiar attractiveness and power. His style was simple and direct, and his discourse was frequently adorned with unequaled parables, illustrations drawn from nature or common life, which, though sometimes veiling the truth from the thoughtless, sometimes added immensely to its clearness and effectiveness. His activity as a preacher at first won him steadily increasing popularity among the people at large, until, about two years after his work began, 5,000 men, whose hunger had been satisfied by his power on the lakeside, determined to make him king. But in this purpose they lacked all real sympathy with the character and aims which Jesus exemplified. The kingdom which centuries before the prophets of the nation had foretold was a kingdom to be sure, but a kingdom which should be based on a right relation of its subjects to God and existing only to serve the divine ends. The Jews as they read these prophecies had seen in them, only something political, worldly and selfish. Now when Jesus in fulfilment of prophecy had come to offer himself to the nation as its promised king, he would be king only as his kingdom might be the expression and instrument of a religious people, deeply, purely, unselfishly religious. So at the very climax of popular favor his clear vision instantly recognized how widely their ideals and purposes differed from his.

The Twelve Apostles.— For some time this condition of affairs had been anticipated, and Jesus had laid his plans and shaped his work accordingly. Since the Jewish people would have no such kingdom as he was about to establish, he had several months previously organized under the name of apostles a group of 12 of his disciples, to whom he would impart himself, and on whom he would so far as possible stamp himself, that they in turn might repeat his activity in their relations to others. Although he retained the name kingdom, what he looked forward to establishing was not a political but a spiritual community or body.

After the choice of the apostles the discourses of Jesus had been largely shaped for their special benefit: after his rejection of the offer of kingship from the unappreciative multitude, who in turn instantly deserted him when they saw that he would refuse to gratify their selfish hopes, his work was mainly for the benefit of the twelve, although he neglected no opportunity which came within his reach of trying to touch the soul of the nation or of individuals. Much of the last year of his life Jesus spent in seclusion. He made a journey, doubtless traveling in leisurely fashion, northwest from Capernaum to Sidon, returning as it appears by a roundabout route through the Decapolis, and another journey northeast to Cæsarea Philippi; some time was spent in Perea to the east of the Jordan; and though he seems more than once to have shown himself conspicuously in Jerusalem or its immediate neighborhood, yet during most of the time which he spent in Judea he secluded himself in an obscure village named Ephraim.

So far as the work of Jesus was concerned, the most significant event of the last year, if not of all the three years of his ministry, was the conversation with the apostles near Cæsarea Philippi as to the opinion of him which generally prevailed and as to their own convictions. While Jesus is reported at least once to have claimed to be the expected Messiah, and while this claim was necessarily implied in much that he had said of himself, and while some of the twelve had very early expressed the opinion that they had found the one of whom Moses and the prophets had spoken, yet this view had never found expression as their matured conviction. Such expression Jesus at last sought. His first question was as to the common sentiment concerning him, and the frank answer was that while he was generally recognized as one far beyond the ordinary, he was not at all recognized as the Promised One. In face of this answer Jesus pressed the further question, "What am I to you?" and the answer of Peter, one speaking for all, was that he was the Christ. This answer assured the ultimate success of his mission, for these followers would win more. But he could not fail at the same time to foresee the irrepressible conflict between himself and the leaders of the nation, and so, relying on their faith in him as the Christ, he immediately began to familiarize them with the fact of his death, though this only confused and offended them, and at the same time to add promises of resurrection which they do not seem to have grasped at all.

The apparent failure of the mission of Jesus which he thus foretold, culminating as it did in his rejection and death, was due alike to what he was, what he taught and what he demanded. He himself was devoted with absolute singlemindedness to his work, sincere, unselfish, loving, beneficent, and pure with such perfect and manifest purity that only a few voices of detraction have ever been out of harmony with the else unanimous recognition and assertion of the sinlessness of his whole life. His teaching, while not in all respects original in matter or form, was in spirit and effectiveness such an advance on the Old Testament which he confirmed or the rabbis with whom he largely agreed that it seemed "a new teaching." He demanded of others the same perfection of sincerity, altruistic self-forgetfulness and supreme devotion to the will of God which he himself practised, and he as sternly denounced hypocrites as he tenderly welcomed penitents. All his teaching came with a unique tone of authority and this was made more significant by the claims which he advanced for himself. He occasionally asserted and constantly implied that he was a special messenger from God and unique representative of him, and from time to time he distinctly claimed divine attributes and powers. Thus he spoke; to confirm this he pointed to his miracles; as such he held himself up as the proper object of supreme and absolutely limitless devotion: the recognition of this supremacy he demanded of all and gladly accepted from his disciples, a self-assertion which in view of his sincerity and simplicity of soul is as significant as in view of his transparent honesty coupled with unsurpassed sensitiveness to evils is the absence of ever confessing a fault. Between such a one with such a message and such demands and the rulers of the nation at the time there was necessarily an irreconcilable antagonism which could end in no way but in his death.

The Messiah.— In the spring of the year 29 (possibly 30), after Jesus had been before the public for three years, the task of implanting the spiritual kingdom in the hearts of the select 12 was so far completed that it would be permanent, and at the same time the conflict with the authorities could not wisely be longer postponed. Accordingly Jesus went up to Jerusalem to the Passover with the throngs which assembled at that time from every part of the country. While he gave repeated proofs that in spirit he was walking in the shadow of the cross which he foresaw at the end of the road, yet this journey, unlike those which had preceded it, was intentionally made, by the sending of 70 messengers before him to proclaim his coming, a significant progress through the country. Reaching the neighborhood of Jerusalem, he stopped for the Sabbath at the neighboring village of Bethany, to which he returned each night till the end, and then on the following day he made a somewhat formal entry into the capital city. It needed only that he should mount a riding ass that those who accompanied him should be reminded of an ancient prophecy, and they, with another throng which came out from Jerusalem to meet him, acclaimed him as the promised and coming king, carpeting the road before him with green branches from the trees at the roadside and with their own clothes thrown before him in the zeal of their loyalty. Thus they led him to the Temple, where the procession dispersed. While informal and at first thought only a failure in its lack of definite result, this "triumphal entry" had deep significance as a public claim of his right to rule the nation as God's appointed representative, and he stopped short of assuming this office only because he desired and demanded first the acceptance of him by the nation. During the days that followed he repeated this claim in various ways; again he drove out of the Temple the huckstering crowds so out of harmony with its proper use, and in prolonged controversy with the representatives of all the parties of the time he bore himself as their Master and proved himself such. All this goaded his enemies at last to action, and through the treachery of Judas Iscariot, one of the inner circle of 12 disciples, almost at once an unlooked-for opportunity presented itself to them.

The Last Supper.— On Thursday evening of Passover week, after special precautions to keep secret the place of their assembling, Jesus sat down at a last supper with his apostles to what he knew would be his last interview with them before his death. While the traitor has gone out to secure his arrest, he pours out his soul to the others in words too tender and profound for their comprehension; he warns them that they will speedily desert him to go alone to his fate; he tells them something of the unique significance of his death in language which contains in germ the later doctrines of the Church, on this point; presenting them bread and wine, he instituted the second of the two rites of the universal church and finally commends them and all future believers in him to God in a prayer of incomparable elevation and pathos. He then went out to a resort familiar to him and his friends, an olive grove named Gethsemane in a valley close to the walls of the city. There the horror of the coming hours, not craven fear of death, but distress at the very thought of the tremendous experience which he must undergo in soul, drew from him a thrice repeated prayer of such intensity that the very blood was forced through the pores of the skin, but on the prayer followed serenity of resignation and purpose which continued unruffled to the end. Then he awakened his disciples who to his disappointment had repeatedly been overcome by sleep and so had left him to his spiritual distress without even the sympathy of his friends, and went to meet the force of Roman soldiers and Temple guards which in needless precaution the officials guided by the traitor brought to seize him. He quietly submitted to arrest, and his followers struck but a single blow in his defense and then scattered in the darkness, two of them, however, John and Peter, following at a distance, the latter only to deny later all discipleship and even acquaintance.

Trial for Blasphemy.— While some details of the four accounts of the trials of Jesus are obscure, if not inconsistent, yet their general course may easily be made out. At the house of the high priest Caiaphas, or of the still more influential Annas, his father-in-law, and an ex-high priest, there was before daylight an informal session of all the Sanhedrin who could be gathered. Unable to find even perjured testimony which was sufficiently consistent to warrant his condemnation, the high priest as president of the great court of the nation put Jesus under oath, and asked him if he claimed to be the Christ. Firmly and positively Jesus answered that he was, whereupon his enemies without even pretense of investigation declared this claim to be blasphemy for which according to Jewish law he must die. But this verdict would be legal only if rendered in the daytime, and so, having been left during the interval to be the object of mockery by the guards, as soon as the day broke, he was formally arraigned and condemned. As, however, the right to inflict the death penalty had been reserved to himself by the Roman procurator, in order to accomplish their purpose they must secure his condemnation of Jesus in addition to their own, and accordingly the Sanhedrin conduct him to Pilate and demand his execution. But Pilate refused to order his execution without investigation, and when they charged him with instigating sedition against the Roman government, the judge instantly recognized their malicious insincerity and the innocence of the prisoner. In his consequent desire to release him Pilate in turn pronounced him innocent; sent him to Antipas, who only made sport of him and returned him; vainly tried to stir up the populace to demand his release according to the custom that a prisoner should be released at Passover time; ordered him scourged in hope that that cruelty would satisfy his enemies; displayed him bloody from the torturing lash and crowned by the soldiers with thorns in cruel jest, fancying that this sight would surely evoke pity; but finally, terrified at the mutterings of the crowd and fearing lest should he persevere charges might be made to the emperor against himself, Pilate ordered the crucifixion of Jesus.

The Crucifixion.— The execution took place at once, scarcely later than the middle of

the forenoon. Although so far weakened by the sufferings of the night and morning that the sufferer fainted under the cross which, as was customary, was laid on him to bear to the place of execution, he bore himself throughout with majestic patience and dignity. Under the jeers of his triumphant enemies, in sight of his mother and friends, in the unexplained and portentous darkness which beginning at noon lasted for hours, amid the indescribable physical tortures of the cross, he spoke but to pray forgivingly for those who were the agents of his suffering, and to commend his mother to John, her nephew and his most intimate and beloved disciple. At mid afternoon he uttered a cry to God, "Why hast thou forsaken me?" which can be understood only as expressive of intensest soul agony. As if this agony culminated and ended with the cry, he then spoke calmly of his thirst and took the drink which a sympathetic bystander pressed to his lips, then commended his spirit to God, and with a loud shout expired, it would seem with a literally broken or ruptured heart. Although death seldom came so soon to the crucified, yet the fact is undeniable in the case of Jesus, for when somewhat later the criminals who had been crucified with him received a blow intended to hasten their death, the soldiers recognized that he was already dead, and yet one of them thrust a spear deep into his side, apparently touching the heart, and on Pilate's inquiry the officer in charge certified to his death. By leave of the governor two members of the Sanhedrin, who were secretly disciples, took down the body and hurriedly but reverently buried it at the close of day not far from Calvary, where he had been crucified, in a rockhewn tomb, which later was officially sealed.

Of the facts relating to Jesus during the next few weeks, no less than five (if the last verses of Mark are by another hand, then six) separate accounts are preserved, no two precisely agreeing, but, on the other hand no two being mutually contradictory, and one of these accounts, that of Paul, was written within 25 years of the events narrated. It is told that first women going at the dawn of Sunday entered the open tomb but found not the body of Jesus; that later Peter and John also found it empty; that Peter, then ten of the apostles together, and also two other men miles from Jerusalem, as well as Mary Magdalene, saw Jesus that same day in recognizable human form and talked with him; that these appearances and conversations were repeated at different places and in varying circumstances for about six weeks; that on one occasion he was seen by as many as 500 at the same time, some of whom were at first doubtful as to the facts: and that then these manifestations entirely ceased, except for the experience of Paul. It is certain that the disciples in these few weeks had come to be convinced that Jesus had actually been with them and that consequently they passed out of a state of gloom and despair into joyous and unflinching boldness; that the belief in the physical resurrection of Jesus was an essential part of the creed and preaching of the primitive church; and that the first day of the week became the Christian day of worship. No plausible explanation of these facts, of the empty tomb; of the reports and convictions of the disciples; who claimed to have seen and talked with Jesus in human form, especially of the case of Paul; of the revulsion of feeling on their part; of the consequent foundation of the Christian Church, and of the consecration of the first day of the week, has ever been given except that after his death Jesus, in this as in so much else unlike all other men, entered by resurrection and later ascension upon a new course of life and a new course of activity. Without the resurrection as well as the life and death of Jesus historical Christianity could never have come into existence; by it he became the founder of the Church and the dominating personality of the ages.

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David Foster Estes,
Professor of New Testament Interpretation, Hamilton Theological Seminary, Colgate University.

Jesus Christ, Logia of, the sayings of Christ, a title given to certain first century papyri, discovered in the course of excavations at Oxyrrhynchus carried on under the direction of Professors Grenfell and Hunt. The first find of these logia was made in 1897, but in 1903 a second collection was discovered. It has been suggested that these may be remains of the so-called Gospel of St. Thomas. Each of the recently unearthed sayings, like those of 1897, is introduced with the sentence 'Jesus saith.' These sayings are for the most part new, though one of them is in part known to have occurred in the Gospel according to the Hebrews. The new sayings are not so well preserved as the 1897 papyrus, in which the deep blackness of the ink was wonderful. In the later discovered papyri the ends of the lines are lost throughout, but there is this advantage: the introduction to the entire collection of sayings, of which both papyri are probably a part, is given, stating that these were the sayings in the logia which Jesus spoke through Thomas and perhaps another disciple.

The first saying is that one of which a part is already known to have occurred in the Gospel according to the Hebrews. It is one of the most remarkable sayings ascribed to Christ. It says: "Let not him that seeketh cease from his search until he find and when he finds he shall wonder; wondering he shall reach the kingdom and when he reaches the kingdom he shall have rest."

The kingdom of heaven is also the subject of the second saying, which is much the longest and most important. The kernel of it is that most remarkable and profoundly mystical saying recorded by St. Luke alone: "The Kingdom

of God is within you,» but the saying in the papyrus appears in quite different surroundings from those attributed to it by St. Luke and extends far into another region. When published the sayings will doubtless be widely discussed by the critics as the logia of 1897 were. They are of enormous interest on account of the variations they disclose from the accepted texts.

One variant which Prof. Hunt quotes as of great value is Luke xi., 52, which reads: «Woe unto you, lawyers; for ye have taken away the key of knowledge, ye entered not in yourselves, and them that were entering in ye hindered.» The papyrus, however, reads: «Ye have hidden the key of knowledge, ye entered not in yourselves and to them that were entering in ye did not open.»

The recently discovered papyrus contains part of the discourse of Christ closely related to certain passages in the Sermon on the Mount in St. Matthew and to the parallels thereof in St. Luke; and secondly, part of the conversation between Christ and his disciples. The latter presents a striking resemblance to the well known story recorded in the Gospel according to the Egyptians and in the uncanonical gospel used side by side with the canonical gospels by the author of the Second Epistle of Clement, which was written about the middle of the second century. It consists of an answer to the question put in the Gospel according to the Egyptians into the mouth of Salome; in the uncanonical gospel quoted by Clement into the mouth of some unnamed person, but by the recently discovered papyrus into the mouth of the disciples. The question, with some variations of form between the three, was: «When will Christ's kingdom be realized?» The answer as recorded in the Gospel according to the Egyptians was: «When ye shall trample on the garment of shame; when the two shall be one and the male as the female neither male nor female.» The papyrus differs somewhat from this, and incidentally shows that the interpretation generally given to «When ye shall trample on the garment of shame» is incorrect. It is usually considered to signify «when ye put off the body; that is, to die.» But the papyrus shows that the real point lies in a mystical allusion to Genesis iii., the phrase meaning, «When ye have returned to the state of innocence which existed before the fall.»

Jesus College, Cambridge, England, founded by Alcock, bishop of Ely, in 1496. It has 16 foundation fellowships, open without restriction to all his majesty's subjects. Five were of the original foundation, and the others have been added by subsequent benefactors. Six of the fellows are required to be in orders. The mastership and one fellowship are in the absolute appointment of the bishop of Ely. To the other fellowships on a vacancy the master and fellows nominate two candidates, one of whom is elected by the bishop. There are numerous scholarships.

Jesus College, Oxford, England, founded by Queen Elizabeth in 1571 on the petition of Dr. Hugh Price, treasurer of St. David's, Wales, who left lands for the maintenance of a principal, eight fellows, and eight scholars. It was increased by different benefactors until it came to consist of a principal, 19 fellows, and 18 scholars; but by the ordinance of the university commissioners the fellowships have been reduced to 13, a half of which as near as may be are to be filled up by natives of Wales, the other to be under no restriction by reason of birth. A fellowship founded by Charles I. for natives of Guernsey and Jersey has been converted into two scholarships for natives of these islands or persons educated at Elizabeth College, Guernsey, or Victoria College, Jersey. This was the first college founded on Protestant principles.

Jesus Island, Canada, an island in the Saint John River not far from where it joins the Saint Lawrence River; area, about 1,200 square miles.

Jet, a mineral, which is found in compact masses so hard and solid as to be susceptible of being turned on a lathe and manufactured into ornamental articles. It has been worked for centuries in Whitby, England. It is found in thin laminations, which subsequently thicken out to 2 or 3 inches in the upper lias strata in that neighborhood; a lower bed, from which the best quality is obtained, has a thickness of 20 feet, and is known as jet rock. Jet is supposed to have been worked in England as far back as the time of the Romans. Jet rosaries and crosses were common in the Abbey of Whitby when it was a resort of pilgrims. The jet manufactures of Whitby fell away about the time of Queen Elizabeth, and were revived in 1800. It is also manufactured at Scarborough, England.

Jetties are dikes at the mouth of a river or across a harbor bar to increase the riverine or tidal current by narrowing the channel, and thus scour out a deeper bed, to accommodate navigation. Single jetties are solely at the mouths of rivers with strong currents, to deflect these to one side of its natural channel, but in most rivers, and in all harbors they are double, forming an entire artificial channel. Briefly, the physical principles are: The power of water to transport solid matter varies as the square of its velocity, so that increasing the strength of current two fifths will about double its sand-carrying capacity; the velocity increases with increase of slope and decrease of friction; the slope is increased by narrowing the channel, since it forces flood waters inside or outside to rise higher at the entrance, and the friction decreases as the width of the channel; and lastly, if a channel of a given depth and width passes a given quantity of water, then a narrower channel involves either a permanently greater height of water if the bed were rigid, or the scouring of the bed to a depth which, multiplied by the new width, will produce an equal cross-section with the old. The increased slope and the correspondent velocity vanish as the water cuts a deeper basin; but the velocity due to lessened friction does not, nor do the deepened channel, the greater discharge through it, and the greater tidal fluctuation due to the larger basin. The channel is scoured along until the deepening sea establishes an equilibrium of action.

The system is not new. A number of important European rivers were jettied even before the middle of the last century, and others not much later. The Danube at Sulina had been deepened to 21 feet, from 8 feet before; and in 1874 Eads found seven German rivers, including the Oder and Vistula, improved so that with

initial channels of 4 to 7 feet, they then had 13 to 23.5. Several of these are still deeper now, the result increasing somewhat for many years under the same conditions. The Neva in Russia has also such works; as also the harbors of Calais and Dunkirk in France. In the United States a very great number have been constructed, both for rivers and harbors; the greatest of all are the jetties at the mouth of the Mississippi, and as the general principles are alike in all, these may be briefly described.

The Mississippi discharges its waters to the Gulf not by one channel, but in the main by three, running through "passes" 12 to 17 miles long from the delta land to the sea, and widely divergent. The largest is the Southwest Pass; next the easternmost, Pass à l'Outre, with two branches. In the middle is the smallest, South Pass, 600 to 800 feet wide, and taking not over a tenth the total discharge, with a shoal at its head only 15 feet deep, and a bar at its mouth only 8 feet; so that, with 30 feet of water through the delta, it was unserviceable for deep-water navigation. Capt. James B. Eads offered to build jetties to deepen the bar at Southwest Pass from its then 13 to 28 feet; but Congress preferred South Pass, as cheaper and simpler, needing work only at the head and foot. Work was begun in June 1875, and within nine months the water was 13 feet on the bar; by 1879 it was 29 feet; it is now over 30.

The west side of the pass had silted up into land 4,000 feet farther out than the east, so that the west side of the two parallel dikes built out to 30 feet depth in the Gulf was about 7,800 feet, while the east was 11,800. First piles were driven in two rows 1,000 feet apart (the piles 12 feet apart) to mark the lines of the projected jetty-walls. Then mattresses were built, of willow branches, or young willows 15 feet long, cut with the leaves on, laid in four courses, each crosswise to the next, and fastened together at top and bottom by pine planking 2½ inches thick, doweled with hickory pins; this compressed the willows to a thickness of about 2 feet, and their brush-ends projected 3 or 4 feet. These mattresses were 100 feet long; for the bottom course they were made 50 feet wide, but steadily narrowed for each of the four courses at first needed to bring them to the surface of the water, the top one being 20 feet wide. Wider ones were used in deep water. These were built on shore, on ways as for launching boats; towed by tugs to the places indicated by the line of piles, and sunk by loading one or two tons of stone on top. Once down, they speedily filled with sediment and became solid. At the sea ends foundations of mattresses 200 to 300 feet broad were laid. For two or three years these stone-laden mattresses gradually sunk in the soft bottom, and new ones were added at the top to bring the surface even. The willows not imbedded in sediment were revetted with stone. Where exposed to storms, they were considerably sloped, and more thoroughly revetted. The sea ends were afterward capped with concrete blocks. The jetties have undergone considerable repairs since then, but have essentially done their work of making the river navigable for large vessels.

One of the difficulties was this: If obstacles were placed in the way of a free flow of water, the river would by so much at least desert this pass and run through the others; so that their heads had to be closed up to a sufficient extent to prevent this. Plans for improving the Southwest Pass in like manner have been prepared by the government engineers, but have not been executed.

At the mouth of the Brazos, west of Galveston, Texas, an ingenious plan was adopted for avoiding interference in the work by flood-tides: A long trestle was built out to deep water above high tide, the mattresses hung under it by ropes, and the stone dropped on them from above to sink them. Instead of being launched from shore and towed, they were carried on a portable railway running on top of the trestle, and let down.

The Columbia River jetty is the most conspicuous example of the single instead of the double dike. It is 4234 miles in length, the longest in the world. The bar at the mouth of the river, ever shifting and sometimes not over 12 feet deep, had half spoiled this superb river for navigation, and was greatly dreaded. But the river has a mean high-water discharge of 600,000 cubic feet per second, a mean tidal ebb of 1,000,000, with tides of 6.2 feet; and in 1884 a single curved line of brush mattresses with rubble-stone copings was begun, completed in 1894, to turn the current away from spreading itself on both sides and scour out the channel on one. This was finished in 1894; it has formed a permanent channel 30 feet deep, and made the river a highway of the heaviest ocean commerce, with lines to all Pacific lands.

Others are too numerous for more than brief mention. At Yaquina Bay, Oregon, 115 miles south of the Columbia — an estuary 20 miles long discharging into the sea through a narrow, tortuous, shifting channel, and over a sand-bar with 7 feet of water — parallel jetties about half a mile long, one of rubble-stone on a rock bed, one of brush and stone on a sand bed, have doubled the depth of water and made the channel calculable. At Galveston, the single jetty was a relative failure, it needing a double one to converge the tides; and in 1896 the government completed it, with sides of 35,000 and 25,000 feet, costing over $8,000,000, and furnishing 27 feet of water between the island and the mainland. Other notable ones are at the mouth of St. John's River, Florida, beginning at the sides of the river-mouth and converging to 1,000 feet apart at the crest of the bar. Charleston's double one has sides of 15,000 feet each.

Jeune, Lady **Mary Stewart-MacKenzie,** English writer on social topics. She is the wife of Sir Francis Jeune and has long been prominent in efforts to relieve the condition of the poor of London. A volume of essays selected from her contributions to periodicals has been published under the title 'Lesser Questions' (1894).

Jev'ons, William Stanley, English logician and economist: b. Liverpool 1 Sept. 1835; d. Bexhill, near Hastings, 13 Aug. 1882. He was graduated from University College, London. Having obtained an appointment in the Royal Mint, he went to New South Wales in 1854, but afterward returned to England, and in 1866 became professor of logic, philosophy and political economy in Owens College, Manchester, and this post he held until his resignation in 1876 in order to accept the chair of political economy in London University. He retired from this

position in 1880 for the purpose of devoting his whole time to literary pursuits. His writings include: 'Pure Logic' (1864) and 'The Substitution of Similars' (1869), in which he sought to popularize symbolic logic through a modification of Boole's mathematical methods; 'Elementary Lessons in Logic' (1870); 'Theory of Political Economy' (1871); 'The Principles of Science' (1874); 'Money and the Mechanism of Exchange' (1875); 'Primer of Logic' (1876); 'Primer of Political Economy' (1878); 'Studies in Deductive Logic' (1880); and 'The State in Relation to Labour' (1882). Among works published posthumously are: 'Methods of Social Reform' (1883); 'Investigations in Currency and Finance' (1884); and 'Pure Logic' (1890). In a pamphlet on the 'Coal Question,' he presented a mass of evidence to show that England's progress would be checked by want of coal; in his work in political economy he attempted to put the chief definitions in the form of mathematical quantitative formulæ, and in this way did important work in revealing the nature and relations of economic facts; he also developed the theory of marginal utility. His 'Life and Letters' edited by his wife were published in 1886.

Jew, The Wandering, a poetical personage of popular traditions, who owes his existence to a story connected with the well-known scene in the history of Christ's passion. As Jesus was on the way to the place of execution, overcome with the weight of the cross, he wished to rest on a stone before the house of a Jew, whom the story calls Ahasuerus, who drove him away with curses. Jesus calmly replied, «Thou shalt wander on the earth till I return.» The astonished Jew did not come to himself till the crowd had passed and the streets were empty. Driven by fear and remorse, he has since wandered, according to the command of the Lord, from place to place, and has never yet been able to find a grave. Shelley, Lewis, Croly, and Mrs. Norton in England, Schubart and Schlegel in Germany, and Sue in France, have turned this legend to account. Goethe has sketched Ahasuerus with great spirit and humor as a philosophic cobbler at Jerusalem who opposes Christ with a cold worldly logic which will not look above the things of earth.

Jew of Malta, The, a tragedy written by Marlowe (q.v.) about 1587, first acted 1592, and first published in 1633, edited by Heywood. Shakespeare was largely indebted to Marlowe's play for his 'Merchant of Venice.'

Jewel-weed, Touch-me-not, or **Snap-weed,** popular names for two plants, *Impatiens aurea* and *I. biflora,* of the natural order Geranaceæ, well known in damp shady places throughout the cooler parts of North America, where they form dense masses. They are characterized by sac-like pendulous yellow or orange, more or less spotted flowers, and by their sensitive seed pods which when mature burst with the slightest touch and throw the seeds to a considerable distance. Hence the second and third names above. The first name is probably a survival of their use as antidotes for so-called Rhus poisoning.

Jewell, joo'ĕl, **Marshall,** American statesman: b. Winchester, N. H., 20 Oct. 1825; d. Hartford, Conn., 10 Feb. 1883. He learned the tanning trade in his father's leather belting business; went West, where he was a telegraph operator for three years, and in 1850 returned and re-entered his father's business. In 1868 he was the unsuccessful Republican candidate for governor of Connecticut, but in 1869 he was elected, and re-elected in 1871. During his administration as governor the present militia system was adopted, and the erection of the new State House begun. In 1873 he was appointed United States minister to Russia, and was recalled to become postmaster-general in President Grant's cabinet in 1874. He resigned in 1876 on account of disagreement with the President's policy in the Whiskey Ring frauds. His work in the Post-office Department was very effective and led to the discovery of the Star Route scandal, and to the introduction of several reforms. In 1880 he was chairman of the Republican National Committee and managed the Garfield campaign.

Jew'elry, ornaments for personal adornment, usually made of gems and precious metals. At some remote period primitive man gradually migrated northward from the tropical belt in which he probably first came into existence, and as he felt the colder temperature inconvenient, especially at night, he found it advisable to invent some sort of covering or clothing, by means of which he could obtain warmth. What the first clothing was it is of course impossible to say, but it may be conjectured to have consisted of belts of grass or leaves knotted together either by their own stocks or by accessory vegetable fibres. When men became hunters, which they did not do until they had progressed far enough to have invented offensive weapons, they no doubt soon used dried skins for clothing. A rough tanning of such skins could have been managed by rubbing them with fat. Then came the difficulty of fastening them. Some savage tribes still wear cloaks which have only a hole cut for the head to go through, and this is likely enough to be a primitive type; then also they might have been tied up with strips of sinew, but at an early stage they were pinned together with a bone or large thorn. Here is the germ of the brooch. Numbers of such pins have been found in all places where the remains of primitive man exist, and they range from the simplest forms to quite ornamental ones. The heads of the carved specimens show a certain amount of progression, and are often decorated with engraved lines, dots, and circles. Ivory, wood, and bone are all commonly used, and in time, as metal workings became known, these carved pins are imitated in bronze or gold. From the Stone Age, through the Bronze Age, up to the Iron Age, in which we are still considered to be, pins and their derivatives, brooches and buckles, have been universally used, and it is an interesting study to endeavor to trace their utilitarian development as well as their artistic and technical beauties. Starting with the earliest metal pins, which are of bronze, it soon appears that the head or thickened end is treated ornamentally, hammered flat, and pierced. Into the pierced hole in the top of pins are often found wire rings coiled several times, or single rings, as in plenty of specimens found in Ireland. In other cases of Roman pins found in Britain, there are chains of which a few links

only are left, and in one case at least a pin the head of which was threaded with a chain of several links, was found among the debris of one of the Swiss lake dwellings. The modern safety-pin is quite the same in all essential points as one which was found by Dr. Schliemann at Mycenæ, and the same form, with the arch more or less specialized in design, has been very largely used North and South, East and West. The Greeks made the arch short, and enlarged and ornamented the nose or hollow for the pin to rest in; the Romans made the arch big, and set it with beads of amber and bronze, and fretted it out in innumerable ways, curves, spirals, and all sorts of twists and turns which the fancy of the artist could devise. The Roman fibulæ are more usually made of bronze or silver, but the Greek are largely of gold, and of exquisite workmanship.

Among the Romans of about the Augustan age, cameos were largely used as pendants; coins also, richly set, were so used. Charlemagne, in the 8th century, wore a splendid reliquary as his necklace, which was sent to him by Haroun-al-Rashid. This was buried with him, and was found on his neck when the body was exhumed in 1169. The use of ornamental monograms in jewelry began during the 14th century. Diamonds used in jewelry before the beginning of the 17th century are always cut, either as "tables" or "roses," the "brilliant" not being then invented, and all colored stones were cut in the rounded form known as "cabochon."

A French jeweler, named Daniel Mignot, during the beginning of the 17th century, is supposed to have first set rows of jewels close together in consecutive order. This notion was, of course, very suitable for working the monograms then so prevalent, and it has been more or less used ever since. From the 16th century pearls were much in fashion, and pendants commonly have single pearls or groups of pearls dependent from them. Toward the end of the 17th century pendants are found made of gold only, but exquisitely pierced, chased, and engraved, and some specimens of Portuguese work are remarkable for delicacy of execution; these are sometimes set with very small diamonds. Sprays of leaves and flowers, and knots of ribbon, during the 17th century, are made in metal, and thickly set with crystals — paste or real jewels — particularly by Venetian, French, and Portuguese, followed at a safe distance by English workmen. The best of these are by Giles Légare, and in the 18th century his follower, Pierre Bourdon.

The jewelers of the beginning of the 18th century did not hesitate to mix gold and silver in their jewelry. Gold was commonly used for the settings of colored stones, and silver for diamonds. Summarized briefly: (1) Savage tribes have used for their ornaments natural objects easily worked. (2) The cultured nations of antiquity have generally made their finest pieces of personal ornament of gold. (3) During the period of the Renaissance gold and silver, colored precious stones, and vitreous enamels were very largely used. (4) During the 19th century the diamond particularly claimed the attention of jewelers. See DIAMOND; GEMS; PEARL, etc.

Jewelry Trade, The. The making of jewelry is one of the oldest trades of which the American historian can find record, for while the manufacture of such articles of adornment occupied a position of little commercial importance until several years after the settlement of this country by the colonists, the fact remains that jewelry was made by the native Indians many years before the first European set foot upon American soil.

Prim and precise as the Puritans are supposed to have been, it is a mistake to imagine that they were too primitive in their opinions to appreciate the advantages of a little jewelry in the adornment of their persons. Both the Dutch and the English brought such ornaments with them to the new world, and one's personal attire was considered incomplete without the buckles, brooches, and rings which were in vogue at that time. As the natural result gold and silver smithing was one of the first industries to be established in the colonies, and every large town had its smiths who produced the most popular articles of jewelry, as well as certain kinds of trinkets for the Indians, medals, snuff-boxes, etc.

One of the most important products of the early silversmith's art was the making of elaborate boxes from rare woods, or sometimes, shell, inlaid with gold or silver. Snuff-boxes were manufactured in this way, while other boxes were made to contain the parchments which conferred the freedom of the city upon distinguished guests. Sometimes these boxes were made entirely of silver and were lined with gold. Occasionally the metal was gold, studded with precious stones. It was such a box as this in which the people of New York presented the "freedom" to Alexander Hamilton, after his elaborate defense of the liberties of the press in New York, in 1784; while similar boxes were later conferred upon Lafayette, Washington, and Scott. The making of such boxes and other ornamental insignia conferred upon distinguished men represents but one of the branches of the art of the smith, for there were so many demands made upon the craft that its ranks were constantly extending. In 1788, when the adoption of the Federal Constitution was celebrated in Philadelphia, there were no less than 35 goldsmiths and jewelers in the procession, while, more than 20 years before, it had been the profuse display of jewelry, silverware, etc., in the homes of the prominent New Yorkers that had incited Townshend to introduce the historic bill known as the "Stamp Act," which was undoubtedly the entering wedge in the struggle which finally separated the colonists and the Crown. At this period in the history of the nation the colonies that could boast of the richest inhabitants, and which could, therefore, afford to spend the greatest amount of money for jewelry and other articles of personal adornment, were South Carolina, Virginia, Maryland, New York, Pennsylvania, and Massachusetts.

When compared to the facilities afforded to jewelers at the present day the tools of the old-time silversmiths were crude enough. The only noticeable difference between them and those used by workers in other metals was in their size, a factor which fitted them for finer work.

The extreme tenuity and the lack of brittleness of gold and silver gave room for the exhibition of great ingenuity on the part of the artist who aspired to forget the ordinary patterns in the creation of more fanciful designs, while the attainment of the polished, or burnished surface, made a more tender treatment imperative. In the beginning of the century the art of frosting gold, like that of satin-finishing silver, was unknown. Gold and silver both came from the workshop with a glittering surface, and such ornamental and decorative work as may then have been attempted, was either crude enameling, applied work, or engraving. Later, of course, came all the new processes by means of which the precious metals have been used conjointly with other metals, or with wood, mother-of-pearl, glass, porcelain, pearls, and gems.

In those days everybody who engaged in the industry of jewelry-making learned his trade so thoroughly and in such an old-fashioned manner that it was impossible to draw the close distinctions between the several different but associated occupations that are so clearly drawn to-day. At that time, to say that a man was a "jeweler" indicated that he was a goldsmith and silversmith, a watchmaker and clockmaker, and a maker of fine mechanical instruments, for each of these branches involved a knowledge of the others. At the same time the trade was thoroughly a mechanical one, and any attempt to realize a higher ideal in the making of jewelry and other ornaments was most unusual. Instead of "wasting his time" over such inventions the artisan devoted all the hours of labor to such work as might be assigned to him, even dividing his time and skill between his own and kindred trades. To a similar degree the seller of such goods was more frequently a workman than a dealer. While a merchant in the strict sense of the word, he was unusually a person who could take his place at the bench if necessity required, and who owed his success as a salesman to his knowledge of the various kinds of metal and fancy work for the adornment of the person. Gradually, as the demand for such goods increased, the more progressive of these merchants began to manufacture the simple articles which they sold, although it was some time before this branch of the industry had extended beyond the making of spoons, forks, rings, and similar small pieces.

From the earliest days in the history of the jewelry trade, Providence, R. I., has been one of the great centres of this industry. It was shortly after the close of the Revolutionary War that Messrs. Sanders & Pitman and Cyril Dodge began to make silverware in that city. As early as 1805 there were no less than four establishments located there. They were operated by Nehemiah Dodge, John C. Jenckes, Ezekiel Burr, and Pitnam & Dorrance, and their product, to make which they employed about 30 men, included silver spoons, gold beads, and the simplest designs in finger rings. A few years later some of these manufacturers began to turn their attention to cheap jewelry in which silver and other alloys were used with a small fraction of gold. These included many small articles like breast-pins, ear-rings, key-rings, sleeve-buttons, etc., as well as some large articles which were plated by the hammering process. The first jewelry establishment at Attleboro, Mass., a town which has continued to hold pre-eminence in the trade, was opened about 1805, while the establishment of the busines in Newark, N. J., by the firm of Hinsdale & Taylor, dates from about the same time. Philadelphia also became identified with the early jewelry interests. The firm of Bailey & Company, a house which is still conducting business, although under another name, was one of the first manufacturers in that city, and its trade with the west and south soon became so extensive that the concern became known as one of the most prosperous in the business.

Maiden Lane, New York, did not become the centre of the American jewelry trade until about 1830. The steady increase in the demand for jewelry inspired new ideas in manufacture, and, as much of the desire for novelties originated in New York, that city naturally became the market for the introduction of such products. In the New York "Mercantile Register" for 1848–9, one may find the advertisements of the following houses, which were then prominently identified with the manufacture of jewelry, watches, and silverware: Ball, Tompkins & Black (late Marquand & Company), 247 Broadway; Allcock & Allen, 341 Broadway; Gale & Hayden, 116 Fulton street; Tiffany, Young & Ellis, 271 Broadway; Wood & Hughes, 142 Fulton street; Samuel W. Benedict, 5 Wall street; George C. Allen, 51 Wall street; Squire & Brother, 92 Fulton street and 182 Bowery. Some of these houses have since gone out of existence; only one now retains its original name, but three are still conducted under firm names which retain some portion of the early title.

Although great advances have been made in every branch of American art there is no particular in which it is more pronounced than in the metal work which is so conspicuous a part of the art of the gold and silver smiths, and the fact that the American product is now regarded as superior to that of any other country of the world is not only due to our knowledge of the art in itself, but is largely the result of our wider knowledge of the articles into whose manufacture good taste enters. To-day the designers employed by the great gold and silver smiths of America are not only men of refinement and liberal education, but they are so truly artists, in the best sense of the word, that they could, if required, draw or model from life, or paint in oils or water-colors. It is largely due to the efforts of such men that so much advance has been made in the making of ornamental gold and silver ware during the past half century, a progress which is indicated by our exhibitions of such articles as loving-cups, vases, and presentation pieces, among which one may mention the gold medals, valued at $1,000 and $500, which were presented by the State of New York to Dr. E. K. Kane and Commander H. S. Hartstein, the Arctic explorers, in 1858; the silver vase made in honor of William Cullent Bryant, now a part of the exhibit at the Metropolitan Museum of Art, and the several testimonials presented to Cyrus Field, upon the completion of the transatlantic cable, in 1866. Among the other conspicuous specimens of this art are the silver service which was presented to the arbitrators of the Alabama claims, in 1873, the silver centrepiece duplicating the statue, "Liberty Enlightening the World,"

which was presented to August Bartholdi, in 1886; the elaborate testimonial presented to William Ewart Gladstone, in 1877; the Edwin Booth loving-cup, and the many yachting trophies that have been manufactured on the occasion of international and other important regattas.

The discovery of gold in California, in 1848, naturally gave a great impetus to the manufacturing jewelry industry, for it gave assurance of an ample supply of metal needed for all purposes without the cost of importation, and, if, at that time, we were lacking in knowledge as to the various forms in which the art of the smiths had been developed, it needed but such expositions as those at London and Paris to perfect our education in that respect. With such secrets revealed to us, however, it took but a comparatively short time for us to acquire the inventions in machinery and tools necessary to the reduction of the cost of production, and it is largely due to our success along these lines that we have been able to lead the nations of the world in this branch of the fine arts.

The process of electro-metallurgy was introduced about 1860, and since that time all kinds of goods in which plating has been employed have been made by this method, the centres of production being located chiefly throughout Connecticut, although there are other large plants at Newark, N. J., and Providence, R. I. Speaking from a strictly commercial point of view it is almost impossible to overestimate the value of this process, for it has brought within the reach of people of limited means an attractive line of tableware and other articles of utility that are now deemed indispensable in every household. If not as artistic and as highly finished as solid silverware they are extremely serviceable and there can be no question but that the better grades of such goods possess considerable artistic merit. In fact, for a time at least, the silver-plated ware encroached upon the province of solid silver, but during more recent years the low valuation of silver bullion, and the mechanical inventions which have further reduced the cost of production, have tended to reverse the tables.

The production of watches is so closely related to the jewelry trade that some reference must be made to it in any review of that industry. It was but a comparatively short time ago that all watches were imported, whereas, to-day we have progressed so far that it is only some very small watches for ladies' use and some particularly complicated chronographs that are now obtained in Europe. All others are made in this country, the industry being largely centred in New Jersey, Massachusetts, and Illinois. In its consumption of diamonds and other precious stones America will also compare favorably with other nations, New York being the largest market for such gems in the world. Although it was but a few years ago that the art of diamond cutting and polishing was established in the United States, our wise tariff regulations have given such an impetus to this branch of the trade that some of the most expert cutters from Holland have now located in this country.

So far as statistics go we have but little material concerning the early history of the jewelry industry. We know that, in 1812, the value of the Providence product was but $100,000, and that, as late as 1860, the returns from all parts of the country were small as compared to those of the present day. In that year, for example, the jewelers and watchmakers of Philadelphia produced but $691,430 worth; the silverware manufacturers, $516,000 worth, and the makers of watch-cases and chains, $1,714,800. The production of gold chains and jewelry at New York was $2,497,761; of gold watch-cases, $337,690, and of silverware, $1,250,695. In Newark, the total product was $1,341,000, while Providence produced $2,251,382 in jewelry, and $490,000 in silverware. The following census statistics, covering the years from 1880 to 1900, indicate the great advances which have since been made in the trade:

	1880	1890	1900
Establishments	739	783	908
Capital	$11,431,164	$22,246,508	$28,120,939
Employees	12,697	13,880	20,676
Wages	$6,441,688	$8,038,327	$10,746,375
Value of product	$22,201,621	$34,761,458	$46,501,181

Unfortunately, however, such statistics cannot indicate what great things have been accomplished from an artistic standpoint, for the time has now come when the American jeweler, instead of going to Europe for his ideas and models, leads the best European producers in both correctness and originality of designs and workmanship. More than 12 years ago the London "Art Journal" summarized America's progress in this branch of the fine arts, as follows: "Judging by the productions exhibited, one may well be in doubt whether our much-boasted European pre-eminence in these things is to last much longer, and whether, after all, we shall not in the near future be compelled to regard the firms of New York as at least our equals, if not our superiors, in the production of high-class gold and silver work."

These words written in October 1893, were a prophesy which has certainly been realized, as is evidenced by the victories of the American jeweler, both at home and abroad.

Jewett, joo'ĕt, **Milo Parker,** American educator: b. Saint Johnsbury, Vt., 27 April 1808; d. Milwaukee, Wis., 9 June 1882. He was graduated from Dartmouth College in 1828, from the Andover Theological Seminary in 1833, and was professor of rhetoric and political economy in Marietta College (Ohio) in 1833–8. Having become a Baptist, he resigned his professorship, in 1839–55 was principal of the Judson female institute established by him in Marion, Ala., and at the same time edited the 'Alabama Baptist.' He then established a young ladies' seminary at Poughkeepsie, N. Y., assisted Matthew Vassar (q.v.) in founding Vassar College, was its first president in 1862–4, and subsequently was active in educational and religious work at Milwaukee, Wis. Among his writings are a treatise on 'Baptism' (1840), and pamphlets on 'The Relations of Boards of Health and Intemperance' (1874) and 'The Model Academy' (1875).

Jewett, Sarah Orne, American novelist and writer of short stories: b. South Berwick, Maine, 3 Sept. 1849. She was educated at Berwick Academy and became a contributor to the 'Atlantic Monthly' in 1869, in which periodical the larger part of her work has appeared. Her usual theme is the New England character seen

from its most attractive side, its gentler aspects given greater prominence, and its harsher ones not unduly emphasized. Her works include: 'Deephaven' (1877); 'Play Days' (1878); 'Old Friends and New' (1879); 'Country By-Ways' (1881); 'The Mate of the Daylight, and Friends Ashore' (1883); 'A Country Doctor,' a novel (1884); 'A Marsh Island,' a novel (1885); 'A White Heron and Other Stories' (1886); 'The Story of the Normans,' an historical work (1887); 'The King of Folly Island, and Other People' (1888); 'Betty Leicester' (1889); 'Strangers and Wayfarers' (1890); 'A Native of Winby, and Other Tales' (1893); 'The Life of Nancy' (1895); 'The Country of the Pointed Firs' (1896); 'The Queen's Twin and Other Stories' (1899); 'Betty Leicester's Christmas' (1899); etc. Her literary style possesses great charm.

Jew'fish, a huge Californian game-fish (*Stereolepis gigas*) of the sea-bass family (*Serranidæ*). It has a single dorsal fin, the soft part of which is shorter than the spinous portion, and is brown with black blotches and becomes much darker with age. Among the dense growths of kelp in moderately deep water along the coast of southern California the jewfish finds a congenial home. It haunts the neighborhood of islands and is especially abundant about Santa Catalina. Belonging to a family of game-fishes and reaching a weight of 300 to 500 pounds, it has long been a favorite object of sport for ambitious anglers. It is commonly taken on hand-lines baited with small fish, is exceedingly gamy, and brings a good price in the market.

Two other fishes of the same family but more closely related to the groupers are known as the Florida or black jewfish (*Garrupa nigrita*) and the spotted jewfish (*Promicrops guttatus*). The former ranges from Florida to Brazil, and the latter widely through the warm parts of both Atlantic and Pacific oceans. The black jewfish is quite common about the coral reefs, in the caverns of which it lurks. Although not especially gamy, its enormous size and weight, sometimes reaching even 1,000 pounds, have induced a few anglers to essay its capture with rod and reel. It is easily distinguished from the Californian jewfish by its greater robustness, strong canine teeth, and rounded caudal fin. Consult Jordan and Evermann, 'American Food and Game Fishes' (1903); Holder, 'Big Game Fishes of the United States.'

Jewish Calendar. The Jews date their era from the Creation, which according to their tradition was 3760–1 years before the Christian era. The Jewish year is a lunar year and consists of twelve months, with an additional one for leap year. The months have alternately 29 and 30 days, the first and thirtieth days being called New-moon. Each cycle of 19 years has 7 leap years, the 3d, 6th, 8th, 11th, 14th, 17th, and 19th. The spring months are called Nisan (in which the Passover is celebrated), Iyar, Sivan; summer includes Tammuz, Ab, Elul; autumn Tishri, Heshvan, Kislev; and winter Tebeth, Shebat, Adar, with 2d Adar for leap year. The civil year began with the month of Nisan; the religious with Tishri. Rules for the computation of the calendar were issued, after various methods had been employed in earlier centuries, by Hillel II. (330–365). The date usually assigned by Jewish writers to the year when Hillel fixed the calendar is 670 of the Seleucidan era, or 4119 A.M., or 359 of the Christian era.

Jewish Charities. On 26 April 1655, the board of directors of the Dutch West India Company wrote to Governor Stuyvesant as follows: "After many consultations, we have decided and resolved upon a certain petition made by said Portuguese Jews, that they shall have permission to sell and to trade in New Netherland and to live and remain there, provided the poor among them shall not become a burden to the company, or to the community, but be supported by their own nation."

The records of the Department of Charities of the city of New York on 31 Dec. 1902 show that in a Jewish population approximating 600,000 in Greater New York, in the almshouse on Blackwell's Island there were 17 pauper Jews, of whom the majority were blind, idiotic or possessed of some peculiar defect which prevented admission to existing Jewish charitable institutions. These figures indicate how thoroughly the Jews of New York have assumed the responsibility imposed upon them over 250 years ago. The same is true of Jews throughout the United States. In our modern day, under more favorable conditions and auspices, the Jew has, to some extent, become non-sectarian in his philanthropies. Hospitals, as a rule, supported and endowed by Jews, throw open their doors to sufferers irrespective of creed, color or nationality. Other instances could be cited of charities not medical, organized along similar lines. The free employment bureau of the United Hebrew Charities of New York makes no distinction with its applicants. The Educational Alliance in the same city offers its clubs and classes to Jew and Gentile alike. Jewish agencies, giving material relief, or to use a better term, those which care for the needy in their own homes, in the main confine their work to beneficiaries of their faith, without, however, making any rigid distinction. On the other hand, the trend of Jewish charity has been in the direction of caring for the Jewish poor, solely through Jewish agencies, and without the intervention or co-operation of other sectarian or non-sectarian societies or institutions.

The problem of the Jewish charitable societies of the United States to-day is the problem of the care of the immigrant. As such, it passes beyond merely local lines. In some of its manifestations it is national in character and in a few it has an international significance. The fact that the large bulk of the needy Jews in the United States reside in New York is accidental, and concerns the Jews of Denver and San Francisco equally with those of the eastern seaboard cities. In so far the problem is a national one. Moreover, to deal intelligently with the question requires a knowledge of the immigrant's antecedents, the impelling motive which brought him to the United States, and an acquaintance with his previous environment. And here the international phase of the question comes in. Roughly speaking, it may be said that there are no American-born Jewish poor. Of the 10,924 families who applied for assistance to the United Hebrew Charities of New York during the year ending 30 Sept. 1903, 2 per cent

were born in the United States. And of these the majority of heads of families were of the first generation. Jewish dependents who have an ancestry in the United States of more than two generations are practically unknown.

In the year 1881 began that great wave of emigration from eastern Europe, the end of which is not yet. Driven by a relentless persecution, which endangered not only their homes but frequently their lives, thousands of Jews were compelled to flee from their homes to seek new residence on these shores. The Russo-Jewish committee which originally undertook the work of caring for these immigrants turned it over very shortly to the Hebrew Emigrant Aid Society, which came into existence in December 1881. In one year this society spent $250,000, $50,000 less than had been spent by the United Hebrew Charities of New York in the seven years of its existence. In the first and only annual report of the Emigrant Aid Society, its president outlined as tersely as possible the efforts that had been made to provide homes and occupations for the thousands of fleeing exiles who reached these shores during the momentous summer of 1882. In the month of July the committee spent for board and lodging alone over $11,700.

With the gradual falling off in immigration, the Emigrant Aid Society went out of existence, and the care of the needy immigrant who remained in New York and who became impoverished after residence, reverted to the United Hebrew Charities. In 1885 immigration again began to grow heavier and continued to grow in such numbers that in the following five years over 120,000 immigrants arrived at Castle Garden. In 1890 the immigration reached the figures of 32,321, the largest number ever recorded up to that time. With all that had been done, the real work of the charities was but to begin. In 1891 the religious persecution of the Russian Jews reached a climax. In the year ending 30 September 62,574 immigrants arrived at New York, of whom nearly 40,000 arrived between June and September. The entire charitable effort of the New York Jewish community was for the time directed out of the ordinary channels and applied to this monumental question of caring for the arriving Russian Jews. The Baron de Hirsch Fund, instead of utilizing its income for its educational work, appropriated over $67,000 to the United Hebrew Charities to assist in the work of the immigration bureau. Over $175,000 was spent by the United Hebrew Charities during this year. In September of 1891 it became apparent that there would be no cessation to the immigration, and that much larger funds would be necessary to give anything like adequate assistance to the unfortunates who were arriving at the rate of 2,000 per week. The enthusiasm which was aroused at a banquet tendered to the late Jesse Seligman brought into existence the "Russian Transportation Fund," which added over $90,000 to the revenues of the United Hebrew Charities and which was given by citizens of New York, irrespective of creed. Later in the year, a standing committee of the society, known as the Central Russian Refugees Committee, was organized and was made up of representatives of the Baron de Hirsch Fund, the Russian Transportation Fund, the United Hebrew Charities and the American Committee for Ameliorating the Condition of the Russian Exiles. The last committee was organized to secure the co-operation of relief societies in other cities, in order that the various European societies who were assisting the persecuted Russians to emigrate should thoroughly understand the attitude of the New York organization. The year, October 1891 to September 1892, will ever be a memorable one in the history of Russian emigration and of Jewish philanthropy; 52,134 immigrants arrived at the Barge office in that time. The treasurer of the United Hebrew Charities paid out the enormous sum of $321,311.05, of which $145,200 was spent by the Russian Refugees Committee between February and September.

Since the year 1881, fully 600,000 Jewish immigrants have arrived at the port of New York alone. Of these the bulk comprise refugees from Russian and Rumanian persecution, Austrians and Galicians. They came from countries in which many of them lived under conditions of appalling poverty. The records of the immigration bureau show that from the standpoint of material wealth, these immigrants are below the average of immigrants from other European countries. Due to their previous condition, a goodly percentage is illiterate. On the other hand, the number of skilled artisans and craftsmen is so large as to be distinctly noticeable. From the standpoint of dependency, it will be of interest to study to what extent this large body of immigrants has added to the dependent and delinquent classes of the communities in the United States. The only figures that are at hand are those of New York, which are higher than would be found in other cities and towns for reasons that are obvious.

In December 1899 a study was made of 1,000 families who had originally applied to the United Hebrew Charities for assistance in October 1894. Of these 1,000 applicants it was found that 602 had not applied for assistance after December 1894. Of the balance, 67 families were dependent on the society to a greater or lesser extent in January 1899. More detailed investigation disclosed the fact that nearly all of these 67 applicants were made up of families where the wage-earner had died, leaving a widow with small children, or of respectable aged and infirm couples unable to be fully self-supporting, or of families in which the wage-earner had become incapacitated through illness. In other words, after five years over 93 per cent of the cases studied were independent of charitable interference. The marked feature in the care of the Jewish poor in the United States is the almost entire absence of the so-called pauper element. Even the 67 families above mentioned cannot be included in this category. Widowhood is the resultant of purely natural conditions, and when it afflicts the poor mother with a family, it frequently produces a condition of dependence which has in it no characteristics of demoralization.

If there is one cause more than another leading up to this condition, it is the absence of the drink evil among Jews. The instances in which drunkenness lies at the bottom of Jewish dependency are so infrequent that they may be ignored. Combined with the absence of this vice, there are other virtues engrafted on the Jew for centuries, all of which tend to the preservation of his self-respect and his self-esteem. Among these are the love of home,

the inherent desire to preserve the purity of the family, and the remarkable eagerness which he shows for education and self-improvement.

From what has preceded, it will be comprehensible that the Jewish charities of the United States, having a special problem with which to deal, have instituted special methods for its solution. In the main, relief organizations have followed the organized methods of sister societies. In the past 25 years, new organizations of all kinds have sprung into existence to meet the demands made by the constantly increased immigration. To revert to New York, when the Central Russian Refugees Committee went out of existence in January 1893, the decrease in immigration no longer warranting its continuance, the active work of assisting the arriving immigrants devolved upon the United Hebrew Charities. The work of this society is typical of similar Jewish organizations throughout the United States. The report of the fiscal year ending 30 Sept. 1903, shows that 10,924 individuals and families applied for assistance. Of these, 6,260 had applied for the first time. Material relief was granted to 7,290; 1,802 were found not to require assistance of this kind, and 1,202 were refused assistance for some cause or other. The society conducts an employment bureau which is free to employer and employee, and during the last fiscal year found employment for 3,892 applicants. It grants relief in kind, including groceries, clothing, shoes, furniture, etc. The extent of the society's work in this direction will be gathered from the statement that 51,875 garments and pieces of furniture were distributed last year. The annual disbursements for material relief alone amount to over $150,000 per annum. Ever since its organization 30 years ago, the society has endeavored to uphold the principles of organized charity. In some instances it has antedated the charity organization societies themselves; as in the giving of relief in amounts adequate to make the recipient independent of further intervention on the part of the relief-giving agency, and the establishment of a graded, carefully regulated and supervised system of pensions covering if necessary a long period of years. As a rule, these pensions are given only to families where the wage-earner has died, and where, unless such provision were made, no recourse would be left, except the breaking up of the family and the commitment of the children to orphanages and similar institutions. To obviate the necessity of such commitment, the United Hebrew Charities disburses annually over $35,000 in pensions. In the history of the society there is no form of relief which shows such good returns for the investment made. Families so supported do not become pauperized, since the subsidy which is granted enables the surviving parent to devote her time to the proper rearing of her children so that they may become useful and intelligent citizens.

Along the lines of making families self-supporting the United Hebrew Charities frequently grants assistance, presumably as a loan, in amounts varying from $50 to $250. These loans are made in special cases where it is not possible to make the applicant self-supporting through the ordinary channels of employment, etc. A wage-earner who has been incapacitated through illness or injury and hence unable to follow any routine work, may still be established in some small business venture and be able to support his family. Thousands of dollars have been spent by the United Hebrew Charities along these lines with the most gratifying results —not only have beneficiaries become independent of the society, but many of them have managed to repay the loans made to them. Of all the problems which confront the average charity organization, possibly the most perplexing is the one of the family in which the mother must be the wage-earner. The kindergarten and the day nursery have by no means solved the problem. They are at best but makeshifts in an attempt to solve a situation which has its root in economic and industrial conditions. Again, the factory removes the mother from her sphere of influence over her children, and opens up opportunity for the growth of incorrigibility and waywardness on the part of the latter. In the hope of partially overcoming this difficulty, the United Hebrew Charities has for some years conducted a work-room for unskilled women in which the latter are taught various needle industries, in the hope that they may eventually be sufficiently accomplished to work in their own homes, and in this fashion supplement the family income. The amount of such work that can be found is limited. More and more, daily, the factory is competing with home industry to the exclusion of the latter. A study made by the society in 1902 showed that work could be obtained for women to do at home in industries such as silk-belt making, men's and women's neckwear, garters and hose supporters, paper boxes, slip covers for the furniture trade, overgaiters and leggings, dressing sacques, hats and caps, flowers and feathers, beaded purses and other beadwork, dress shields, incandescent light mantles, embroidery and art embroidery, passementerie work, bibs, knit goods, etc. In the society's work-room the effort has been made to teach such industries to unskilled women, so as to enable them to become at least partially self-supporting.

It is needless to state that in a system as comprehensive as the United Hebrew Charities desires to be, provision has been made to alleviate distress in all its forms. Under the plan of dividing the city into districts, immediate relief can be given to emergency cases. These districts are in charge of co-operating societies known as Sisterhoods, who are responsible for the condition of the poor who have been placed in their care. Each of these agencies is practically a miniature United Hebrew Charities. Not only have they organized centres for the distribution of material relief, but along the lines of a more progressive philanthropy, the sisterhoods have developed day nurseries, kindergartens, clubs and classes of various kinds, employment bureaus, mothers' meetings, and in fact have become a social centre for the poor of their neighborhoods. Since a large percentage of the distress which is met with is occasioned by illness, medical relief of all kinds has been organized. Each district as a rule has its physician and its nurse, and where these are not at hand, co-operation has been effected with other organizations specially equipped for such work.

In very recent years, the spread of tuberculosis among Jews has merited the earnest attention of the society, and among its other activities it has been a pioneer in developing a

systematic plan for caring for such tuberculous applicants in their own homes, for whom no provision could be made in existing sanatoria. The campaign thus begun has been not only a charitable, but a social one. Not only have these unfortunates been given food, nourishment and medical care to aid them toward recovery, but in addition thereto, instruction has been given them in the rudiments of sanitation, and in the prevention of infection. It is significant that the work of the United Hebrew Charities in this field has been followed to some extent by the recently organized Committee on Tuberculosis of the Charity Organization Society.

The name "United Hebrew Charities" as applied to the New York organization is somewhat of a misnomer, since it does not include all Jewish charitable agencies in the city of New York. It would be more proper to speak of it as the consolidation of all the purely relief societies which existed in New York prior to 1874. Aside from these, there are to-day hospitals, orphanages, technical schools for boys and girls, trade schools, day nurseries and kindergartens, guilds for crippled children, burial societies, loan societies, societies for maternity relief, and a goodly number of smaller organizations which have been founded by the immigrants of the last twenty years. Among the most important large organizations and institutions in New York may be mentioned: The Mount Sinai Hospital, Lebanon Hospital, Beth Israel Hospital, Montefiore Home, Hebrew Orphan Asylum, Hebrew Sheltering Guardian Society, Hebrew Infant Asylum, and Hebrew Free Loan Association. It is estimated that there are over 1,000 Jewish organizations and societies in the city of New York to-day, whose activities to a greater or lesser extent are directed along philanthropic lines. Practically all of the larger organizations, such as the hospitals, etc., work in co-operation with the United Hebrew Charities. In some of the other cities in the United States, where the question of the care of the poor is not so complex as in New York, closer co-operation has gone by leaps and bounds. In cities like Philadelphia, Cincinnati, Chicago, Cleveland, and others, the individual societies have formed federations of charities, the purpose of the federation being to express the philanthropic impulse of the community in terms of greatest economy, the smallest amount of friction and the highest possible efficiency. In Philadelphia the federation is the common treasury. It acts as the common collection agency of all moneys and distributes them pro-rata among the various societies and institutions whose autonomy is not impaired by this method. In other cities, this plan with some slight variations is in force. In New York sporadic attempts to form a federation have been unsuccessful owing to the immensity of the problem. There are indications at present that federation may become a possibility in the near future.

In addition to these local federations, the various societies throughout the United States have joined together to form a national body known as the National Conference of Jewish Charities. At present it comprises the relief organizations of 53 cities. Two biennial conferences have been held and the third will be held in the city of New York in May 1904. The published reports of these meetings indicate conclusively the wisdom and the necessity of founding such a national organization. The rules governing the transportation of dependents which have been in force in the National Conference of Jewish Charities since its inception were adopted with alterations and additions at the last meeting of the National Conference of Charities and Correction at its meeting in Atlanta in May 1903. At the meeting of the National Conference of Jewish Charities held in Detroit in May of the same year, the writer introduced a resolution advocating the establishment of a central bureau for the placing out and boarding out of dependent Jewish children in private homes. At that time the work of devising such a plan was delegated to the Independent Order B'nai B'rith, a fraternal Jewish order, which at present has the entire subject under discussion, and has drafted a plan which has been submitted to the various Jewish societies and institutions throughout the country. In New York city, under local auspices a similar movement has been inaugurated. Since July 1903, at which time work was begun, applications have been received for children from 84 Jewish families. Sixteen children have been placed in boarding homes and four in free homes.

Some idea of the extent to which Jewish charities have been developed in the United States may be gathered from the following: In practically every city and town there are benevolent societies which look after the interests of the poor in their midst. Jewish orphan asylums are established in the cities of Atlanta, Baltimore, Boston, Brooklyn, Chicago, Cincinnati, Cleveland, Newark, New Orleans, New York, Philadelphia, Pittsburg, Rochester, and San Francisco. In New York there are three institutions and in Philadelphia there are two. New York has four Jewish hospitals and Philadelphia has two. Baltimore, Chicago, Cincinnati, Denver, New Orleans, and San Francisco have each one. Homes for the aged and infirm are found in most of the large cities. Similarly, educational movements along philanthropic lines are developing throughout the country. These include organizations such as the Hebrew Educational Society of Brooklyn, the Hebrew Education Society of Philadelphia, the Jewish Training School of Chicago, the Hebrew Free and Industrial School Society of Saint Louis, the Hebrew Industrial School of Boston, the Clara de Hirsch Home for Working Girls, the Hebrew Technical School for Girls, the Hebrew Technical Institute and the Baron de Hirsch Trade School, the last four being situated in the city of New York. The Maxwell Street Settlement of Chicago and the Neighborhood House in Saint Paul are under Jewish auspices. Cincinnati, Milwaukee, and Cleveland have Jewish settlements. In New York the Educational Alliance, the largest institution of its kind in the United States, has within the past few years developed a settlement with resident workers. Along educational lines, the Jewish Chautauqua Society, a national organization, has for the past two years conducted a summer school in philanthropy in connection with its summer assembly held in Atlantic City, N. J. At these sessions, important communal problems of interest to Jewish workers in philanthropy have been considered.

Other national organizations of importance are the Jewish Agriculturalists' Aid Society, the

Baron de Hirsch Fund, and the Jewish Agricultural and Industrial Aid Society. The first named, with headquarters in Chicago, is engaged in placing farmers throughout the Northwest, particularly in Dakota. The work of this society while not on an extended scale, has nevertheless given results and has demonstrated the fact that it is possible to take residents of congested centres, remove them to country districts, and make farmers of them. The Baron de Hirsch Fund was established under a foundation of the late Baron de Hirsch, the deed of trust being incorporated in March 1890. Its activities at present are directed to the conduct of the Baron de Hirsch Trade School in New York city and the Agricultural Colony at Woodbine, N. J., where the Fund has an Agricultural and Industrial School. The Fund likewise gives moneys to co-operating societies in various cities for the purpose of granting tools and teaching trades to recently arrived immigrants. The Jewish Agricultural and Industrial Aid Society is an off-shoot of the Baron de Hirsch Fund, receiving money from the latter society and from the Jewish Colonization Society, which was created under a de Hirsch endowment. Its purpose is to find agricultural and industrial positions for Jewish immigrants. Under the care of this organization are the various colonies in south Jersey, aside from Woodbine, and the organization has made farm loans to farmers in various parts of the United States, particularly in Connecticut. Probably the most important phase of this organization's work is the attempt to remove residents of the congested centres of large cities to places throughout the United States, where work has previously been found for them. In the first year the organization sent away 1,800 persons. In the second year 3,200 persons. During its present fiscal year, beginning 1 Jan. 1903, it has sent out 5,190 individuals, and its work is constantly increasing. The plan of the society is to find industrial positions anywhere in the United States, and having found them, to obtain individuals able to fill them from New York and other large cities like Philadelphia, Chicago, and Boston. In order to carry on the work as effectively as possible, the society co-operates with the Independent Order B'nai B'rith, which has lodges distributed throughout many of the smaller towns and communities in the United States, and with the benevolent organizations and societies represented in the National Conference of Jewish Charities. It has an office in New York city known as the Industrial Removal office, which is the centre of the activities of the society. From here all applicants who desire to leave the city are sent away, provided with the necessary transportation and with the guarantee that provision will be made for them at their destination until such time as they become full-fledged wage-earners. Should conditions require it, it is not uncommon for the society to send the wage-earner in advance and to make provision for the care of the family remaining here through the United Hebrew Charities. As soon as the society hears from its correspondent that the wage-earner is in a position to care for his family the latter is sent on and a reunion of the family accomplished.

On the literary side of Jewish philanthropy, it is interesting to note that the United Hebrew Charities of New York city is publishing a monthly magazine, 'Jewish Charity,' which is devoted to the consideration of all topics of interest to workers in Jewish philanthropic fields.

LEE K. FRANKEL,
United Hebrew Charities, New York City.

Jewish Chautauqua, founded in 1893 by Rev. Dr. Henry Berkowitz of Philadelphia, and incorporated in 1899, with a body of officers representing the chief cities in the United States. This society has about 3,000 members, divided into various sections. Its courses include preparatory, two years, with readings in Jewish history and literature; Bible, four years; and special courses in post Biblical history and literature, 'Jewish Characters in English Fiction,' 'Beginners and Advanced Hebrew.' Its chief work of late years has been embodied in its summer assembly, at Atlantic City, N. J., which is held annually in July and lasts three weeks. It includes a summer school, popular lectures and conferences, literary and social entertainments, in which many prominent speakers participate. During the session of 1903 the condition of religious schools, dependent and delinquent children, how to relieve congestion in large cities, the status of the Jews of Russia, the attitude of Jewish university students toward Jewish problems, were the topics discussed. The average attendance at the morning sessions was from 150 to 350 persons and at the evening from 300 to 800 persons. During the summer of 1903 an English organization on the plan of the Jewish Chautauqua was formed at Ramsgate.

Jewish Exchequer, a special division of the Court of Exchequer of England (1200–90) which dealt with lawsuits between Jew and Christian, chiefly in reference to debts due the former, and recorded the taxes imposed on the Jews. The fact that it was found necessary to have a centre for Jewish business indicates the prominence in trade and finance of the Jews in England from the reign of Henry II. to the period of their expulsion (1290). The court did not long survive their departure. Many important data from its records have been jointly published by the Selden Society and the Jewish Historical Society of England.

Jewish Fraternities. While societies for mutual benefit exist in large numbers among the Jews in every land, in the United States, the fraternities or orders have acquired special popularity, and promote not alone Jewish solidarity but aid in maintaining many charitable institutions. These organizations as a class give pecuniary benefits in case of illness, and death-endowments, which latter insurance feature is now being made optional. The oldest and most influential is the Order of Benai Berith ("Sons of the Covenant"), formed 60 years ago, and having a membership of 30,000. Its 315 lodges extend over the entire country, and it has 13 lodges in Algeria, Bulgaria, Egypt, Turkey, and Palestine, 42 in Germany, 16 in Rumania, and 10 in Austria. It supports orphan asylums in Cleveland, Ohio, Atlanta, Ga., San Francisco, Cal., a home for the aged at Yonkers, N. Y., a free library in New York, while it co-operates with an orphan home in New Orleans, a technical school in Philadelphia, and a hospital for consumptives in Denver, Colo. The next leading order is the Free Sons of Israel, founded in 1849, with 103 lodges and 11,000 members. The Free Sons of Benjamin (1879) has 192 lodges; 14,088 male and 1,361

female members. The Berith Abraham (1859) has 288 lodges and 42,000 members. The I. O. Berith Abraham, with 302 lodges and 56,949 members, was founded in 1887. The Ahavas Israel Order (1890) counts 124 lodges. In addition there are seven other fraternities which have been recently started. The Order of Kesher Shel Barzel, founded a home for the aged at Cleveland. Special efforts are now being made by the Benai Berith to institute lodges among the Russian and Rumanian immigrants, and the project of establishing a Jewish University of the highest rank has been brought to its attention.

A. S. Isaacs,
Prof. German Literature, New York University.

Jewish Sects. To the fact that Judaism has never been a sluggish stream, but was ever in active movement, we owe the existence of sects among the Jews. The right of liberty of thought was always exercised, and to the conflict of opinion the survival of Judaism is largely due. Apart from the individualism which is a marked element in Jewish character, the influence of surroundings has had a formative effect, and the rise of sects in the nations among which he lived accustomed the Israelite to the spectacle of sects in his own community, due usually to the interpretation of text or ceremony, or to the initiative of some resolute leader. The history of Jewish sects displays the same bitterness and hostility that characterize sectarian feuds in general, although since the dispersion there has been more rattle than fang in the conflict between schools and parties in Jewry. The synagogue has never proclaimed any dogma of infallibility, and the rabbi was never regarded as absolute authority over conscience and soul. Climate, temperament, and environment were often the determining factors in precipitating the conflict which was waged, not by fierce encounters on the bloody field, but by debate in the schools and in polemical treatises that aroused partisan outcry and led to peaceful secession within the fold. Judaism and the law were never at stake — it was only the interpretation of one body of teachers or individual opinion which had to shift its ground.

Samaritans.— A brief summary of Jewish sects may best begin with the oldest of all. The Samaritans, termed in the Talmud (q.v.) "Cuthim," are traced to the mixed multitude who were made to settle in Samaria on the fall of the kingdom of Israel. The religion of the new colonists was a blending of Mosaism and heathenism, which led to a gradual separation from the Jewish body. They took no part in the revived commonwealth under Ezra and Nehemiah, but formed their own community, with their own temple, which was destroyed about 120 B.C. by John Hyrcanus I. (q.v.). The Samaritans gradually lost whatever prestige they had claimed. They now exist as a small sect, with constantly dwindling numbers, at Nablûs (the Arabic form of Neapolis, the name given to Shechem under Vespasian). Here perhaps 100 survivors follow their traditional rites, and sacrifice as of old on Gerizim. The Samaritans now possess interest only from an archæological point of view, although their ritual and literature have value for students of the Bible and of post-Biblical history.

Pharisees.— This party, often misunderstood and maligned, and which has had the ill-fortune (similar to that of the Jesuits, for example), of supplying the term "pharisaic," in the sense of hypocritical, was the great popular party in Judea, including the representative leaders and men of learning in the Asmonæan era, who strove to maintain the traditional faith and ceremonies at all hazards and despite political entanglements. It is the opinion of Graetz, the best-known Jewish historian, that, deriving their name from *Perushim,* "the explainers" (of Scripture), they formed the learned body of the nation, and can only be called a party by way of distinction from the Sadducees and the Essenes. The Pharisees were the religious enthusiasts of their day, loyal to every traditional observance, naturally with the defects of their virtues when such rigid adherence became formalism. But it is faulty generalization to stigmatize all Pharisees as hypocrites because some were insincere, as occurs in the history of every creed.

Sadducees.— This sect, probably named from one of their leaders, Sadok, constituted the party of wealth and political power, who made the law subordinate to the exigencies of the national life, and to whom the traditions of their religion were secondary when the independence of the nation was to be upheld. Hence the differences in interpretation of the law, which led to violent feuds and internecine conflict at a critical era when union might have checked the advancing Roman legions.

Essenes.— Sprung from the Assideans of the early Maccabæan days, resembling in some respects the Nazarites, the Essenes were rigid separatists from contamination, large numbers of whom were ascetics, favoring celibacy and forming a kind of religious brotherhood whose relation to early Christian practices, like baptism, is a suggestive topic for study. They were mystics, too, the logical forerunners of the sect of Chasidim, which was to acquire more notoriety than good repute in later centuries. The Essenes exercised no political influence. It was reserved for the Pharisee and the Sadducee to employ intrigue, hatred, and bloodshed against each other until Jerusalem fell.

Karaites.— About the middle of the 8th century this important sect arose among the Jews in Moslem lands. Their name means "readers," and they were followers of the Old Testament, but not the Talmud or rabbinical interpretations. Just as a sect in Islam rejected the traditional ruling, so almost contemporaneously a sect in Jewry abandoned rabbinical tradition. The leader in the movement was Anan ben David, a native of Babylon, who, chagrined at his failure to become an ecclesiastical dignitary, resolved to organize a revolt against tradition. For a time the movement made headway, but it never gained many adherents, and to-day exists in remnants only in Jerusalem and parts of Turkey, in Egypt, Galicia, and the Crimea. The Karaites, however, contributed largely to the study of the Old Testament, for the conflict between the Talmudists and their opponents led to closer and more accurate inquiry, and Scriptural investigation was followed with scientific thoroughness. The Karaites were keen disputants, and their polemical onslaughts on the Talmudists furnish a piquant phase in the history of Jewish thought. They failed, however, in their protest, and no reformation resulted. It is of interest to note that to-day in Russia the Karaites receive special consideration from the government, and

apparently are not subjected to all the harsh exactions under which the rabbinical Jews suffer. Their very limited numbers, however, may account for the toleration.

Sabbatians.— In the 17th century a remarkable sect arose among the Jews, the followers of Sabbathai Zebi (1626–76), who was born in Smyrna, went to Jerusalem in 1664, and there proclaimed himself the Messiah and predicted his approaching rule over the universe, with his headquarters in Jerusalem, restored and made glorious. The news spread rapidly and produced profound excitement in Turkey and elsewhere. It was a century of gloom and anxiety for the Israelite, the era of Jewish massacres in the Ukraine, and with the greater avidity he turned to hopes of a revived nationality; many in sober European lands began to prepare for the journey eastward. Such Zionistic dreams are of frequent recurrence, and numerous have been the false Messiahs in Jewish history. Sabbathai's career, however, was to receive a sudden check: the Sultan of Turkey, Mahomet IV., disliking popular excitement, imprisoned the prophet when he visited Constantinople, and after two months' confinement his pretensions faded away. He made a tame confession of his dishonesty and became a convert to Islam when the Sultan suggested the step. Many of his adherents in Turkey, Poland, Italy, Austria, Holland, and Germany were not discouraged by his conversion, but still believed in his Messiahship. In 1668 on the Passover he declared that he had received revelations from the Holy Ghost and was permitted by the Turks to preach in the synagogues. A sect of Sabbatians was gradually formed, with special doctrines and rites of their own, gradually dissolving into minor bodies of no influence. The Sabbatians in Turkey adopted Islam in 1687, with Sabbathai's successor, his brother-in-law Jacob Querido, at their head. On his death, his son became their Messiah (1695–1740). This Jewish-Turkish sect still exists and numbers about 4,000 adherents. Sabbathai's followers in Poland fell into crass mysticism, with harmful influences on Jewish development. In Italy they soon ran their course, and in Holland and Germany they were unmasked and sought flight.

Frankists.— These were a sect named after their founder, Jacob Leibovicz Frank, born in Podolia about 1726, died at Offenbach 1791, who was one of the apostles of Sabbathai Zebi. His vagaries were as pronounced as those of his master. Ultimately, after heated disputes with the rabbinical Jews, he abolished the law, and his sect became Catholic and was absorbed by the dominant religion in Poland.

The Chasidim.— The people who bear this name, meaning "the pious ones," constitute a sect dating from about the middle of the 18th century, and which exercised a profound influence on the Jews of eastern Europe. In its inception, as Dr. Schechter states in his 'Studies in Judaism,' it was a revolt against the excessive casuistry of the contemporary rabbis and "a protest of an emotional but uneducated people against a one-sided expression of Judaism" without feeling and affection. It was to develop rapidly into mysticism, the reveries and revelries of the Cabala, which produced incalculable evil wherever it spread. Its founder was Israel Miedzibocz (1698–1759), later called Israel Baal Schem, shortened into Bescht, born in a small village in Bukowina, and about whose childhood and youth wondrous legends are narrated. He became a rabbi in Podolia and Wallachia, teaching his doctrines to eager disciples and working miracles. In some respects he was an Essene of the 18th century, and he has been both condemned and admired. A religious revivalist, he drew much of his inspiration from the 'Sohar,' aptly called the Bible of the Cabalists, a clever literary forgery of the 13th century; but his idealism became a downward development in the sect's subsequent history. Under his successor, Beer of Mizriez, Chasidism extended to a more learned circle, who in their turn exercised a wider influence which led to many divisions and degeneracy. They were fiercely opposed by the rabbinical Jews. In Wilna their writings were publicly burnt (1772), and they were put under the ban. Solomon Maimon in his autobiography gives an account of this sect. It is still in full swing in eastern Europe, an aberration that will pass away with the spread of modern culture.

Other Sects.— The Falashas of Abyssinia, the Daggatouns of the Sahara, the Black Jews of India and Cochin-China, may be regarded as sects or colonies, along with the few remaining Jews in Kai-Fung-Fu, Province of Honan, China, and are mentioned to show the variety of type in present-day Israel. The divisions into "orthodox," "conservative" and "reform" Jews are largely arbitrary, and await more exact classification.

A. S. Isaacs,
Prof. German Literature, New York University.

Jewish Women's Council. Founded September 1893, this organization has been of marked value in awakening the interest of American Jewesses in the history and literature of their special creed as well as in developing among them modern methods in educational and charitable. Affiliating with the National Council of Women it has arrayed on a common platform its representatives. The latest survey of its condition and workings was given at its third triennial in Baltimore, Md., 2–11 Dec. 1902. There were present 3 officers, 7 directors and 52 delegates from 26 sections, with 2 delegates from Junior sections. Addresses were made by Miss Jane Addams, of Hull House, Chicago, on 'The New Social Spirit'; other topics discussed were: 'Aspects of Judaism in Cities and Small Towns,' 'Federated Charities,' 'The Juvenile Court.' The Council consists of 64 active sections, with about 8,000 members, and 16 junior sections, with about 500 members. There are 82 study circles, 2,000 members, studying Jewish history and literature, and 12 circles studying methods in philanthropy. It has 18 religious schools among the poor, with 19 paid and 141 volunteer teachers, reaching 2,500 pupils. Thirty-three sections carry on activities in philanthropy, with settlements, sewing and industrial schools, five kindergartens, one manual training school, two gymnasiums, two free baths, two day nurseries, four personal service groups, two kitchen gardens, and other forms of useful activity, often open to all creeds. Cooperation is encouraged with the State Federation of Women, International Congress of Women, the National Jewish Hospital for Consumptives at Denver, Colo.,

the National Needlework Guild and the Consumers' League. Mrs. Hannah G. Solomon, of Chicago, is president of the organization (1902–5).

Jews and Judaism, the religion of the Jewish people — whether called Jews, Israelites, or Hebrews — based upon the Old Testament, and developed in their ages of alternate wandering and settlement in various lands. Judaism presents a series of changes from age to age, and is inseparable from the history of the Jewish race. The story of Judaism is the story of the Jew. From its rude beginnings in the era of Abraham the Patriarch, down through the centuries of Bible environment; from the formation of a kingdom to the final destruction of Jerusalem by the Romans; from the period of dispersion East and West to the dawn of the Middle Ages; then through successive social and political upheavals to the birth of modern times and the gradual shifting of nations and ideas until the present day; — through all these vicissitudes Judaism has ever been moving, influenced by every current and new condition. In the days of Abraham it was ethical Monotheism; in the era of Moses, Mosaism; in later ages, when it was likely to degenerate, Prophetism arose to inspire new life. When the national existence was reaching its end Talmudism was its protecting garment, to continue as Rabbinism for a long period, and it is still vital in many lands. Then with Moses Mendelssohn (q.v.) and the French Republic, modern Judaism began a new era, which was to develop still further with the spread of individualism in life and thought, under whatever names, conservative or reform, it was known. To realize what Judaism is, it must be studied in its broader range as well as in close detail. It must not be limited to one period, and it must not be made co-extensive merely with its Biblical or post-Biblical epoch. Judaism awaits its historians, and their task is one that demands not only the exact knowledge of the origin, growth, and development of Jewish tradition, customs, rites, and laws, but also a comprehensive survey of the civilizations with which the Jew came into contact, and to which he gave and from which he received so much. Judaism may be only on the threshold of its influence, for at no period since its beginning has it been more diffused and universalized through the planting of the Jew in every land on the globe.

Ancient Jewish History.— The early history of the Jews is identified with that of Palestine, as told in the Old Testament. The narrative proper begins with Abraham and the Patriarchs, and continues through the story of Joseph in Egypt, to which Israel and his family remove, and the years of oppression under the Pharaohs. Then Moses appears as a deliverer, the revelation on Mt. Sinai follows, and a code of laws is given to the people, who form a theocracy, with rites sacrificial, after the fashion of their day, and a hereditary priesthood. The conquest of Canaan begins a new era — the period of the judges — but as the nation grows more warlike and becomes envious of its neighbors, the judge must give way to a king, and Saul, David, and Solomon successively reign. The builder of the temple, the central figure in Oriental legend, could not assure peace to his kingdom, and a division followed. Of the two kingdoms that of Israel, with its capital first at Shechem and later at Samaria, was the more extensive and populous, embracing 10 of the tribes; but it was addicted to idolatry and fell captive to Sargon of Nineveh (721 B.C.). The kingdom of Judah, consisting of the tribes of Judah and Benjamin, was more faithful, but deplorably weak, and was conquered by Nebuchadnezzar, by whom the temple was destroyed (586 B.C.). In 536 B.C. Cyrus allowed the temple to be rebuilt, and in 516 B.C. it was finished under Ezra and Nehemiah.

Persian rule and influence, to which the Jew owed much, were succeeded by the sway of Egypt, not less vital for Judaism's growth. Under Ptolemy II. (Philadelphus), the Septuagint version of the Old Testament was written, which familiarized the Greek world with Jewish thought. Another change of masters subjected the Jew to Syrian supremacy, under which occurred the Maccabean revolt, followed by internal schism and a gradual weakening of national vitality under Herod, with Rome eager to despoil.

The Final Dispersion.— A fierce struggle to regain fatherland and liberty in the last days of Nero was fruitless. The temple was again destroyed, Jerusalem reduced to ruins, and the dispersion began in earnest (70 A.D.). A further revolt by Bar-Cochba, in the reign of Hadrian (132–135 B.C.) was ineffective. Jews were forbidden to enter Jerusalem, whose very name was changed to Ælia Capitolina.

A period of intense significance for Judaism had now arrived. It was to exchange one strip of land for the wide world, and for better or worse encounter new currents which were to change its form and destiny. The Palestinian phase was to give way to a broader development, which might have been a dangerous experiment if the Old Testament basis, the sacredness and authority of the law (*torah*) had not been retained. The remnant of Judah, however, met the issue with courage, and in every land of their dispersion managed to preserve a certain national character, due to their observance of national customs and traditions, while the ages of persecution only made them more firmly attached to their religion.

Jewish Learning.— The story of the Jews in the dispersion is a record of varied experience, a history written in sadness. The dispersion was a *via dolorosa* from land to land. Long before the final overthrow Jewish settlements were made in Italy and Asia Minor, in Egypt, North Africa and Babylonia. But now enforced exile scattered them in all directions. Happily the leaders concerned themselves with intellectual and spiritual factors, and in Palestine and Babylonia schools arose which were to preserve the religion and national consciousness more effectually than priest and sacrifice ever could have done. When Johanan ben Zakkai founded his school at Jamnia, while the ruins of Jerusalem were still smoking, the Romans were unaware that a power had arisen which was to maintain Judaism through centuries of Roman, Christian, and Mohammedan sway, and amid every mediæval and modern condition. The study of the law, the interpretation of tradition, the development of custom and prayer, the rise of synagogues, the organization of a distinct religious hierarchy, the birth of Talmudism; these were

the factors which made the vanquished victors, and gave them life and influence when conquering races had passed away. It was fortunate that in the struggle between the Persian and Byzantine empires, as in later centuries between Caliph and Christian, or between rival pontiffs and emperors, the Jews were largely students, and had no "dark ages," such was the marvelous influence of their torah and Talmud, while in the conflict of opinions they preserved their intellectual vitality and breadth.

In the Middle Ages.— It is impossible within present limits to give more than a brief outline of the history of the Jews in the dispersion. With the breaking up of the Roman empire and the rise of Islam, the Jews began to feel the pressure of still other new masters, whose rule was not without its occasional gleams of sunshine. In the East, with Islam firmly settled in Persia and Mesopotamia, the condition of the Jews improved, their academies flourished, and a line of famous scholars, the gaonim, kept alive Jewish learning until 1036 A.D. In the West, chiefly in southern Europe and Spain, the spirit of persecution was rarely absent, although there were golden centuries in Spain under the caliphs, and learning flourished in France and Italy despite the enmity of pontiff and king. Jewish traders became the intermediaries in commerce; Jewish physicians were notable figures at the courts; and Jewish teachers gave instruction to lovers of learning. The liberal spirit of the caliphs at Bagdad, Cordova, and Cairo was emulated in Christian countries. In Spain, the Hebrew "Sepharad," the Jews enjoyed a high degree of favor under the caliphs (711–1150). They furnished ministers of state, scholars, scientists, poets of distinction. For 150 years (1150–1300) their condition under the Catholic kings was fairly prosperous. But soon restrictions became the order of the day, they lost the rights of Spanish citizens, were secluded in special quarters of their own, and massacres ensued, while some of their stateliest synagogues were converted into churches. This was the period when many Jews yielded to baptism, practising in private, however, Jewish rites: they were called "Maranos," or secret Jews, and included some of the noblest families in Spain. With the birth of the Inquisition at Seville in 1480, conditions became still more intolerable, and expulsion followed in 1492, 300,000 Jews leaving Spain. Four centuries later Spain was to offer shelter to Jewish refugees from Russian persecution; and its government is now restoring the famous synagogue at Toledo, which had been turned into a church, and showing a spirit of reparation that tells the story of humanity's progress.

The Jews in Modern History.— The exiles from Spain, the Sephardic branch of modern Jewry, found refuge in Italy and Holland, after a temporary stay in Portugal, where they took active part in the Renaissance. Great numbers, too, emigrated to Turkey. It was Elias Levita who, through his students, Sebastian Münster and Paul Fagius, introduced Hebrew studies into Germany, while Leo Hebræus (Judah Abrabanel) was a famous Neoplatonist. Luis de Torres, a Jewish youth, participated in the quest of Columbus, and a Jew, the pilot Gaspar, aided Vasco da Gama in his search for a water-route to the Indies, whose plans, too, were assisted by Abraham Zacuto, the scholar and astronomer, a teacher of the University of Salamanca, and later astronomer and chronographer to Manuel the Great of Portugal. Dark days followed the exile from Spain, and in the general sorrow mysticism spun its weird spell as the Cabala gained adherents, while the methodical study of the Talmud was to degenerate into one-sided scholasticism and intellectual jugglery. It was an era relieved, however, by some bright names. Joseph Nasi, Duke of Naxos, was a favorite of Sultan Selim II., who wished to make him king of Cyprus; Solomon Ashkenazi was Turkish ambassador to the republic of Venice; Benedict Spinoza, the thinker, and Sabbathai Zebi, the pseudo-Messiah, were products of the same century. Manasseh ben Israel, whose features were painted by Rembrandt, opened negotiations with Oliver Cromwell for the return of the Jews to England, from which land they had been banished in 1290. With the further migration of the Jews into Slavic countries and their closer segregation, due to the spirit of persecution, which was as bitter as in the era of the crusades, a new language or jargon — the Jewish-German — arose among them, which is now (1903) receiving careful scientific study. In the year of Luther's Pentateuch translation (1523) a Jewish-German dictionary appeared at Cracow, and in 1540 the first Jewish-German translation of the Pentateuch was issued there.

In the Middle Ages the charge of usury was often brought against the Jews, and doubtless was a motive for popular outbreaks against them. Usury is strictly prohibited by the Mosaic law. If, in ages when the Jew was disqualified from following agriculture or other ordinary pursuits, he had recourse to finance and often lent money at excessive rates, kings, nobles and priests were just as guilty, although the Jew was usually the scapegoat. "Every country has the Jews it deserves," is Karl Emil Franzos' pertinent saying. With civil and religious liberty there would be no cause for the ghetto, for narrow exclusiveness, for charges of usury, and other accusations. The 17th century, with the Thirty Years' War, which made nearly all of central Europe a battle-ground, had its full share of persecutions for the Jews, and many of the fairest communities were despoiled, the Jews in Poland losing 200,000 men, women, and children in the Cossack invasion (1648–51). That century marked the lowest ebb of Jewish life and aspiration. It was, fortunately, to be succeeded by the dawn of a new era. It was Moses Mendelssohn (1729–86) who strove to awaken his coreligionists to new life, and to rise to the level of the highest culture of their time, without abandoning the essentials of their religion. As his friend Lessing sought to emancipate German literature from French models, so Mendelssohn labored to free the Jew from mediævalism in thought and custom. It was a return to Jewish idealism and humanity that he advocated, a departure from the social and intellectual ghetto forced upon them by bigotry from within and without. From him dates the era of emancipation which was ushered in as well by the French Revolution. With their gradual acquirement of full citizenship in European lands, resolute changes in forms and ritual were imperative; and the mediæval atmosphere in prayer and ceremony was to pass away. Scholasticism was also to be overcome by Leopold Zunz (1794–1886) and the coterie of well-equipped scholars who opened

a new path in the study of Jewish history and doctrine and showed the evolution of prayer and ceremony. With him were ranged S. L. Rapoport (1791–1867), S. D. Luzzatto (1800–65), Zacharias Frankel (1801–75), Abraham Geiger (1810–74), Samson R. Hirsch (1808–88), H. Graetz (1817–91), L. Loew (1811–75), Samuel Holdheim (1806–60), and the still surviving Moritz Steinschneider (1816).

To-day the condition of the Jews abroad may thus briefly be summarized: In Russia, Rumania, and Galicia, which contain the great majority of Israelites, they suffer social and political exactions, and are under strict mediæval restraint so far as their religious state is concerned. They are more or less rigid Talmudists, and are least influenced as a whole by the modern movement, although there are signs among them of new life. The revolution of 1848 completed the work of the French Revolution in assuring political equality to the Jews in Western Europe. In 1858 Lionel de Rothschild was the first Jew to take his seat in the English Parliament. London has had several Jewish lord mayors and a Jewish master of the rolls (Sir George Jessel). Anti-Semitism has rapidly lost its fangs in France, Austria, Hungary, and Germany, whose Jewish citizens are indistinguishable, save in religion, from those of other creeds. In Italy, Rome grants a site for a new synagogue not far from the Arch of Titus, mute witness of Israel's vitality. A Jew is Italian minister of war. What a transformation since the days when Jews were thrown to the lions or forced to live in the catacombs! As a result of the admission of Jews to every field of activity, they furnish their quota of famous names in all lands in music, art, science, literature, philanthropy, commerce, and politics.

Zionism, etc.— The Zionistic movement of the past decade, so far as it aims at a restored Jewish nation in Palestine, numbers the largest body of adherents in Russia and Rumania; but with their full acquirement of political rights their attitude will change. Great Britain's offer of land in East Africa for a Jewish settlement under British sway is seriously considered by Dr. Herzl and the Zionists (1903), and may pave the way for practicable colonization both there and elsewhere, which will materially lighten the Jew's burden in persecuting lands, and give him new life and activity under more favorable conditions.

Continuity of Judaism.— The outline of Jewish history from the earliest times to the present, with observation of conditions throughout the world, proves that Judaism has always been a living religion in every environment and despite the cross-fertilization of ideas that it has encountered in Babylonia, Rome, Egypt, Persia, Arabia, Spain, mediæval Germany, and Italy. The law of adaptation has left its mark on the thought and principles of the Jewish belief. While the sources are in the Pentateuch or torah, the stream of Jewish tradition is continuous, and Judaism, practically the tradition of the Jews, may be defined as ethical monotheism illumined by national customs and observances. A double stream of thought is to be discerned — a particularistic and a universal, exclusiveness and breadth, Jewry and the wide world, the God of Israel and the God of humanity. These tendencies appear not only in the Old Testament, but throughout the entire stretch of Jewish literature, and are still to be met in the views of modern rabbis of the various schools, old and new. But Judaism is none the less a fixed religion, even if it is difficult to define, and demands no assent to formal articles of belief. Its first intuition is belief in God, no blind power, but with the attributes of unity, incorporeality, eternity, omniscience, and omnipotence, and whose justice is tempered with mercy. The reality of revelation is its second principle, the revealings on Sinai through Moses, and their confirmation through the prophets of laws and statutes, the moral and ceremonial law — the immutability of the torah. As a necessary corollary comes a third principle, future reward or punishment for those who obey or transgress the law. Compensation in the hereafter implies the soul's immortality. Whatever varying views were held as to these principles and their interpretation by earlier and later rabbis, amid all exaggerations and aberrations to which they were subjected, giving rise to sect and schism, the ethical basis of Judaism was unquestioned, and action, not moralizing, was always the highest duty. The creed of Judaism has been defined from time to time by different rabbis, the most famous of whom, Maimonides (1130–1205), gave the most widely accepted exposition in 13 articles embodying these points: Belief in a creator, in His unity, incorporeality, eternity, and that He alone is to be worshipped; belief in prophecy, and that Moses was greatest of all prophets, both before and after him; that the torah was revealed on Sinai, and possesses immutability; that God knows the thoughts and actions of men; belief in reward and punishment, in the coming of the Messiah, and in the resurrection of the dead. These articles were opposed by some of his contemporaries, as they have also been by some later rabbis, who frame different classes of doctrine or dogma and otherwise modify Maimonides' principles, which are still, however, regarded as authoritative by the large majority of Jews to-day. (See MAIMONIDES.)

Ceremonial and Festival Usages.— The ceremonial code and historic ritual are vital factors in the preservation of Judaism — "signs," and observances like circumcision, the Sabbath, the festivals, and the dietary laws. Their aim is to quarantine the Jew from idolatry and secure the permanence of his God-idea, and to ensure self-control over passion and appetite, promoting physical and moral growth, and maintaining family happiness and purity.

The chief Jewish festivals are the New Year, the Day of Atonement, Tabernacles, Passover, and Pentecost, with Purim, Hanukkah (to celebrate the victory of the Maccabees), and Fast of Ab, in memory of the fall of Jerusalem.

The breadth of Judaism is not to be lost sight of amid the many observances that are part of its historic programme. The Jew's original Semitism has developed into a cosmopolitanism which makes him a citizen of every land that assures him civil and religious liberty. He can be conservative in England, liberal in Germany, a formalist in France, a pietist in Poland, a mystic in Turkey, and can wear in the United States an intellectual coat of many colors that would astound his brethren in India. The breadth and catholicity of Judaism are organic; the Jew does not seek proselytes; he believes with Maimonides that "the pious of all nations

have a share in future bliss." His aspirations are not tribal; he believes in the perfectibility of humanity; and whether his Messiah be a person or an epoch, he holds that the time will come when all men will acknowledge the unity of God and the brotherhood of man.

Jewish Statistics.— The figures of Jewish population, as contained in the 'American Jewish Year Book' for 1900–01, are herewith given. For the British Empire the total is 148,149, divided as follows: England, 97,350; India, 17,194; Australia, 15,268; Canada, 6,414. For other countries: Austria-Hungary, 1,871,414; Russia, 5,700,000; Rumania, 300,000; Germany, 567,884; Turkey, 350,000; France, 72,000; Italy, 50,000; Netherlands, 97,324; Egypt, 25,200; Morocco, 150,000; Belgium, 4,000; Argentina, 6,735; Denmark, 4,080; Greece, 5,792; Persia, 50,000; Servia, 4,652; South Africa, 10,000; Switzerland, 8,069; Sweden and Norway, 3,402; Spain, 2,500; Peru, 498; Bulgaria, 22,617; Venezuela, 411; Abyssinia, 120,000; China, 300; Algeria, 43,500; Tunis, 4,500; Curaçao, 831; Surinam, 1,250; making, with the United States (1,200,000), a total of about 11,000,000 for the world. For Jewish statistics of the United States see JEWS IN AMERICA.

Bibliography.— Among the more important ethical and philosophical writings of the rabbis which are generally regarded as setting forth what is characteristic in Judaism — not to refer to special works of one-sided tendency — the following are recommended: Saadya (10th century), 'Emunoth Vedeoth' (Beliefs and Opinions); Bachya (11th century), 'Choboth Ha Lebaboth' (Duties of the Heart); Hallevi (12th century), 'Cuzari'; Maimonides (12th century), 'Morê Nebuchim' (Guide of the Perplexed); Albo (15th century), 'Sefer Ikkarim'; Troki (16th century), 'Chizzuk Emunah'; Mendelssohn (18th century), 'Jerusalem.' For general information on the subject of Jews and Judaism may be read: Graetz's 'History of the Jews'; Morris Joseph's 'Judaism as Creed and Life'; Stanley's 'History of the Jewish Church'; Daly's 'The Settlement of the Jews in North America'; Kayserling's 'Christopher Columbus and the Participation of the Jews in the Spanish and Portuguese Discoveries'; 'Publications of the American Jewish Historical Society'; Schechter's 'Studies in Judaism,' and many issues of the American Jewish Publication Society. Within recent years in particular a rich and extensive literature has sprung up in this line of study in England, Germany, France, Russia, Italy, and elsewhere.

A. S. ISAACS,
Prof. German Literature, New York University.

Jews in America. Although the Jewish population of America has been greatly increased by immigration only since 1881, Jews have been closely identified with American history for centuries, and some of that race even settled in this country in Columbus' day.

Before taking up the history of the Jews in America, some statistics concerning the American-Jewish population at various periods will be in order, as tending to throw light on more isolated historical incidents relating, for the most part, to the experience of a small fraction only.

Statistics.— The latest and most authoritative statistics as to the present Jewish population of the United States are furnished by the 'American Jewish Year Book' (September 1903), wherein it is computed that the total number of Jews in this country is 1,127,268, of whom 500,000 are credited to New York State, 28,000 to California, 75,000 to Illinois, 25,000 to Indiana, 26,500 to Maryland, 60,000 to Massachusetts, 50,000 to Missouri, 25,000 to New Jersey, 50,000 to Ohio, and 95,000 to Pennsylvania; all the other States and Territories, including Hawaii, Porto Rico, and the Philippine Islands, and also the District of Columbia, likewise containing some Jewish residents. In making up this total, account is taken of the fact that 761,598 Jewish immigrants arrived at the ports of New York, Philadelphia, and Baltimore from 1881 to 1 July 1903. The same authority computes the Jewish population of America, exclusive of the United States, as follows: Canada and British Columbia, 25,000; British West Indies, approximately, 2,500; Argentina, 22,500; Brazil, 3,000; Cuba, 4,000; Mexico, 1,000; Curaçao, 103; Surinam (Dutch Guiana), 1,121, and Venezuela 411; making 1,186,903 in all for America. These figures are mere estimates, than which nothing more accurate is at present obtainable; but they are no doubt approximately correct, being based upon partial actual counts, analyses of death-rates, and reports of competent judges in the various localities; and having also been reviewed from time to time in the light of criticism and new data. If anything, the figures are probably somewhat too low, the city of New York, in its five boroughs, being credited by competent judges in 1903 with a population of over 600,000 Jews, which would make the estimate for the State above quoted about 150,000 too low. Estimates for other districts are also likely to be low; although that given for Cuba is undoubtedly too high. In rough figures, then, the Jewish population of the United States to-day may be estimated at 1,200,000.

The first systematic attempt to secure statistics of the Jewish population in the United States culminated in the publication of a report by the Union of American Hebrew Congregations in 1880, giving estimates for each State and city in the Union, and aggregating 230,257 persons. In connection with the national census of 1890 statistical information was gathered regarding Jewish congregations in the United States, and the total number of Jewish communicants was estimated at 130,496, belonging to 533 church organizations. Of these, 316 organizations, having 122 church edifices, valued at $2,802,050, and 51,597 communicants, are to be credited to Orthodox Judaism, while Reform Judaism counted 217 organizations, having 179 church edifices, valued at $6,952,225, and 72,899 communicants. A very large majority of the Jewish immigrants arriving in the United States since 1890 belong to the orthodox wing, and even the figures of 1890 undoubtedly disregard numerous small, often unorganized, orthodox congregations, from whom it was relatively more difficult to secure reports. In 1818 the Jewish population of the United States was estimated at 3,000 only; in 1848, at 50,000. In South America there were several thousand Jews prior to 1650, the greater part of whom were in Brazil, as noted below; but hostile laws and the persecutions of the Inquisition, while driving some

to the West Indies, and even as far north as New Netherlands, caused several thousand Jewish settlers in Spanish and Portuguese territories to totally give up their Jewish identity.

It might be said that there were successive tides of Jewish emigration to America from European countries, fairly well separated from each other in point of time. During the first 250 years after the discovery of America the settlers were mainly Jewish immigrants of Spanish-Portuguese stock, with only an occasional sprinkling of German, French, English, and Polish Jews. German Jewish emigration becomes considerable only a short time before the American Revolution (though evidence is accumulating that it took upon itself larger dimensions and at an earlier period than is commonly believed); it was stimulated by the reactionary measures following the Napoleonic wars and the revolution of 1848, and began to include emigrants from the Austro-Hungarian empire, and later on an increasing number of Poles. The Russian-Jewish exodus, which began about 1881, was by far the heaviest of these various currents of emigration, and was itself succeeded or joined by a Rumanian-Jewish wave about 1900. For Jewish statistics of other countries see JEWS AND JUDAISM.

Jews in the Spanish and Portuguese Colonies.— Before the discovery Jews were actively identified with the fate of America, as may be said without reference to the curious and once widely accepted theory that the American Indians are descendants of the lost Ten Tribes. Emilio Castelar, the late Spanish statesman and historian, referring to the coincidence that the Jews were expelled from Spain in the year that Columbus started on his first voyage of discovery — a circumstance noted by Columbus himself in his journal, and repeatedly thereafter commented upon by Jewish historians — makes this observation:

> It chanced that one of the last vessels transporting into exile the Jews expelled from Spain by the religious intolerance of which the recently created and odious Tribunal of the Faith was the embodiment, passed by the little fleet bound in search of another world, whose creation should be new-born, a haven be afforded to the quickening principle of human liberty, and a temple reared to the God of enfranchised and redeemed consciences.

But Jewish aid to Columbus was not limited to Jews accompanying him on this first voyage (including Luis de Torres, a new convert to Christianity, who went as interpreter because of his knowledge of Arabic, and settled before 1500 in America), nor to the circumstance that Columbus carried with him, as aids on his voyage, a sea-quadrant called "Jacob's Staff," invented by a Spanish Jew, and astronomical tables and charts invented by another Jew. The more significant and important fact is that Jewish financiers at the Spanish court were his leading patrons, and advanced the money for his voyage, as evidenced by original account-books still found in the Spanish archives; so that it was a mere recognition of this circumstance that induced him to address the first two letters (now justly famous, and the earliest copies of printed editions of which command thousands of dollars from book-fanciers) narrating his discovery to those two secret Jewish friends, Louis de Santangel, chancellor of Aragon, and Gabriel Sanchez, royal treasurer. In the light of such facts the late Herbert B. Adams wrote that "not jewels, but Jews, were the real financial basis of the first expedition of Columbus." The revenues needed to fit out the second expedition were secured from the proceeds of the property, of which the expelled Spanish Jews were despoiled by the Inquisition at the time of their expulsion from Spain.

In spite of prohibitions upon Jewish settlement in Spanish and Portuguese America, many Jews rapidly emigrated to the New World from among those exiled from Spain and Portugal; occasionally, in spite of the inconsistency involved, in view of those prohibitions, Jews and Jewesses were forcibly transported to America by the state through the agency of the Inquisition. By 1548 Jews are referred to not merely as having settled in Brazil, but as introducing sugar-culture there, which they transplanted from Madeira. The smoking of tobacco had been introduced to Europeans even before 1500 by Luis de Torres, a companion of Columbus. Occasionally, enormous sums of money had to be raised and given to the crown in order to effect suspensions or revocations of prohibitions upon Jewish settlement in the Spanish and Portuguese colonies. But the Inquisition and its terrors were introduced even into the New World; hence Jews found it advisable to try to conceal their faith under the cloak of Christianity; and it is principally in the records of the Inquisition that we find proofs of the Jewish practices of many of these settlers — called Marranos or secret Jews — whose trials commonly resulted in imprisonment, frequently in death at the stake, and were at all events followed by confiscation of their property.

In Brazil, Jewish settlers actively aided the Dutch in effecting their conquest of that country, about 1620, after which the Jews *en masse* threw off their Christian disguise and publicly professed their own religion. The Dutch West India Company (q.v.), which obtained the proprietorship of Brazil, had many influential Jewish stockholders, and under their auspices large numbers of Jews from Portugal, Holland, and Germany immigrated. Jewish residents are referred to about 1640 as owning the principal sugar-plantations of Brazil, and as heavily interested in the diamond industry then developing there; and there is also evidence that a Jewish literature sprang up in Brazil at this time. Some idea of their numbers may be gathered from the fact that at the time of the surrender of Recife (Pernambuco) to the Portuguese, after its recapture from the Dutch, soon after the middle of the 17th century, that city alone contained about 5,000 Jews, even after many had departed from the city. In smaller numbers they were also established in other cities of Brazil, in Mexico, Peru, the West Indies, and at other points. The Dutch capitulation of Brazil in 1654 led to their flight in large numbers from that country, their migrations leading them northward, particularly to the West Indies, and one party of refugees even becoming the nucleus of a Jewish settlement at New Amsterdam (New York city) in 1654. Many, however, remained in the South American colonies, and their Jewish identity was gradually lost under the hostile influences at work. The settlements under Dutch auspices at Surinam,

Cayenne, and Curaçao, are deserving of particular attention.

Of the professing Jewish inhabitants now to be found in these districts, enumerated in the statistics just considered, very few are descendants of the original Spanish settlers, the great bulk of them being comparatively recent arrivals from Germany, Russia, and Rumania. Through the munificence of Baron de Hirsch (q.v.) millions of dollars were employed about 1891 in the purchase of land and equipment for the use of agricultural colonies of Russian Jews established under his auspices in Argentina, where several thousand Jews settled, though they have met with only moderate success.

West Indies.— Reference has already been made to early settlements of Jews in Cuba and other West Indian islands. Their settlement in Jamaica was particularly important on account of their numbers and the once great commercial importance of the island. For the latter reason, their residence in the Barbados, at St. Eustatius, Martinique, and in the Danish West Indian colonies also led to important consequences. Reference will be made hereafter to this circumstance. Except in Cuba, the decline of the above named places commercially has caused a decided diminution in the number of their Jewish inhabitants, and to-day the chief interest in the settlements is historical.

Early Settlements in the United States before the Revolution.— There are indications of some isolated and casual arrivals of individual Jews within the present limits of the United States prior to the arrival of the party from Brazil in colonial New York during the Dutch régime, in 1654; these were in Maryland, Virginia, and New England, to say nothing of a party of Jewish soldiers and sailors who seem to have reached New Netherlands (New York) in 1652. These instances (other than those in the Dutch colony) are purely casual, however, and unimportant, because Jews were not allowed at this time to live as avowed Jews in any of the principal countries that then had colonies in America except Holland. Prohibitions against their settlement were in force (though occasionally ignored) in Spain, Portugal, England, and to some extent in France. Holland alone at this time welcomed the Jewish refugee, to her great commercial advantage; and this "common harbor of all opinions and of all heresies" was, logically enough, destined to establish a precedent for granting religious liberty also in the New World. It is true that in New Netherlands Governor Peter Stuyvesant (q.v.) was decidedly hostile to the Jewish arrivals, as were also some of the early Dutch ecclesiastical authorities; but, thanks to the leveling and humanizing influence of commerce, and to Jewish holdings of stock in the Dutch West India Company, the directors of that company, 26 April 1655, instructed their governor that the "Jews shall have permission to sail to and trade in New Netherlands, and to live and remain there, provided the poor among them shall not become a burden to the company, or to the community, but be supported by their own nation"; and Stuyvesant was strongly reproved soon after for seeking to thwart these clearly expressed wishes of the company. The emancipation of Jews was, however, only gradual; certain restrictions were continued through the whole colonial period, though they decreased from time to time, and in importance. Public worship, as distinguished from private religious services, was forbidden them till near the close of the 17th century, as was also selling at retail, and certain political rights of citizenship were also denied; but these restrictions in the course of time were largely removed in practice, so that the adoption of the first constitution of the State of New York, in the Revolutionary period, which established absolute religious liberty, conferred in effect few, if any, privileges on the Jewish residents of that State, which they had not already virtually enjoyed. In the interior, the number of Jewish residents had grown somewhat by emigration from Germany, Hungary, Poland, and also from England, which, under Cromwell, readmitted the Jews soon after the time of their settlement in New Netherlands; but the increase in numbers through immigration was not great till after 1800, for there were few Jews in England, and still fewer who desired to emigrate from there, while emigration to New York and New England prior to the above date from any of the other designated countries was very small.

To Newport, R. I., Jews emigrated very soon after they first settled in New Amsterdam, and Roger Williams (q.v.) in terms included them in his programme for establishing a colony where religious liberty would be accorded to all sects and creeds. In the course of time they erected a synagogue here also, as well as in New York, and established a community which contributed most materially to the commercial prosperity of Newport, which city far outrivaled New York for some decades before the Revolution, and until, during that struggle, its shipping interests received a blow from which they never wholly recovered. Here also, there were some retrogressions during the colonial period from Roger Williams' enlightened declaration of principles; but on the whole, Jews were most prosperous residents of Newport during the latter portion of the colonial period. Even though the colony never was numerous, it embraced such merchant princes as Aaron Lopez and Jacob Rodrigues Rivera, and its fortunes were commemorated, after all the old-time residents had departed, in Longfellow's famous lines on "The Jewish Cemetery at Newport." Already in the colonial period Jewish settlers occasionally found their way into Connecticut, also to Boston, and even, it would seem, to Maine, but they were very few in number, and the present Jewish residents of New England date almost entirely from the period of German settlement after 1848, followed by a much more considerable Polish and Russian-Jewish settlement toward the end of the 19th century. About 1820 Major Mordecai M. Noah, at one time United States Consul to Tunis, developed a fantastic plan for founding a Jewish state for the oppressed Jews of other lands under his own "judgeship," near Niagara Falls, at a place he named, "Ararat, City of Refuge," and attempted to tax all the Jews throughout the world for this purpose, but the scheme merely aroused amused attention. Other less ambitious early colonization schemes also were formed.

Pennsylvania, under William Penn's generous plan for founding a home for victims of persecution, attracted Jewish settlers, and in the early

decades of the 18th century a little stream of immigration began which brought a number of German, English, and Polish Jewish settlers to the colony, whose numbers were increased, after the capture of New York by the British in 1776, by the arrival of Portuguese Jews from that city. The Jewish settlement in Lancaster, Pa., was made about the time of the American Revolution; and there was a small Jewish immigration into Maryland and Virginia, with communities in Schaefersville, Easton, Baltimore, and Richmond. Before the close of the Revolution a Portuguese synagogue had been erected in Philadelphia; soon a German Jewish congregation was established there; and about the same period one was erected in Richmond, Va. The laws of Maryland prohibited Jewish settlement, and as early as 1658, Dr. Jacob Lumbrozo, "the Jew physician," figured there as defendant in a blasphemy trial, which nearly cost him his life. Baltimore is of particular interest because it was the only city in the United States in which systematic and long-continued efforts were necessary, subsequent to the Revolution, in order to secure full civil and political rights for Jews as such: they acquired them finally in 1826. Georgia attracted Jews almost immediately after the founding of the colony, parties of both German and Portuguese Jewish settlers having arrived at Savannah in 1733. Some of these were indigent Jews, who were assisted to emigrate by coreligionists in England. Offshoots from this colony migrated to South Carolina before the first half of the 18th century, and a congregation was formed in Charleston in 1750. By the time of the Revolution, and for some decades thereafter, Charleston contained one of the most important and prosperous Jewish communities in the United States. In both of these colonies Jews seem to have figured as holders of responsible civil office before the close of the Revolutionary War.

The various places which contained Jewish communities prior to the Revolution have now been enumerated; the total Jewish population embraced in them and in other and more isolated settlements was, as seen, somewhat less than 3,000 in the year 1800.

Interior Settlements.— Space does not permit consideration of the various Jewish settlements and their date of establishment outside of the limits of the 13 colonies. The great majority of Jewish residents of the United States still reside along the eastern coast-line. In time, the westward movement carried Jewish settlers along with it, some into interior cities in the original 13 States, others farther west. By 1800 there were several Jewish residents at Pittsburg. Judah Touro (q.v.), the well-known Jewish philanthropist, went to New Orleans about 1801, and Jews were destined, during the latter half of the 19th century, to achieve considerable political distinction there, though probably there were some Jewish settlers in the Louisiana Territory nearly a century earlier, who were persecuted by reason of the prohibitions in the French "Code Noir" upon Jewish settlement. The first indisputable Jewish resident of Kentucky seems to have settled there about 1808. Ohio appears to have received its first Jewish residents about 1817–19, and after 1830 a considerable tide of German-Jewish immigration flowed toward Cincinnati. In Illinois, which has to-day a considerable number of Jewish inhabitants (see above), especially in and about Chicago, the first Jewish settler probably arrived about 1841; and after a couple of years, numbers of German Jews began to come. A little later this same tide reached Detroit, Mich. Texas, while still belonging to Mexico, had quite a contingent of Jewish settlers, who began to arrive about 1821. California attracted a considerable number of Jews at the time of the gold discovery in 1849, and in 1850 they had two congregations in San Francisco. It will be observed that the great majority of Jews in the United States are to be found in the large cities.

The reactionary movement that followed the Napoleonic wars in Germany, early in the 19th century, and particularly the barbarous Jewish marriage laws of some of the German states (which, among numerous disabilities from which Jews suffered, were possibly the most objectionable, as they forbade more than a certain number of Jewish couples to live in any district), greatly stimulated German Jewish emigration to the United States from about 1815. After the revolutions of 1848 the political and economic unrest in Germany and throughout Europe caused a particularly valuable and intelligent class of Jewish immigrants to come to this country, including, in addition to Germans, also Hungarians, Poles, and Bohemians; while after 1881 the Russian-Jewish exodus assumed large dimensions, and the Rumanian-Jewish emigration began to be heavy about 1900. The volume of these tides can be gauged by comparing the estimates of Jewish population at various periods, already quoted, with these various dates. The forced emigration of recent years from Russia and Rumania has naturally had the effect of bringing to these shores persons less adequately equipped, and who had known fewer opportunities for development and self-improvement than the earlier immigrants, generally speaking, had enjoyed.

The Jews in American Commerce, Industries, and the Professions.— Reference has already been made to early Jewish activities in the field of commerce, exhibited in Brazil and the West Indies particularly. It is most important here to note the consequences which followed the dispersion of the Jews throughout so many different lands and districts, resulting in their opening of international and intercolonial trade relations with each other long before those having no such ties of relationship or confidence, and no such common language or commercial abilities, were ready for any such mutual intercourse. The result was that in early colonial days Jews were pioneers and prime promoters of intercolonial and foreign commerce in America, which became not merely profitable, but actually indispensable, for the maintenance of the colonies. The most distant points thus became interlinked by means of their Jewish residents. Every industry and branch of trade engaged their attention. Among persons who were particularly prominent in these fields, besides Lopez, Rivera and Touro, already referred to, were Lewis Gomez and his sons, who were exporters of wheat on a very large scale in colonial New York, early in the 18th century; Hayman Levy, the fur-dealer of New York, who had close relations with the

American Indians, and was at one time the employer of the first John Jacob Astor; David Gradis of Bordeaux, who is described as having "controlled the trade of France with the West Indies," in the 18th century, etc. Aaron Lopez of Newport had a fleet of over 30 vessels shortly before the Revolution, engaged in trade between Newport, the West Indies, and Africa. Newport Jews also created the spermaceti industry. Jews were among the founders of the New York Chamber of Commerce, and one figures on its seal as a member of the committee receiving its charter from the colonial governor. They were also among the founders of the New York Stock Exchange, and ever since that time have been growing in importance in America as bankers, brokers, financiers, and railroad magnates. They have been particularly influential in certain lines of trade, including the cotton, tobacco, sugar, coffee, jewelry, leather, hides, meat-packing, and clothing industries, and department-store activities.

The Jews of America have produced distinguished inventors, lawyers, physicians, rabbis, journalists, scientists, artists, dramatists, and professors, filling chairs at all the leading universities, far in excess of the proportional number of their race in the population of the country. On the other hand, the large immigration of unskilled laborers into the United States has led to the employment of thousands of Jews here in every industrial pursuit, frequently at very low wages and under unfavorable conditions.

Jews in the Army, Navy, and Public Service Generally.— Prior to the American Revolution there were Jews serving in the militia and in the colonial wars. During the Revolutionary War, their numbers on the army rolls far exceeded their ratio to the total population, and a number achieved distinction above the ranks. The New York Jewish congregation concluded, by a decisive majority vote, to disband, rather than to sacrifice patriotism on the altar of religion, and many of its members fled to Philadelphia, just prior to the British occupancy of New York. In the South a corps of volunteer infantry, known as Captain Lushington's company, composed principally of Jews, was organized in Charleston in 1779, and fought in the patriot ranks. A number of Jews had figured as signers to the Non-Importation Agreement of 1765. Among those on the Revolutionary rolls who achieved military distinction are Col. Solomon Bush; Col. David S. Franks, aide-de-camp to Gen. Arnold before the latter's treason, and who was the bearer of the signed definitive treaty of peace, sent abroad by Congress for delivery there; Isaac Franks, who became colonel of Pennsylvania's volunteers soon after the Revolution, after having served long during the war in the ranks; Capt. Jacob de la Motta; Maj. Nones; Lieut. Seixas; and Deputy Commissary-General of Issues Sheftall, of Georgia. During our War of 1812 and the Mexican War many Jews served in the ranks, and occasionally as holders of important military positions; while during the Civil War the number of Jewish soldiers in the field far exceeded their ratio to the whole population of the country, and they held military positions from brigadier-general down. Hon. Simon Wolf, in his work, 'The American Jew as Patriot, Soldier and Citizen,' has, by means of enormous labor and investigation, collected available names and records of Jewish soldiers in the Federal army and navy, in which he reports that during the Civil War, no fewer than 7,884 Jews served, and even these numbers are necessarily incomplete. As the Jews were Union men in the North, so those living in the South generally espoused the cause of the Confederacy; but Mr. Wolf's figures include less than 2,000 Confederate Jewish soldiers. The number included by him as serving in the Union and Confederate navies is almost negligible. A similar list of Jews who served during the Spanish-American War has been compiled (American Jewish Year Book 1900–01, pp. 527–622), and includes thousands of names, again exceeding the relative ratio based on that of the total number of persons serving to the total population; and President Roosevelt, years later, felt called upon to compliment them publicly upon their bravery, as indicated by instances of Jews who served under him and were commended for gallantry. Neither have Jews failed to enlist in our navy, for since the latter was instituted, a number of Jews have notably risen from the files to naval distinction, as witness the careers of Capt. Etting, Maj. David M. Cohen of the United States Marine Corps, Capt. Levi M. Harby, Capt. Jonas P. Levy, and "Commodore" Uriah P. Levy, who at the time of his death in 1862 was the ranking officer in the United States navy. Nor have Jews failed to render the government signal services in private life. Haym Salomon, the associate of Robert Morris and Madison, was broker to the Office of Finance, and it was through his hands that the loans from France and Holland to the infant republic passed; he made heavy advances to the government, which at the time of his death was indebted to him in hundreds of thousands of dollars, which have never been repaid, in spite of repeated Congressional reports in favor of the claim. During the Revolutionary period, there were still others who aided the government's hazardous financial fortunes. Among the most distinguished Jewish patriots of the Revolution stands Francis Salvador, who was a member of the South Carolina Provincial Congress and of the General Assembly of that State. On the other hand there were, naturally enough, also a few Tories among the Jews, chief among whom were David Franks of Philadelphia, who had been British commissary-general, during the French and Indian war, together with his father, Jacob Franks. David Franks' daughter, Rebecca Franks, was one of the leading belles and wits of Philadelphia and New York during the Revolution. A number of Jews have served in Congress, both in the Senate and the House of Representatives, the most prominent among them having been Judah P. Benjamin (q.v.), who resigned his seat in the Senate to become attorney-general, secretary of war, and then secretary of state of the Confederate States, and subsequently became leader of the English bar. Several Jews have been U. S. ministers to Turkey and consuls-general, one of the former, Oscar S. Straus, now being a member of the Permanent Court of Arbitration at The Hague. Many have been judges in different States, and several have been attorneys-general of their States. A number have been mayors of leading cities, while many others have held local and

State offices. Among those who rendered our government most valuable services in trying financial times are J. & W. Seligman & Co. Several Jews, particularly Moritz Pinner, David Einhorn, and M. Heilprin, were active workers for individual liberty in the anti-slavery movement.

Charities and Other Institutions.— The Jewish charities of the United States are unequaled in magnitude and efficiency, compared with the total Jewish population. Naturally enough, the enormous exodus of well-nigh indigent Jews to these shores has greatly increased the burden falling on their more fortunate coreligionists. The amounts disbursed by the organized Jewish charities in New York city alone exceeds $1,000,000 per annum. Almost every possible field of charitable endeavor is attended to. New York city, for example, contains three Jewish hospitals, a home for incurables, two Jewish orphan asylums, two Hebrew technical schools, an educational alliance, a home for aged and infirm, and an organization of United Hebrew Charities for direct relief; and these are but a few out of scores of charitable societies and institutions. The pure milk depots opened by Nathan Straus, at a heavy loss to himself, in New York — an example which has been followed in other cities — is one of the most effective forms of charitable endeavor, and has saved thousands of infant lives. Various Jews of the United States have contributed hundreds of thousands of dollars at a time in individual instances to charitable purposes, best known among whom Mr. Jacob H. Schiff of New York, who is credited with observance of the old Jewish practice of giving a tithe of his income to charity. The arbitration movement for settling controversies between capital and labor, known as the Civic Federation, has enlisted several Jews in its directorate. The Jewish charities of the United States are being systematized and organized more and more from year to year; aid is being afforded by the newly instituted annual national conferences of Jewish Charities, and under their auspices, removal offices have been opened within the United States to aid indigent immigrants after arrival, to seek locations for them in the interior of the country, and thus somewhat relieve the congestion of the large Eastern cities. Of course all the local New York charities deal particularly with recent arrivals, but the Baron de Hirsch Fund and the Educational Alliance especially address their efforts toward them.

A number of very large mutual benefit and mutual development societies, taking the form of fraternities of Jewish lodges, exist within the United States and do much good, chief among them being the Independent Order B'nai B'rith, the Independent Order Free Sons of Israel, and the Independent Order Sons of Benjamin. The recently organized Zionist movement has appealed greatly to many thousands of Jews in America, particularly to the more orthodox, and they have organized numerous societies to aid in establishing a Jewish state, in Palestine or elsewhere, for the benefit of the persecuted Jews of eastern Europe.

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See JEWS AND JUDAISM, and JUDAISM, REFORMED, for consideration of the religious life of the Jews of America.

MAX J. KOHLER, A. M., L.L. B.
Cor. Sec. American Jewish Historical Society.

Jew's Harp, a small musical instrument held between the lips, the sound coming from the vibrations of a tongue of metal, bent at a right angle, which is set in motion by being twitched with the fore-finger. The sound is increased in intensity by the breath, and altered in pitch by the shape of the cavity of the mouth, which acts as a reflector. The name some derive from *jeu*, play, from the fact of its being a toy; but more probably it is a derisive allusion to the harp of David.

Jew's Mallow, a pot-herb. See CORCHORUS.

Jex-Blake, Sophia, English physician: b. Sussex January 1840. She was the daughter of a physician, studied medicine in Boston, Mass., 1866–8, and returning to England matriculated at the University of Edinburgh, but was not allowed to complete her studies there and take the degree of M.D., which she subsequently obtained at the University of Bern. She founded the London School of Medicine for Women, the Edinburgh School of Medicine for Women in 1886, and retired from active practice in 1899. She has published 'American Schools and Colleges' (1866); 'Medical Women' (1872); 'Puerperal Fever' (1877); 'The Care of Infants' (1884).

Jez'ebel, the Phœnician wife of Ahab, king of Israel. She was the evil genius of her husband, favored the idolatrous worship of Baal in Palestine, and persecuted the prophets of Jehovah. Her name left a dark stain upon the annals of Israel and survived to the later dispensation where it occurs in the Book of Revelations (Rev. xi., 20) as a symbol of feminine depravity and impiety.

Jhelam, jē'lam, or **Jhelum** (ancient HYDASPES), a river which has its rise in Kashmir. An octagonal tank has been built in a garden at Vernag, and into this reservoir flow springs

from the Western Himalayas, which form the head waters of the Jhelam. The river flows northwest to the Wulur Lake, about 10 miles from Srinagar; then southwest and northwest, forming a curve from Wulur Lake through Barambula Pass to Mazufurubad, where it turns south, and flows along the boundary between Punjab and Kashmir, a distance of about 100 miles. Leaving the boundary line at Jhelam it flows southwest into the Chenab River. Its whole course is about 500 miles, nearly all of which is navigable. The first part of its course is through remarkable mountain scenery and the last through a rich agricultural region. It is the thoroughfare for a number of large cities and small towns. This is the river upon the banks of which Alexander the Great built a war fleet in 326 B.C. and fought a battle with Porus.

Jig, a light quick tune or air to be found in the sonatas of Corelli, Handel, and other composers till toward the middle of the 18th century. The Irish jig, played to a dance also called a jig, is a lively tune of two or three sections written in 6–8 time. The jig is popular among many nations, is distinguished by various titles, and has a certain amount of difference in the steps according to the habits and customs of the people by whom it is adopted. With some it is a sober, steady country dance; with others it is a wild, savage exercise, without point of meaning. With some it is made a means of displaying the agility of the lower limbs of a combined company of dancers; with others it is a terpsichorean drama for two performers, in which all the emotions excited by love are represented by gestures and cries.

Jig'ger, the corrupt current form of "chigoe," the South American name of a small arachnid, or red bug (*Sarcopsylla penetrans*), which abounds in tropical America, and is troublesome by working its way under the skin, especially of the feet, where, unless speedily removed, it produces eggs and forms a bad sore.

Jihad, jĭ-häd', **Jehad,** or **Tihad** (Arab. "zeal, endeavor"), the term applied to the religious war, as undertaken by Mohammedans against those who did not believe in the mission of the Prophet, for the purpose of promoting the spread of Islam. The Jihad was a religious duty, imposed upon the faithful both by the Koran and the concurrence of sacred tradition. Its purpose was ostensibly the Mohammedanization of the unbelieving, and it was carried on in a systematic manner. The disposition of the peoples conquered in the Jihad was prescribed by law. Captives and others who fell into the hands of the Mohammedan hosts had the choice of three things given them. Either they were to deny their own faith and accept that of Islam, or to consent to pay a toll tax to their conquerors. If they refused both of these alternatives they were put to death by the sword. Consult: Baillie, 'Of Jihad in Mohammedan Law' (1871); T. T. Hughes, 'Dictionary of Islam' (1886).

Jim'son-weed. See DATURA.

Jingal, jĭn'gâl, a large heavy musket used in eastern Asia, especially by the Chinese. It is fired on a rest, or swivel, from a wall, or the bulwark of a boat or ship.

Jingo, a word first used as a political term in the Russo-Turkish War of 1877–8, and was applied to a class of British politicians who continually urged on Disraeli, then the prime minister, the necessity of taking sides with the Turks. The word was adopted from "McDermott's War Song"—that is, the song sung in music halls by McDermott and very popular at the time. The chorus ran thus:

> We don't want to fight, but, by Jingo! if we do,
> We've got the ships, we've got the men, we've got the money, too.

Jinrikisha, jĭn-rĭk'ĭ-sha ("man-power vehicle"), a two-wheeled carriage, resembling a gig, and drawn by a human runner between the shafts, universally used in Japan since 1868.

Jiu Jitsu, the Japanese method of personal attack and self-defense, literally means the gentle art of making one's opponent use his strength to his own disadvantage. There are many methods, but only one is recognized as official, that devised by Prof. Jiguro Kano, principal of the High Normal School of Tokyo, and is taught to every officer and enlisted man of the Japanese army, navy and police departments. Included in the one hundred and sixty feats of the Kano system are the "serious tricks," by which death may be caused at the will of the adept, and the process of kuatsu or revivification, by which the apparently lifeless victim is restored to the full use of his functional powers. Jiu Jitsu is not a system of muscle building by physical training, but rather a means of offsetting the effectiveness of powerful muscles, by performing the most skilful yet simple maneuvers. The United States Government has recognized its importance as science by having it taught at West Point and Annapolis as a special training. Consult Skinner, 'Jiu Jitsu' (New York 1904).

Joab, jō'ăb, the son of King David's sister Zeruiah, and commander-in-chief of David's army. He is first mentioned as the leader of David's men in an expedition against Abner. When Joab treacherously murdered Abner in revenge for the death of Asahel, David dared not punish the deed, and thus showed the ascendency which Joab had acquired over him. After David had been established king in Jerusalem, Joab conducted all his wars with uniform success. He remained faithful to him during the rebellion of Absalom. When he had slain that ungrateful son, David made a weak attempt to supersede him in favor of Amasa, the general of Absalom. Joab slew Amasa and resumed his post, a proceeding in which the king tacitly acquiesced. He further supported David by assisting in the murder of Uriah the Hittite. Toward the close of David's reign he joined in the rebellion of Adonijah, for which Solomon, by the advice of David, put him to death.

Joachim, yō'ä-hĭm, **Joseph,** Hungarian violinist: b. Kittsee, near Presburg, 28 June 1831. He studied under Szervaczinsky, the opera concert-meister at Budapest, with Böhm at Vienna, and Hauptmann at the Vienna Conservatory, and after appearances in concert, continued his studies at Leipsic. In 1849 he became concert-meister of the Weimar grand-ducal orchestra, of which Liszt was then conductor, in 1854–66 was solo-violinist and conductor of concerts to the king of Hanover, and in 1868 became director of the Hochschule für ausübende Tonkunst at Berlin. He became known, both

as an interpreter of the best music and as an executant, as the greatest violinist of his time, and particularly as a quartette player gained an almost classic reputation. His compositions include the 'Hungarian Concerto' in D-minor for violin and orchestra, his most important work; ballads, trios, overtures, marches, and works for violin and pianoforte.

Joachim, jō'ą-kĭm, Saint, Order of, an order of knighthood founded 20 June 1755, under the title "Order of Jonathan for the purpose of defending the honor of Divine Providence." It consisted of 14 dukes, princes, counts and nobles, and its grandmaster was Prince Franz Christian of Saxe-Coburg. Its object was by the establishment of commanderies to stir up the rich to philanthropic work among the lower classes. This order was still in existence in 1820, but it has since then been dissolved.

Joan (jo-ăn or jōn) **of Arc** (JEANNE D'ARC — properly DARC), the Maid of Orleans, heroine in French history: b. Domrémy, Basse Lorraine, now department of the Vosges, 6 Jan. 1412; d. Rouen 30 May 1431. While she was still a girl she began to be deeply affected by the woes of her country, much of which was conquered by the English and their Burgundian allies, leaving only a small portion to the French king, Charles VII. From about 13 she declared she heard heavenly voices, which at last became very definite in their commands to go to the aid of Charles and liberate France. At first she was regarded as insane, but eventually she found her way to the king and his councillors, and having persuaded them of her sincerity, received permission to hasten with Dunois to the deliverance of Orleans. In a male dress, fully armed, she bore the sword and the sacred banner, as the signal of victory, at the head of the army. The first enterprise was successful. With 10,000 men she marched from Blois, and on 29 April 1429 reached Orleans with supplies. By bold sallies, to which she animated the besieged, the English were forced from their intrenchments, and Suffolk abandoned the siege (8 May 1429). Other successes followed; Charles entered Rheims in triumph; and at the anointing and coronation of the king, 17 July, Joan stood at his side. She then asked to be allowed to return home, but at the urgent request of King Charles, remained with the army. She was later less successful and failed to capture Paris. On 24 May 1430 she entered Compiègne, then besieged by the Burgundians, and on the same day, in a sally from the town, was taken prisoner. Subsequently she was delivered to the English, who, with the University of Paris and the bishop of Beauvais, demanded her execution as a sorceress. She was taken to Rouen, and after a long mock-trial, accompanied with many shameful circumstances, condemned to death. On submitting to the church, however, and declaring her revelations to be the work of Satan, her punishment was commuted to perpetual imprisonment. But pretexts were soon found to treat her as a relapsed criminal, and as such she was burned at Rouen, and her ashes were thrown into the Seine. She died with undaunted fortitude. Her recantation is now doubted by some historians. Voltaire, in a notorious burlesque, 'La Pucelle,' Southey, Schiller, and others have made her the subject of their verse. Schiller's drama, 'Die Jungfrau von Orleans,' still remains the worthiest monument of her fame. A revision of the trial was later had, and she was declared innocent (1456). From 1875 the question of her canonization was discussed at Rome, and in 1902 she had been pronounced "venerable." Consult: Quicherat, 'Condemnation et Rehabilitation de Jeanne Darc' (1841–9); Marin, 'Jeanne Darc, Tacticien et Stratégiste' (1891); Oliphant, 'Jeanne d'Arc' (1896); Murray, 'Jeanne d'Arc' (1902).

Joan of Arc, Personal Recollections of, a historical novel by "Mark Twain" (S. L. Clemens), published in 1896. It professes to be a translation by Jean François Alden from the ancient French of the original unpublished MS. in the national archives of France, written by the Sieur Louis de Conte, her page and secretary. The historical facts are closely followed.

Job, jōb, Book of, title of a book in the Old Testament, so called from the man whose history it relates. It cannot be ascertained with certainty when the book was produced. Job himself belongs to the patriarchal age, but the book was written at a period when great calamities had fallen upon the people of God, and they had been driven by bitter experience to consider the nature and object of His providential workings. It is probably later than Jeremiah (626 B.C.) or Habakkuk (604 B.C.), both of whom had paid some attention to this problem.

The prologue (ch. i. ii.) is written in prose. Satan is permitted to test Job's trust in God, and the patriarch is suddenly stripped of his possessions and bereaved of his children. Yet Job ascribes no wrong to God. He himself is smitten with deadly leprosy. Job's three friends came to see him and he bursts into a despairing cry for death.

The debate between Job and his three friends (ch. iv.–xxxi.) is written in poetry. These friends attribute Job's affliction to his sin and hypocrisy. They are answered by Job's self-vindication; he adjures God to reveal the cause of his chastisement. In the speech of Elihu, a youth, who has listened to the debate, the goodness of God is asserted. He afflicts men to deter them from sin.

Then the Lord speaks out of the whirlwind (ch. xxxviii.–xlii. 6) and shows his power as Creator and Preserver of all things in the material world. Job answers, "I have heard of Thee with the hearing of the ear, but now mine eyes see Thee." The epilogue is in prose. Job is restored to health and prosperity.

The meaning of the book seems to be, that suffering or calamity is not a proof of guilt in the sufferers; the ways of God are so high, His power so vast in creation, in the government of nations and in the realm of mind, that man is incapable of gauging His methods of overruling human life.

Job's Tears, a stout grass (*Coix lachryma-jobi*), allied to maize, and which is sometimes seen six or eight feet in height. It is a native of southern Asia, is naturalized in Spain, and in other countries is sometimes grown in hothouses. The hard, round, shining seed-capsules, from whose fanciful resemblance to tears the plant derives its name, are used in making rosaries and ornamental articles, as medicine by the Chinese, and as a staple food among some of

the hill-tribes of northern India. See also, GRASSES IN THE UNITED STATES.

Jocelyn, jŏs'ĕ-lĭn, **Ada Maria Jenyns,** English novelist: b. Aldershot, Hampshire, 7 Sept. 1860. She was married to Colonel R. J. O. Jocelyn in 1892. Among her numerous fictions may be mentioned 'A Distracting Guest' (1889); 'Only a Horse Dealer' (1892); 'Pamela's Honeymoon' (1894); 'Lady Mary's Experiences' (1897); 'The Seat of Fortune' (1901).

Jocelyn, Nathaniel, American portrait painter: b. New Haven, Conn., 31 Jan. 1796; d. there 13 Jan. 1881. At 18 he was apprenticed to an engraver, but after three years his early love for painting asserted itself and he established himself as a portrait painter at New Haven in 1820. He was for some time resident in Savannah, where he painted many portraits, but returned to his native town where his work was very popular and where from 1825 to 1835 he painted the portraits of many notables, not a few of which are preserved in Alumni Hall at Yale. His fame extended beyond the limits of his State and he exhibited at the Academy of Design on several occasions. At the age of 80 he painted 'Ocean Breezes,' a successful work of fancy, and his only one. His portraits have been greatly prized by critics. Jocelyn was a staunch anti-slavery man, and his home in New Haven was long one of the stations on the Underground Railroad. He was for many years the senior partner of a bank-note engraving company in New York which subsequently became the American Bank Note Company, resigning from the latter in 1867.

Joe Miller, the name attached to a well known collection of jests, first published in 1739. The name belonged to a comic actor, Joseph Miller (1684–1738), who had then a great reputation as a wit and humorist. The real compiler, however, was a certain John Mottley, an obscure author (1692–1750). The term is now often applied to any stale or worn out jest.

Joe Pye Weed. See EUPATORIUM.

Joel, jō'ĕl, one of the minor prophets. He most probably flourished about 770 B.C., a few years before Amos and Hosea, whose writings have many correspondences with his. Joel's prophecy is full of Oriental symbolism, and is pervaded by a tone of solemn warning. He announces what he calls "a day of Jehovah," that is, a day of judgment and vengeance for Judah and Jerusalem. This is typified by a plague of locusts whose devastations are vividly described. The prophet appeals to the people to meet the impending judgment by prayer and fasting. Jehovah himself is represented as giving his answer to the cry for help; relief from famine, abundant rain, rich harvests are to bring relief. Moreover a new spirit is to be poured out upon the people so that in the day of trial they shall call upon God and be saved. The people of Jehovah sold into captivity by Phœnicians and Philistines are to be restored. The nations are to be called to judgment, and in that fearful day Jerusalem shall find refuge in Jehovah. The style of the prophet is gorgeous in its profusion of imagery; metaphor and hyperbole have to be interpreted, and fact discerned amid the maze of fancy. Yet the language is smooth and flowing without the strain and abruptness of Hosea and Jeremiah, and we are compelled to look upon Joel as a man of calm and settled mind, without any of the doubts and struggles that racked the minds of other Hebrew poets and prophets.

Jogues, zhōg, **Isaac,** French missionary among the North American Indians: b. Orleans 10 Jan. 1607; d. Ossernenon, near the present Awnesville, Montgomery County, N. Y., 18 Oct. 1646. He became a Jesuit at Rouen in 1624, and, after some years passed in study and teaching, was ordained in 1636. At his own request he was immediately sent to the Huron mission in Canada. In 1639 he undertook a mission to the Tobacco Nation, in 1641 preached to the Algonquins at Sault Sainte Marie, not long after went to Three Rivers for supplies for the Huron Mission, and upon his return was captured by the Mohawks and severely tortured. He remained among the Indians as a slave, until the summer of 1643, when he made his escape to the Dutch settlement of Rensselaerswyck (Albany), and was conveyed thence to New Amsterdam. He finally reached France, where he was treated with great consideration, and invited to court. Returning to Canada, he traveled to the Mohawk country in May 1646, in the capacity of an ambassador to conclude a treaty between that people and the French. Ascending the Sorel, he passed through Lake Champlain and Lake George, which he named Lac Saint Sacrement. Having ratified the peace he returned to Quebec, and after a few days' rest set out for the Mohawks again, this time as the founder of the Mission of the Martyrs. He was soon tortured as a sorcerer, and finally killed. Consult: Martin, trans. by Shea, 'Father Isaac Jogues' (1896); Parkman, 'The Jesuits in North America' (new ed. 1898).

Johannesburg, yō-hăn'nĕs-boorg or jō-hăn'nĕs-bĕrg, South Africa, the metropolis of the Transvaal Colony, situated 5,500 feet above the sea, about 30 miles southwest of Pretoria, with which and with Delagoa Bay 397 miles, Durban 483 miles, East London 668 miles, Port Elizabeth 715 miles, and Cape Town 1,015 miles, it is in railway communication. It is the recognized business centre of the rich gold fields of the Witwatersrand, and the largest town in the Transvaal. In 1886 it was represented by a few shanties, but the discovery of gold and the development of gold mining made it within a comparatively few years one of the most important towns of South Africa. Municipal government was conferred upon the city by the Transvaal authorities in 1896, when the population within a three-mile radius was 102,078, of whom 50,907 were whites, 67 per cent of these being of British origin, while the Boer citizens numbered 6,205. The great Uitlander agitation which culminated in the Transvaal war 1899–1902, centred in Johannesburg, which was occupied by Lord Roberts in 1900. Since the close of the war, important public improvements to cost $30,000,000 have been begun. These include many miles of well-paved streets, an elaborate electric car system, new waterworks, sanitation system, a factory section, and handsome suburbs. Mementoes of the former Boer rule are an imposing but dismantled

fortress which dominates the town, and the monument near Krugersdorp which commemorates the declaration of Boer independence in 1880. Among the notable buildings and institutions are: many fine hotels, clubs, etc.; a handsome railway station lighted by electricity; the market buildings, in the large Market Square, where also are the post and telegraph offices and the buildings of the chamber of mines; the fine public library building; the stock exchange; the court-house; many churches; a synagogue; a good hospital; a jail and a police barracks, and a new theatre and opera house. The town is lighted partly by gas but mainly by electricity.

In 1903 there were 160 incorporated mining companies employing 40,000 natives. Prior to the war 96,000 natives were working in the mines; 124 of the mining claims are located on the main reef and the others in the neighborhood of Klerksdorp. Prior to the war the gold production was valued at $7,000,000 a month, and the machinery employed was estimated at $100,000,000. The industry is fast recovering itself, and it is estimated that within a few years the annual production of gold will be equal to $121,500,000. The international peace exhibition of South Africa, to be held at Johannesburg 1904–5, is expected to fully rehabilitate commercial interests, and it is predicted that within six years Johannesburg will have a population of 200,000.

John, the name of 23 popes, as follows:

John I., Saint: b. Tuscany; d. 526. He succeeded Hormisdas in 523, and was a friend of Boethius, who dedicated to him several of his works. Theodoric sent him to Constantinople, to induce the Emperor Justin to adopt milder measures toward the Arians. Though received with uncommon pomp, his mission was fruitless, and on his return Theodoric threw him and his companions into prison, where he died. He is commemorated by the Roman Catholic Church 27 May.

John II. (Mercurius, mẽr-kū'rĭ-ŭs): d. Rome 27 May 535. He was a Roman and was surnamed Mercurius by reason of his eloquence. He became pope in 532.

John III.: d. Rome 12 July, 572. He was a Roman and became pope in July 560. During his time the Lombards frequently ravaged Italy.

John IV.: b. Salona in Dalmatia; d. Rome 11 Oct. 642. He was elevated to the papal chair in December 640 and was noted for zeal and orthodoxy. He formally condemned the Monothelitic statement of faith which Sergius had drawn up at the desire of the Emperor Heraclius.

John V.: b. Antioch, Syria; d. Rome 2 Aug. 686. He was the earliest of several pontiffs of Oriental origin and had been sent to the sixth General Council by Pope Agatho as legate. He became pope, 24 July 685.

John VI., he was a Greek by birth; d. Rome 9 Jan. 705. He became pope in 701, and when appealed to with reference to the long dispute between Saint Wilfred of York and the archiepiscopal see of Canterbury, decided in favor of the latter.

John VII., a Greek: d. Rome 17 Oct. 707. He became pope 1 March 705.

John VIII., a Roman: d. Rome 15 Dec. 882. He became pope in 872. The Saracens during his pontificate pushed their ravages to the gates of Rome, and he was compelled in 877 to pay them tribute. He crowned three emperors, Charles the Bald, 875; Louis the Stammerer, 878; and Charles the Fat, 881. He attempted, but unsuccessfully, to unite the Greek and Latin churches.

John IX.: b. Tibur; d. May 900. He belonged to the Benedictine order and became pope, as the choice of the Frankish party, in June 898.

John X.: b. Romagna; d. July 929. He was a man of great ability and of virtuous character notwithstanding the aspersions Liutprand casts upon him. He was archbishop of Ravenna in 905 and became pope in 914. He placed himself at the head of an army and drove the Saracens from Italy, but his determination to rule independently of any faction aroused the anger of his opponents and he was imprisoned, and at length murdered, by Theodora's daughter, Marozia, whose ambitions he had thwarted.

John XI.: b. 906; d. 936. He was the son of Marozia (q.v.) and Guy, duke of Spoleto. He was elected pope while under age in 931, and governed through the influence of his mother. His brother Alberic II. revolted and imprisoned the pope and his mother in the castle of San Angelo, where John died.

John XII. (Octavian): d. Rome 14 May 964. He was the son of Alberic and grandson of Marozia. He became pope in 956, after the death of Agapetus II., though only 18, and was the first pope who changed his name on accession to the papal dignity. He applied to the emperor Otho I. for assistance against Berengarius II., crowned the emperor 962, and swore allegiance to him, but soon after revolted against Otho, who caused him to be deposed by a council, in 963, and Leo VIII. to be elected. On Otho's death, in 964, John returned and excommunicated his rival.

John XIII., a Roman: d. Rome 6 Sept. 972. He was bishop of Narni, was made pope in 965 by the influence of the emperor Otho I., and was expelled by the Roman nobles. Otho II. restored him to Rome, and was crowned by him. The Poles and Hungarians were converted during his pontificate.

John XIV. (Peter): b. Pavia; d. Rome 20 Aug. 984. He was bishop of Pavia and had been chancellor to Otho II. who made him pope in November 983, in place of the anti-pope Boniface VII. The latter had seized the papacy after the death of Otho I. Boniface now returned from Constantinople and imprisoned John in the castle of San Angelo, where he died soon after.

John XV.: d. Rome April 996. He did not reach the blood-stained throne of his predecessor. He died within the month of his election, even before his consecration.

John XVI. (Philag'athus), a Greek of Calabria: d. 996. He became pope in 986. He solemnly canonized St. Udalbric, bishop of

Augsburg. This is the first historical mention we find of a solemn pontifical canonization.

John XVII. (Sic'co): b. Ripa Jani; d. Rome 7 Dec. 1003. An anti-pope intruded during the pontificate of Gregory V.

John XVIII. (Phasianus, fa-sē-ā'nŭs). He became pope on Christmas Day 1003, and in May 1009, resigned his office and entered a monastery.

John XIX., a Roman: d. January 1033. He succeeded his brother Benedict VIII. He was disposed to concede the title Ecumenical to the Patriarch of Constantinople, but this met with so much opposition from the Latin Church that he was obliged to withdraw the concession.

John XX., frequently called **John XXI.** (Pedro, pā'drō): b. Lisbon, Portugal; d. Viterbo, Italy, 20 May 1277. He became in 1273 cardinal-bishop of Frascabi and pope in September 1276. He was learned in philosophy and medicine and wrote several treatises still of interest as showing the status of mediæval medicine.

John XXI. See John XX.

John XXII. (Jacques D'Euse, zhäk dēs): b. Cahors about 1244; d. Avignon 4 Dec. 1334. He was archbishop of Avignon, and was elected pope at Lyons 1316, after the death of Clement V. He resided at Avignon, but had many adherents in Italy. He is important in German history on account of the active part he took in the disputes of the emperors Louis of Bavaria and Frederick of Austria. Louis intruded the anti-pope Nicholas V. and declared John XXII. deposed. Several theological controversies filled his pontificate with ecclesiastical strife, the most notable being the question of absolute Evangelical poverty raised by the Franciscans and that of hominalism led by William Ockam. He published in 1317 the 'Constitutions of Clement V.,' a manual of canon law, since known by the title 'Clementines' (q.v.). He was also the author of the decretals called 'Extravagantes.' See Canon Law.

John XXIII. (Baldassare Cossa, bäl-däsä'rā kōs'sä): b. Naples; d. Florence 22 Dec. 1419. He was elected pope in 1410, by the Council of Pisa, after the death of Alexander V., on condition that, if Gregory XII. and Benedict XIII. would resign, he would also retire to end the schism. He summoned the Council of Constance, demanded by the Emperor Sigismund, in 1415, where he confirmed his resignation 2 March; but 20 March he fled secretly from Constance to Schaffhausen, and revoked his resignation. He was cited before the council, but not appearing, he was suspended, and finally deposed. He was imprisoned four years. Pope Martin V. subsequently pardoned him and made him cardinal bishop of Tuscoli, and dean of the college of cardinals.

John, king of England: b. Oxford 24 Dec. 1166; d. Newark, Nottinghamshire, 19 Oct. 1216. He was the youngest son of Henry II., by Eleanor of Guienne. Being left without any particular provision he received the name of *Sans Terre* or Lackland; but his brother, Richard I., on his accession conferred large possessions on him. He obtained the crown on the death of Richard in 1199, although the French provinces of Anjou, Touraine, and Maine declared for his nephew, Arthur of Brittany, who was lineally the rightful heir, then with the king of France. A war ensued, in which John recovered the revolted provinces and received homage from Arthur. In 1201 disturbances again broke out in France, and Arthur, who had joined the malcontents, was captured and confined in the castle of Rouen, and never heard of more. John was universally suspected of his nephew's death, and in the war which followed, he lost Normandy, Anjou, Maine, and Touraine. In 1205 his quarrel with the pope began regarding the election to the see of Canterbury, to which the pope had nominated Stephen Langton. The result was that Innocent III. laid the whole kingdom under an interdict, and 1211 issued a bull deposing John. Thereupon John made abject submission to the pope, even agreeing to hold his kingdom as a vassal of the pope (1213). His arbitrary proceedings led to a rising of his nobles, and he was compelled to sign the Magna Charta or Great Charter 15 June 1215. But he did not mean to keep the agreement, and obtaining a bull from the pope annulling the charter, raised an army of mercenaries and commenced war. The barons, in despair, offered the crown of England to the dauphin Louis, who accordingly landed at Sandwich 30 May 1216, and was received as lawful sovereign. The issue was still doubtful when John died. Consult: Stubbs, 'Constitutional History of England,' Vol. I.; Norgate, 'England under the Angevin Kings' (1887), and 'John Lackland' (1902).

John II., king of France, surnamed the "Good": b. about 1319; d. London 8 April 1364. He was the son of Philip VI. and was a monarch distinguished alike for his incapacity and his misfortunes. In 1356 he was defeated and taken prisoner by the Black Prince at the battle of Poitiers, and detained at Bordeaux and at London till released at a heavy expense to his country by the Peace of Brétigny in 1360. On learning that his son, the duke of Anjou, who had been left as a hostage in England, had effected his escape, he returned to London, where he died.

John III. (Sobieski), king of Poland: b. Olesko, Galicia, 2 June 1624; d. 17 June 1696. John Casimir appointed him standard-bearer to the crown, and he distinguished himself in the war against the Russians and Swedes, which terminated with the Peace of Oliva in 1660. In 1669 Michael Koribut was chosen king on the resignation of John Casimir against a party who preferred Sobieski. On the death of Michael he was chosen king, 21 May 1674. A new war with the Turks was concluded after varying success by a peace, 27 Oct. 1676. The anarchy in which Poland was constantly kept by the turbulence of its aristocracy was aggravated during the reign of Sobieski by the intrigues of his wife, and his own talent for administration was not equal to his capacity as a general. Besides internal troubles, European politics at this time occupied the attention of Sobieski, whose alliance was solicited both by Louis XIV. and the emperor. He at length concluded (31 March 1683) an alliance with the latter against the Turks, who had allied themselves with the

malcontents in Hungary and threatened a most formidable invasion of the empire. Uniting with the Austrian forces 9 September, at the head of a combined force of 83,000 men, he inflicted a decisive defeat on the Turks, and compelled them to raise the siege of Vienna, 12 Sept. 1683. He terminated the campaign with the capture of Gran (27 October), which had been in the possession of the Turks for nearly a century and a half. In 1686 he overran Moldavia and Wallachia, but failed to make a permanent conquest.

John of Austria, commonly called **Don John of Austria,** Spanish general: b. Ratisbon, Bavaria, 24 Feb. 1547; d. near Namur, Belgium, 1 Oct. 1578. He was an illegitimate son of the emperor Charles V. In 1570 he conducted a campaign against the Moors of Granada with great vigor and relentlessness, and in the following year commanded the allied fleet which won the great naval battle of Lepanto over the Turks (7 Oct. 1571). In 1576 he was appointed governor of the Netherlands, and had won with the Prince of Parma the victory of Gemblours (1578) over William the Silent, when he died, not without suspicion of having been poisoned by his jealous half-brother, Philip II., but for this belief there is no evidence. Consult: Motley, 'The United Netherlands'; Stirling-Maxwell, 'Don John of Austria' (1883).

John of Gaunt, gänt or gânt, DUKE OF LANCASTER, English soldier: b. Ghent, Flanders, (whence his name) 1340; d. London 3 Feb. 1399. He was the fourth son of Edward III. and his queen, Philippa of Hainaut. He was created Duke of Lancaster in 1362; served in the French wars, and became governor of Guienne. He assumed in right of his wife the title of King of Castile, invaded that kingdom to assert his claims, but relinquished them in favor of Prince Henry of Castile, his son-in-law. He was a supporter of the reformer John Wiclif, and a patron of the poet Chaucer. Shakespeare introduces him as a prominent figure in the play of 'Richard II.' His eldest son, Bolingbroke, became king of England as Henry IV. Consult: Longman, 'Life and Times of Edward III.' (1869); Trevelyan, 'England in the Age of Wycliffe' (2d ed. 1899).

John of Leyden, lī'dĕn. See ANABAPTISTS.

John, Epistles of, three letters upon Christian doctrine and conduct attributed to Saint John the Divine, the fourth Evangelist.

The First Epistle of Saint John.—This epistle was attributed to the apostle and evangelist by writers of the generation succeeding that in which he lived. Its thought, diction and style are those of the fourth gospel, though nothing indicates whether it was written before or after that book. Its date cannot be earlier than 90 A.D. nor later than 100 A.D. Critics generally agree that it was written from Ephesus. It was addressed to certain Christians of Ephesus and its vicinity who had fallen into error. These were Docetæ (q.v.) and failed therefore to reach true fellowship in Christ. The apostle presents Jesus as Christ and shows that we come into fellowship with God through Him, and inculcates faith in a real Redeemer, as a means of crushing the practical error whose result was barrenness in religion.

The book is a pastoral letter of instruction and exhortation, not a theological tract or a commentary on the Gospel. The purpose is set forth in chapter v. 13. The epistle falls into three main divisions: (1) God is light (i. 5–ii. 28), (2) God is righteous, or God is love (ii. 29–v. 5), (3) Jesus is the Son of God; fellowship with God comes through him. Sometimes the second division is subdivided under the headings (1) God is love, (2) God is righteous. But the writer evidently intends these two truths to stand as different aspects of the same truth, for as the love of God springs from his righteousness so his righteousness is the outcome of his love.

The Second Epistle of Saint John.—All evidence conclusively points to the apostle Saint John as author of this epistle. It is directed "to the elect lady and her children," who must have been an individual Christian woman; other views are attended with grave grammatical difficulties, whether we translate it to "the lady Elect" or "the elect Kyria." Her name is in fact unknown. The apostle had been met by some of her children and had rejoiced in their conduct, but warns them against defection.

The letter opens with a greeting; expresses joy in her sons' behavior (verse 4); exhorts all to abound in love (verses 5, 6); warns against deceivers (verses 7, 8), in closing the writer expresses a hope of visiting her, and delivers her sister's greeting.

The Third Epistle of Saint John.—It is addressed to Gaius, who cannot be identified with any person of that name mentioned in the New Testament (Acts xix. 29; xx. 4; Rom. xvi. 23; 1 Cor. i. 14). He lived near Ephesus, and was hospitable to the preachers sent by the apostle (verses 2–4). The character of Diotrephes (verses 9–11) Demetrius, who probably bore the letter is commended (verse 12). A vivid glimpse of church life at the close of the 1st century is given in these letters which reveal the Church in Asia Minor infected with speculative error, personal ambition, and insubordination to apostolic authority, and points to opposition which local leaders sometimes exhibited toward the delegates of the central authorities.

John, Order of Saint, a military religious order of mediæval origin. The Knights Hospitallers of Saint John, subsequently known as Knights of Rhodes, and lastly as Knights of Malta, were once a great power in Christian Europe. The origin of the order is unknown, but most probably it was early in its history that a rich merchant of Amalfi built not far from the Holy Sepulchre at Jerusalem a certain church known as Santa Maria della Latina, with a monastery for monks, under the rule of Saint Benedict, and a hospital for pilgrims. The first patron of the order seems to have been Saint John the Compassionate, patriarch of Alexandria in the 7th century. Afterward Saint John the Baptist was chosen patron, and the Benedictine brethren assumed the title of Johannites, or Brothers Hospitallers of Saint John. Pope Paschalis II. in 1113 gave them the privilege of electing their own rector. Later, in addition to the vow of poverty, chastity and obedience they were pledged to make war upon the infidels, and assumed a black cloak with a white cross on the left side. The members were divided

into three classes, knights of noble birth, the fighting class, priests bound to the service of the church, and brethren of service who took care of the sick and acted as guides to the pilgrims. In 1291 the order was driven from Palestine by the conquests of the Saracens, and after holding Cyprus for a time they occupied Rhodes in 1309, from which they were ultimately driven by Sultan Soliman II. in 1522. After that the knights retired to Candia and other places, but finally to Malta, which Charles V. granted them in 1530. Here they continued to be a bulwark of western Europe against the Turkish navies till modern times. The chief of this order, which had great possessions in almost every part of Europe, was called "Grandmaster of the Holy Hospital of St. John of Jerusalem, and Guardian of the Army of Jesus Christ." He lived at Valetta, in the island of Malta.

The military duty of the knights consisted in taking the field at least three times against the Turks or the pirates of Barbary. In war they wore a red jacket or tabard, charged with a white cross. In 1798 Malta was unexpectedly attacked and taken by Bonaparte, and about the same time the extensive properties belonging to the order in various countries were confiscated. This may be considered the end of the order as a vital institution, although shortly after the capture of Malta, Paul I., who had been chosen grand-master, took the order under his protection, and it still exists nominally at least. After the death of Paul the nomination of the head of the order was vested in the pope.

John, yōn, Eugenie, "E. MARLITT," German novelist: b. Arnstadt, Thuringia, Germany, 5 Dec. 1825; d. there 22 June 1887. She was the daughter of a portrait painter, and after pursuing the study of music at Vienna, lived at court for some years. She then returned to her native town and took up novel writing, using the pseudonym of "E. Marlitt." Her works, which are very numerous, have been translated into English by Mrs. A. L. Wistar, and have been very popular in this country. Among them are 'Gold Elsie' (1868); 'Old Mamselle's Secret' (1868); 'Countess Gisela' (1870); 'Princess of the Moor' (1872); 'The Second Wife'; 'In the Counselor's House'

John, Saint. See SAINT JOHN.

John, Saint, Gospel of. See GOSPELS.

John B. Stetson University, a coeducational school founded in 1883, at De Land, Fla., under the auspices of the Baptist denomination. The institution was first called De Land University, but in honor of John Batterson Stetson (q.v.), who has given large gifts to the institution, nearly all of the buildings and the campus, the name has been changed. The departments are a preparatory, schools of music, law, art, and technology, a normal and practice school for teachers, a business college, and a college of liberal arts. The courses lead to the degrees of bachelor of arts, laws, and philosophy, and to degrees of bachelor of civil, electrical, and mechanical engineering. The school in 1898 made arrangements with the University of Chicago, whereby the graduates of the college of liberal arts, who have a high standing in their studies, may receive corresponding degrees from the Chicago institution. In 1902 the number of students in attendance was nearly 450, the number of professors and instructors 40. The endowment fund amounted to about $210,500.

John Baptist, the forerunner of the Messiah and the Elijah, or Elias of the New Testament. About five years before the Christian era the Angel Gabriel, according to St. Luke's Gospel, appeared to the aged priest Zacharias and announced the birth of John by Elizabeth, the priest's wife. John was to be filled with the Holy Ghost and to go before the Lord in the spirit and power of Elisha to prepare a people for Him. This was some months before the angel announced in Nazareth, to a maiden called Mary that she should bear a son, whose name was to be Jesus, "the son of God." John Baptist, born 5 B.C. spent his early manhood in the desert. He announced the coming Messiah, and preached repentance, baptizing as a symbolic rite of purification and pardon. He was naturally the first publicly to recognize Jesus Christ and salute him as the "Lamb of God." Herod Antipas (q.v.) then ruled Palestine, his throne being under the protection of Augustus, and he imprisoned the Baptist in the gloomy fortress of Machaerus, east of the Dead Sea, being offended by the plain speaking of the stern ascetic. At a birthday feast given to his Galilean nobles Herod was fascinated by the dancing of Salome, the daughter of Herodias, the wife of his brother Philip, whom he had taken to wife, although her lawful husband still survived. The rebuke administered to Herod for his adultery by John had incensed Herodias and she was bent on vengeance. When Antipas swore to give Salome whatever she might ask to the half of his kingdom, she at her mother's suggestion, asked for the head of John Baptist on a charger or large dish. This was the occasion of the Baptist's martyrdom. The place where this incident happened was the Golden House of Tiberias, whose ruins are still pointed out as Kasr Bint-el-Melek, "Palace of the King's Daughter."

John Brown's Body, a famous marching song of the Civil War, the origin of which has for years been in dispute. It has been generally credited to C. S. Hall of Charleston, Mass., (1861). The words were applied to an old tune common in England in the 18th century.

John Bull, a name first used by the English humorist, Arbuthnot, and since popularized as a typical name suggesting a humorous or burlesque representation of the English character. He is represented as a bluff, jolly, bull-headed farmer.

John C. Green School of Science. See GREEN, J. C.

John Chrysostom. See CHRYSOSTOM, JOHN.

John Doe, a fictitious name given to unknown plaintiffs or defendants in law. In former times the name was applied to the fictitious lessee of the plaintiff in the mixed action of ejectment, that of the fictitious defendant being "Richard Roe."

But if the lessor made out his title in a satisfactory manner, then judgment and a writ of possession were awarded to John Doe, the nominal plaintiff, who by this trial had proved the right of John Rogers, bis supposed lessor.— Blackstone.

John Dory. A fish. See DORY.

John Halifax, Gentleman, a novel by Dinah Maria Muloch Craik (1856), in which the hero, John Halifax, one of "nature's noblemen," beginning life as a poor boy, works his way up to prosperity and happiness, by means of his high principles, undaunted courage, and nobility of character. The heroine is Ursula March; and the simple domestic story includes few minor characters. The interest lies in the development of character: and the author's assertion is that true nobility is of the soul, and does not inhere in wealth, in learning, or in position; and that integrity and loftiness of purpose form the character of a true gentleman.

John Paw, a large and beautiful grouper (*Epinephelus Drummond-Hayi*), which is dark umber brown densely covered with small white pearly spots. It inhabits the Gulf of Mexico and is valued as a food fish in Florida. It is also known in the Bermudas, where it is called "speckled hind."

John Strange Winter. See STANNARD, HENRIETTA.

John Ward, Preacher, a novel by Margaret Deland, published in 1888. A Presbyterian minister named Ward, a logical Calvinist, is assured that belief in election and reprobation, eternal punishment, and kindred doctrines, is necessary to salvation; and so preaches them with force and conviction. While his congregation agrees with him, his wife entertains decidedly broad theological views in general. The couple love each other with that singleness of devotion without which the course of the story would be manifestly improbable; for it depends upon the question whether love will be able to hold together what conscientious habits of thought and ethical convictions tend to drive apart.

John's, Eve of Saint, the survival of a popular celebration of remote antiquity, held on the 23d of June, which in Christian times became the vigil or eve of the feast of the nativity of St. John Baptist, 24 June (Midsummer Day). On the eve of the feast it was the custom in former times to kindle fires called St. John's fires. This was indeed a continuance of those Teutonic and Scandinavian pagan festivals, which at the winter solstice were observed with Yule-fires, and at the summer solstice with similar beacon-fires, originally intended to communicate through the country the changes in the seasons announced by the priesthood, so as to direct the activities of agriculture and navigation. The burning of the Yule log at Christmas is a survival of these observances.

Johns Hopkins University, a university at Baltimore, Md., founded by Johns Hopkins, who was born in Maryland and amassed a fortune in Baltimore. He died in 1873 and bequeathed $3,500,000 to found a university. Opened in 1876, it is now one of the foremost universities in the United States. The students are distinguished by the title of graduates and undergraduates, the former being such as have received a degree at this university or elsewhere, and who desire to carry their studies further, special attention being here given to the most advanced subjects, as well as to original research. The buildings of the university include McCoy Hall, in which are the library, assembly room, and rooms appropriated to literary and historical studies; Levering Hall, the building of the Young Men's Christian Association; Hopkins Hall, equipped for the study of geology and mineralogy; a chemical laboratory; a biological laboratory; a physical laboratory; a gymnasium; an administration building; and four buildings for medical instruction.

In 1902 a large tract of land in the suburbs of the city, comprising 176 acres, was presented by several friends as a future site for the University, and it is expected that before many years it will be possible to remove the philosophical department thereto. This noteworthy gift was followed within a few months by a generous contribution, from alumni and citizens of Baltimore, of $1,000,000 toward the permanent endowment of the institution.

Connected with the university is the Johns Hopkins Press, from which issue the 'American Journal of Mathematics'; 'The American Chemical Journal'; 'The American Journal of Philology'; 'Memoirs from the Biological Laboratory'; 'Studies in Historical and Political Science'; 'Journal of Experimental Medicine'; 'Beiträge zur Assyriologie'; 'Modern Language Notes'; 'Johns Hopkins University Circulars'; 'Terrestrial Magnetism and Atmospheric Electricity'; etc.

The degrees of Bachelor of Arts, Doctor of Philosophy, and Doctor of Medicine are conferred. Advanced and graduate students have elective courses, but each instructor has a discretion of his own with regard to admission to his classes. The university reported at the close of 1903: Professors and instructors, 147; students, 695; number of graduates, 1,535; volumes in the library, 115,000; productive funds, $3,488,843; grounds and buildings valued at $1,157,881; value of books and apparatus, $350,000; income, $250,454.

An important place at Johns Hopkins University has always been held by the "fellows." Twenty fellowships are awarded each year to the most promising among the many candidates, without preference of college; each fellowship is of the annual value of $500, though it does not exempt from charges for tuition. In the language of the official announcement of the university, the fellowships are bestowed "almost exclusively on young men desirous of becoming teachers of science and literature, or proposing to devote their lives to special branches of learning which lie outside of the ordinary studies of the lawyer, the physician and the clergyman." The university also extends the privilege of "fellowships by courtesy" (without emolument) to certain individuals.

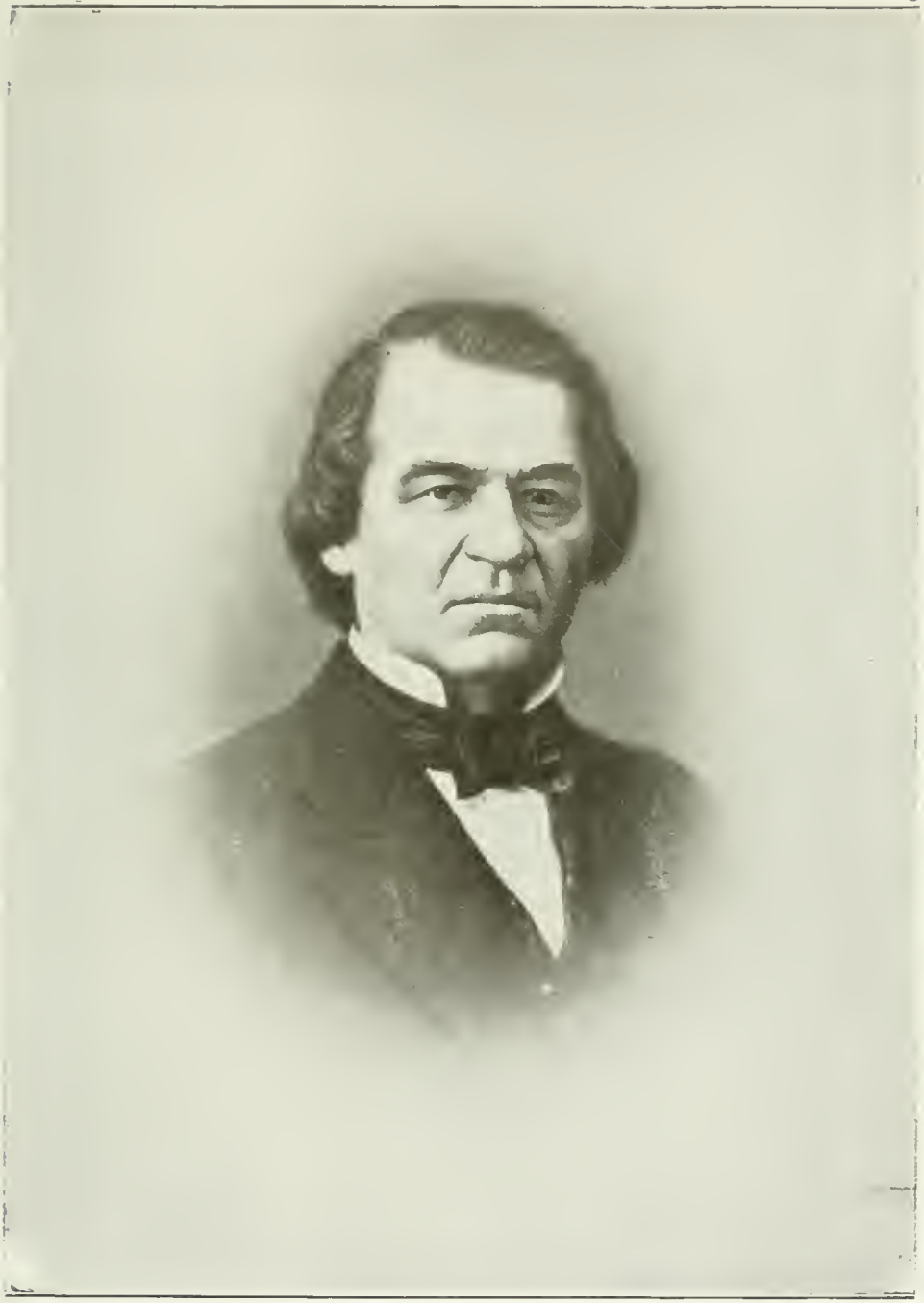
The university receives as students the following classes: (1) College graduates, who may proceed to the degree of doctor of philosophy, or may work for longer or shorter periods in the various seminaries or laboratories without reference to a degree. (2) Undergraduate students looking forward to the degree of bachelor of arts and following one of seven parallel groups of study. (3) Candidates for the degree of doctor of medicine, for whom a four-year course is provided, and who may be either men or women. (4) Doctors of medicine desiring to pursue certain special courses. (5) Students

who have not taken a degree, and are not looking forward to a degree, but who desire to avail themselves for a brief period of the opportunities here offered. The courses of study under 1, 3 and 4 are entirely closed to those who are still candidates for a baccalaureate degree. The Johns Hopkins University, although giving little attention to applied science and technology, has been a very large factor in determining the character and methods of instruction to which these schools owe their success. It is impossible to overestimate its influence upon higher education in this country, and especially is this true in all things relating to science. There is scarcely an American college faculty that has not been enriched by the presence of one or more of its graduates, bringing with them at least something of the spirit of that institution, its respect for exact scholarship and regard for scientific truth.

Johnson, jŏn'sŏn, **Alvin Jewett,** American publisher: b. Wallingford, Vt., 28 Sept. 1827; d. New York 22 April 1884. He worked on a farm, taught school in Virginia, went to New York in 1853, published 'Johnson's Illustrated Atlas,' a reconstruction of 'Colton's Atlas,' and thereafter several works, including 'Johnson's Universal Cyclopædia,' now known in a revised form as 'The Universal Cyclopædia.'

Johnson, Andrew, the 17th president of the United States: b. Raleigh, N. C., 29 Dec. 1808; d. near Carter's Station, Tenn., 31 July 1875. In 1818 he was apprenticed to a tailor at Raleigh, in 1824–6 worked as a journeyman at Laurens Court House, S. C., and then removed to Greenville, Tenn., where also he worked at his trade. At that time the State of Tennessee was controlled by the landed proprietors, who formed an aristocratic class. Johnson made himself the leader of an opposition or workingman's party, in 1828–30 was an alderman of Greenville, and in 1830–3 its mayor. In 1834 he was a leading advocate of the new State constitution, by means of which the power of the greater landholders was reduced. He was elected to the State legislature in 1835 and again in 1839, as a Democrat of the Jacksonian type. A Democratic elector for the State in 1840, he stumped effectively for the Van Buren ticket, and gained considerable reputation as an orator. In 1840 he was elected to the State senate from the counties of Greene and Hawkins, and during his term urged that the basis of representation should be the white vote without consideration of slave-ownership. In 1843 he was chosen to Congress, to which he was four times re-elected. While in the House he supported the restoration to General Jackson of the fine imposed upon him for the imprisonment of a judge at New Orleans in 1815; the annexation of Texas; the homestead law, distasteful to the Southern slaveholding class; the compromise of 1850; and the presidential veto-power. He was opposed to disregard of economy in the expenditure of public moneys. In 1853 he was elected governor of Tennessee, and in 1855 re-elected after a bitter campaign. He sat in the United States Senate in 1857–62, and there opposed the grant for the construction of a Pacific railway and strongly attacked secession. His vigorous Union attitude rendered him so unpopular in the South that he was several times burned in effigy, and upon his return to Tennessee his life was endangered. Appointed military governor of the State, with rank of brigadier-general of volunteers, 4 March 1862, he displayed great prudence in the employment of his autocratic powers. On 6 June 1864 he was nominated Vice-President of the United States by the national Republican convention assembled at Baltimore, and, elected with Lincoln, entered on his office 4 March 1865. President Lincoln died by assassination 15 April, and Johnson became President. His policy toward the seceded States was, contrary to expectation, one of leniency. On 22 May he opened all Southern ports save four in Texas, to foreign commerce, and 29 May he proclaimed general amnesty to all except 14 specified classes. These and similar measures aroused the opposition of the majority of Republicans in Congress, and thenceforward differences between the executive and legislative branches of the government were constantly arising. Johnson established provisional governments, afterward disallowed by Congress, in seceded States, and Congress retaliated by passing over his veto of 27 March 1866 the civil rights act, admitting freedmen to full citizenship rights. In August 1866 he undertook a tour of the Northern States which became known as "swinging 'round the circle," and in the course of which he denounced Congress and advocated his own plan of reconstruction. Other bills, including one for the arrangement of the Southern States, with the exception of Tennessee, into military districts; and the tenure-of-office act, were passed over the President's veto. In August 1867 Johnson removed from office Stanton, secretary of war, and appointed Grant to the post; but in September following Congress refused to ratify the removal, Grant resigned, and Stanton resumed his former duties. On 21 Feb. 1868 Johnson dismissed Stanton and appointed Gen. Lorenzo Thomas secretary ad interim. Two unsuccessful attempts to impeach the President had already been made. On 24 February a resolution of impeachment was passed by the House and on 5 March the trial began. Eleven articles charged the President with high crimes and misdemeanors in connection with five various matters, most important of which were the removal of Stanton in disregard of the tenure-of-office act and the appointment of Thomas. The trial was presided over by Chief Justice Chase. On 16 May a test vote resulted in 35 for conviction, 19 against; and the requisite two thirds vote not having been obtained, the President was acquitted. The result is now generally approved. "The single vote by which Andrew Johnson escaped conviction," says Dunning, "marks the narrow margin by which the Presidential element in our system escaped destruction." In January 1875 he was chosen to the Senate, and 5 March took his seat in the extra session. He was sincere and able, and if Congress viewed his procedure as usurpation no less did he believe that of Congress to be unconstitutional. Consult: Dunning, 'Essays on the Civil War and Reconstruction' (1898); and Dewitt, 'The Impeachment and Trial of Andrew Johnson' (1903), a spirited defense. See also United States — Reconstruction.

Johnson, Bradley Tyler, American lawyer: b. Frederick, Md., 29 Sept. 1829; d. 5 Oct. 1903.



ANDREW JOHNSON,

17TH PRESIDENT OF THE UNITED STATES.

He was graduated from Princeton in 1849, studied law at Harvard in 1850–1, entered practice at Frederick in 1851, became in that year State's attorney for Frederick County, was a delegate to the National Democratic Convention at Charleston and Baltimore in 1860, withdrew from the convention, and supported the Breckenridge and Lane ticket. At his own expense he organized a company for the Confederate service, in which he rose to be brigadier-general of cavalry (1864). Subsequent to the War he practised law at Richmond in 1865–79, at Baltimore in 1879–90; and was a member of the State senate of Virginia in 1875–90. His works include: 'Reports of Chase's Decisions' (1875) 'Memoir of J. E. Johnston' (1891); a 'Life of General Washington'; etc.

Johnson, Bushrod Rust, American soldier: b. Belmont County, Ohio, 7 Oct. 1817; d. Brighton, Ill., 11 Sept. 1880. He was graduated at West Point in 1840. He saw service in the Florida and Mexican wars, resigning his commission in 1847 to become professor in the Western Military Institution of Kentucky, at Georgetown. He entered the Confederate army as a brigadier-general at the commencement of the Civil War, and in 1864 became a major-general. He commanded a division under General Lee till the surrender at Appomattox. He subsequently became superintendent of the Military College in the University of Nashville, and chancellor of that institution.

Johnson, Cave, American politician: b. Robertson County, Tenn., 11 Jan. 1793; d. Clarksville, Tenn., 23 Nov. 1866. Admitted to the bar, he practised at Clarksville, in 1820 became a judge of the State circuit court, and was a Democratic representative in Congress in 1829–37 and again in 1839–45. In 1845 he was appointed postmaster-general, from which post he retired at the close of Polk's administration (1849). He was president of the Tennessee State bank in 1850–9, and was elected to the State senate as a Unionist in 1863, although unable to serve because of ill-health.

Johnson, Clifton, American author and illustrator: b. Hadley, Mass., 25 Jan. 1865. He obtained a secondary education, worked on a farm, was clerk in a book-shop and school-teacher, studied in the New York art-schools, published in 1892 'The New England Country,' an illustrated study of farm-folk, and later was much abroad obtaining notes and pictures for works on foreign life. Other volumes of which he is author and illustrator are: 'The Country School' (1893); 'The Farmer's Boy' (1894); 'What They Say in New England' (1896); 'Among English Hedge Rows' (1899); etc.

Johnson, David, American painter: b. New York May 1827. He was self-taught, excepting for the few lessons he received from Jasper F. Cropsey, and chose American landscape as his specialty. Among his works are: 'Echo Lake' (1869); 'Lake George' (1876); 'Greenwood Lake' (1878).

Johnson, E. Pauline, Canadian poetess: b. Chiefwood, Ont., 1862; the daughter of George Johnson, head chief of the Mohawk Indians, and of his English wife. She has written several striking poems on Indian subjects and has given public recitals from her works. 'The White Wampum' appeared in 1894.

Johnson, Eastman, American painter: b. Lowell, Maine, 29 July 1824; d. New York City 5 April 1906. He began his art studies at the Royal Academy, Dusseldorf (1849–51) and developed a distinct talent for genre. He afterward traveled in France, Italy, and Holland, and spent four years at The Hague. Among his pictures painted in Europe are the 'Savoyard,' and the 'Card Players,' in which he showed the influence of the Dutch school. He returned to the United States in 1856 and devoted himself for some years to the study of rustic and negro life and he painted some of the most popular pictures ever produced by a native painter; many of them have been engraved and chromolithographed. The best known are 'Old Kentucky Home'; 'Husking Bee'; and the 'Boyhood of Abraham Lincoln.' He also produced excellent likenesses of Grover Cleveland, Benjamin Harrison and other eminent men.

Johnson, Edward, American colonial historian: b. Herne Hill, Kent, England, about 1599; d. Woburn, Mass., 23 April 1672. He emigrated to America probably with Governor Winthrop in 1630. In 1632 he was engaged in trade at Merrimack, and was on the committee appointed to superintend the foundation of a new town and church at the place now called Woburn. In 1643 he was elected by the town of Woburn a member of the legislature of Massachusetts, in which he continued to sit till 1671, with the exception of 1648. In 1655 he was chosen speaker of the house. He was recorder of Woburn from the time of its incorporation till his death. In 1665 he was one of the members deputed to hold conference with the commissioners sent from England by Charles II. He wrote a 'History of New England from the English Planting in 1628 till 1652, or Wonder-Working Providence of Zion's Saviour' (1654).

Johnson, Edward, American soldier: b. Chesterfield County, Va., 16 April 1816; d. Richmond, Va., 22 Feb. 1873. Graduated from the United States Military Academy in 1838, he fought in the Florida wars, for his services in which he was brevetted captain, and subsequently in the Mexican War, being brevetted major for his conduct at Chapultepec. He received his captain's commission in 1851, but in 1861 resigned to enter the army of the Confederate States as colonel of the 12th Georgia volunteers. He was promoted brigadier-general in 1862 and major-general in 1863. At Gettysburg he commanded a division. He was captured with his entire force at Spottsylvania (12 May 1864) and retaken in the following December. Subsequent to the war he was a farmer in Chesterfield County, Va.

Johnson, Franklin, American Baptist clergyman and scholar: b. Frankfort, Ohio, 2 Nov. 1836. He was graduated from the Colgate Theological Seminary (Hamilton, N. Y.), in 1861, held pastorates in Michigan, New Jersey, and at Cambridge, Mass., in 1862–88, was co-editor of 'The Watchman' in 1876, and in 1890–2 president of Ottawa University. In 1892 he was appointed professor of history and homiletics in the University of Chicago. Among his writings, besides translations and an annotated edition of St. Matthew, are: 'Moses and Israel'; 'Heroes and Judges from the Lawgiver to the

King'; 'The New Psychic Studies in their Relation to Christian Thought.'

Johnson, Helen Kendrick, American author: b. Hamilton, N. Y., 4 Jan. 1843. She was the daughter of A. C. Kendrick (q.v.) and was married to Rossiter Johnson (q.v.) in 1869. Beside editing several compilations of verse she has published 'The Roddy Books,' popular juvenile tales (1874–6); 'Our Familiar Songs' (1881); 'Raleigh Westgate' (1889); 'Woman and the Republic' (1897). She has been an active member of the Association Opposed to the Extension of Suffrage to Women.

Johnson, Hĕrschel Vespasian, American jurist and politician: b. Burke County, Ga., 8 Sept. 1812; d. Jefferson County, Ga., 16 Aug. 1880. He was graduated from the University of Georgia in 1834, studied law, practised there, from 1844 at Milledgeville, and in 1848 was appointed to the Senate of the United States to fill the seat of W. T. Colquitt, resigned. A strong advocate of Clay's compromise scheme, he identified himself with the Southern Unionists. In 1849–53 he was a judge of the Georgia superior court, in 1853–7 governor of the State. He was nominated by the northern Democracy in 1860 as vice-president on the presidential ticket with Douglas. Though opposed to secession, he followed his State, and in 1862 was elected to the Confederate Congress. Elected United States senator in 1866, he was refused his seat because of war disabilities. He was a judge of the Georgia superior court from 1873 until his death.

Johnson, Horace Chauncey, American artist: b. Oxford, Conn., 1 Feb. 1820. He was a pupil of A. H. Emmons at Hartford, and of the antique school of the National Academy, New York; studied also in Rome (1856–8); established his studio in Italy, and later at Waterbury, Conn. His works include: 'Roman Peasants on the Campagna'; 'Grape Gatherers of Gensano'; 'Italian Kitchen'; 'Azrael'; etc.

Johnson, Sir John, American colonial soldier: b. near Johnstown, N. Y., 5 Nov. 1742; d. Montreal 4 Jan. 1830. He was the son of Sir William Johnson (q.v.), was knighted in 1765 and succeeded to his father's estates and baronetcy in the Mohawk Valley in 1774. When the Revolution came on he escaped to Canada in 1776 with 700 loyalists. He organized the corps known as the Queen's Own American Regiment, of which he was commissioned colonel. In July 1777, he took part in the siege of Fort Stanwix (q.v.). He defeated General Herkimer in the latter's brilliant attempt to cause the besiegers to abandon their operations; but was himself subsequently defeated. During the next two years he continued active in northern and central New York, and the Indian massacres of Cherry Valley and Wyoming formed some of the most painful incidents of the war. He was, however, crushingly defeated at Newton 29 Aug. 1779, and retired to Montreal. His influence over the Indians had always been remarkable and the British government appointed him superintendent-general of Indian affairs in British North America, besides making him extensive land grants, to replace the Mohawk family estates which had been confiscated.

Johnson, Lionel Pigot, English poet: b. Broadstairs, Kent, March 1867; d. 9 Oct. 1902. He was educated at Winchester College, and Oxford University. He published 'Poems'; 'Ireland and Other Poems'; and 'The Act of Thomas Hardy'; and contributed to 'The Academy' and other literary journals. His verse though often obscure exhibited much command of metre and was full of promise.

Johnson, Oliver, American reformer and editor: b. Peacham, Vt., 27 Dec. 1809; d. Brooklyn, N. Y., 10 Dec. 1889. He became editor of 'The Christian Soldier' in 1831, and from that year to 1865 was engaged in the anti-slavery cause as a lecturer and editor. He was one of the founders of the New England Anti-Slavery Society in 1832. He was editor of the 'Independent' from 1865 to 1870; became editor of the 'Christian Union' in 1872; and published 'William Lloyd Garrison and his Times' (1880).

Johnson, Owen, American novelist: b. New York 27 Aug. 1878. He is a son of R. U. Johnson (q.v.) and was graduated from Yale in 1900. He has published 'Arrows of the Almighty' (1901).

Johnson, Reverdy, American jurist: b. Annapolis, Md., 21 May 1796; d. there 10 Feb. 1876. He was educated at St. John's College in that city, and at 17 began to study law. In 1815 he was admitted to the bar, in 1817 removed to Baltimore and subsequently devoted his time mainly to the arguing of cases before the United States Supreme Court. He reported seven volumes of the decisions of the Maryland court of appeals, known as 'Harris's and Johnson's Reports,' 1820. In 1821 he was elected a State senator, and at the expiration of his term in 1825 was re-elected for a second term. In 1845 he was chosen a United States senator, resigning in 1849 on being appointed attorney-general of the United States. On the succession of Mr. Fillmore, after the death of President Taylor, he resigned that office, and resumed in Baltimore the practice of the law. In 1861 he was a member of the peace commission, was United States senator 1863–8, and succeeding Charles Francis Adams as minister to England in 1868 negotiated the treaty for the adjustment of the Alabama claims, afterward rejected by the Senate.

Johnson, Richard Mentor, American statesman and soldier: b. Floyd's Station, near Louisville, Ky., 17 Oct. 1780; d. Frankfort, Ky., 19 Nov. 1850. He was educated at Transylvania University, and subsequently studied law and practised with success. He commenced his public career as a member of the Kentucky legislature, to which he was elected at 23, and in 1807 was returned to Congress, and remained a member of the House until 1819. He was a firm supporter of the administration of Madison, and upon the commencement of the War of 1812 raised a body of Kentucky mounted riflemen, whom he commanded, on the Canadian frontier. The decisive charge of his mounted volunteers mainly contributed to the brilliant victory gained over the British and Indians at the battle of the Thames, 5 Oct. 1813, and it was by his hand that the Indian leader Tecumseh is commonly supposed to have fallen. In 1819 he was elected to fill a vacancy in the United States senate, of which he continued a member until 1829, when he was again returned to the House of Representatives. He remained a member until his election by the Senate in March, 1837, as Vice-President of the United States.

He discharged the duties of presiding officer of the senate for four years, and in the Presidential election of 1840 was an unsuccessful candidate of the Democratic party for Vice-President. He thenceforth lived chiefly in retirement. He was, however, serving a term in the State legislature at the time of his death. In Congress his chief efforts were against the discontinuance of the Sunday mails, and in behalf of soldiers of the Revolution or of the War of 1812, who applied for pensions. He was the author of the law abolishing imprisonment for debt in Kentucky.

Johnson, Richard W., American military officer: b. near Smithland, Ky., 7 Feb. 1827; d. St. Paul, Minn., 21 April 1897. He was graduated at West Point in 1849, in 1861 became colonel of the 3d Kentucky cavalry, 11 October was appointed brigadier-general of volunteers, and later commanded a division at Murfreesboro, and with his division fought under Thomas at Chickamauga (19–21 Sept. 1863). He commanded the 12th division of the Army of the Cumberland in the invasion of Georgia and a division of cavalry at Nashville, was brevetted brigadier-general, United States army, for his services (13 March 1865), and, having been mustered out of the volunteer service, became provost-marshal of the military division of the Tennessee. In 1867 he resigned from the service with rank of major-general, changed by act of Congress (1875) to brigadier. Among his writings were: 'Life of Gen. G. H. Thomas' (1881); and 'A Soldier's Reminiscences' (1886).

Johnson, Robert Underwood, American editor and poet: b. Washington, D. C., 12 Jan. 1853. He became associate editor of the 'Century Magazine' in 1881. His efforts as secretary of the American Copyright League in behalf of the establishment of international copyright greatly aided in obtaining the law of 1891. He edited, with C. C. Buel, the notable 'Battles and Leaders of the Civil War' (1887–8), and has published three volumes of verse: 'The Winter Hour and Other Poems' (1891); 'Songs of Liberty and Other Poems' (1897); and 'Poems' (1902).

Johnson, Rossiter, American author and editor: b. Rochester, N. Y., 27 Jan. 1840. He was graduated from the University of Rochester in 1863 and was associate editor of the Rochester *Democrat* 1864–8. From 1869 to 1872 he edited the Concord (N. H.) *Statesman;* and in 1873–7 was associated with George Ripley and Charles A. Dana in editing the American Cyclopædia, while in 1879–80 he aided Sydney Howard Gay in his 'History of the United States.' Since 1883 he has been editor of the 'Annual Cyclopædia.' He edited the series of 'Little Classics' (8 vols. 1874–80), and was editor-in-chief of the 'World's Great Books' (50 vols. 1898–1901). His original works include 'Phaeton Rogers,' a novel of boy life (1881); 'A History of the French War ending in the Conquest of Canada' (1882); 'History of the War of 1812' (1882); 'Idler and Poet,' verse (1883); 'Short History of the War of Secession' (1888); 'The End of a Rainbow,' a story (1892); 'The Hero of Manila' (1899); 'Short History of the War with Spain' (1899).

Johnson, Samuel, American college president, first president of King's College (now Columbia University): b. Guilford, Conn., 14 Oct. 1696; d. Stratford, Conn., 6 June 1772. He was graduated at Yale College in 1714, and two years later appointed tutor there. In 1720 he resigned to receive ordination as a Congregational minister, and settled at West Haven. He relinquished his charge in 1722, and soon after sailed for England, where he received Episcopal ordination in 1723. Shortly after he returned to America, bearing a commission as missionary of the Society for the Propagation of the Gospel in Foreign Parts, and settled in Stratford, Conn., as rector of an Episcopal church there. In 1743 he received the degree of D.D. from the University of Oxford. In 1746 he published 'A System of Morality,' and in 1752 a compend of logic and metaphysics, and another of ethics; the two latter were printed in Philadelphia by Franklin as text-books for the University of Pennsylvania. In 1755 he was offered the presidency of that university, but declined it. In 1753 he was invited to accept the presidency of the newly founded King's College in New York, in all the plans for which he had been consulted. He did so, but in 1763 resigned and returned to Stratford, where he resumed his parochial duties, revised his previous works, and published an 'English and a Hebrew Grammar' (1767). Consult Beardsley, 'Life of Samuel Johnson, D.D.' (1876).

Johnson, Samuel, English lexicographer, poet and essayist: b. Lichfield, Staffordshire, 19 Sept. 1709; d. London 13 Dec. 1784. He was the son of a Lichfield bookseller and was educated mainly in the grammar school of that city; although perhaps the best part of his education he gave himself, in the free run which he had of the books in his father's shop. Lichfield was the literary centre of a large district and old Michael Johnson supplied scholars with their folios, as well as less severe readers with romances, poems, essays, and pamphlets. Samuel read with wonderful rapidity, ravenously as if he devoured the book, and what he read his powerful memory retained. At 19 he entered Pembroke College, Oxford, «the best qualified for the university that his tutor had ever known come there.» Thence he was driven by poverty after a residence of only 14 months. During the next few years he lived partly by teaching. At 26 he married. Two years later he went up to London with a half-finished tragedy in his pocket, and David Garrick as his companion. There for five-and-twenty years he lived the hard life of a poor scholar. His wife died after a long illness. In this period of his life he did most of his work. He wrote the 'Debates of Parliament,' which were wholly in form and mainly in substance his own invention; his great 'Dictionary'; his two poems 'London' (1738); and 'The Vanity of Human Wishes' (1749); the 'Rambler,' the 'Idler,' and 'Rasselas' (1759), and numerous minor pieces. He published moreover 'Observations on Macbeth,' and made a beginning of his edition of Shakespeare. In 1762 a pension of £300 from the king freed him from the pressure of poverty and the rest of his life he passed in modest comfort. A friendship which he formed a little later added greatly to his happiness. A wealthy London brewer of the name of Thrale, a man of such rugged strength that he sought a comrade in his rough genius, gave him a second home. His pen had

long intervals of rest. He finished his Shakespeare, wrote four political tracts which added nothing to his reputation, and his 'Journey to the Western Islands' (1775). Happily he was roused from his indolence by the request of the booksellers that he should undertake that one of all his works by which he is best known,—the 'Lives of the English Poets' (1779–81). "I wrote it," he says, "in my usual way, dilatorily and hastily: unwilling to work, and working with vigor and haste." The indolence into which he seemed to have sunk was more apparent than real. That powerful mind was seldom long at rest. "He was a kind of public oracle, whom everybody thought they had a right to visit and consult." David Hume might complain that "men of letters have in London no rendezvous, and are indeed sunk and forgotten in the general torrent of the world." They who knew Johnson felt no such want. "His house became an academy." So did the taverns which he frequented, whose chairs he looked upon as so many thrones of human felicity. Among his friends he numbered Reynolds, Burke, Goldsmith, Garrick, and Boswell. They were all members of that famous club of which he was the light and centre. In the world of letters his opinion was eagerly awaited. "'What does Johnson say of such a book?' was the question of every day." This, the happiest period of his life, was brought to an end by the death of Mr. Thrale in 1781. Though the ranks of his friends were thinning and his strength was failing he did not lose heart. He tried "to keep his friendships in constant repair," and he struggled hard for life. "I will be conquered," he said; "I will not capitulate." Death had always been terrible to him. He now faced it month after month in the gloom of solitude. "His death," wrote one of his contemporaries, "kept the public mind in agitation beyond all former example." "It made a kind of era in literature," said Hannah More. Harriet Martineau was told, by an old lady who well remembered the time, that "the world of literature was perplexed and distressed as a swarm of bees that have lost their queen." High as Johnson still stands as a writer, his great reputation rests mainly on his talk and on his character as a man, full as it was of strange variety, rugged strength, great tenderness, dogged honesty and truthfulness, a willingness to believe what was incredible combined with "an obstinate rationality" which ever prevented him, and Toryism with the spirit of a rebel glowing beneath. It is in the pages of his friend and disciple that he lives for us as no other man has ever lived. Of all men he is best known. In his early manhood he set up an academy, and failed. The school which he founded in his later years still numbers its pupils by thousands and tens of thousands. "We are," said Sir Joshua Reynolds, "of Dr. Johnson's school. He may be said to have formed my mind, and to have brushed from it a great deal of rubbish. He qualified it to think justly." He still qualifies the mind to think; he still clears it of cant; he still brushes from it all that rubbish which is heaped up by affectation, false sentiment, exaggeration, credulity and indolence in thinking. Even in his lifetime his written style was censured as "involved and turgid, and abounding with antiquated and hard words." Macaulay went so far as to pronounce it "systematically vicious." In the structure of his sentences he is as often at fault as in the use of big words. He praised Temple for giving a cadence to English prose, and he blamed Warburton for having "his sentences unmeasured." His own prose is too measured and has too much cadence. It is in his 'Ramblers' that he is seen at his worst, and in his 'Lives of the Poets' at his best. He often rose to noble heights of eloquence; while in the power of his honest scorn he had scarcely a rival. His letters to Lord Chesterfield and James Macpherson are not surpassed by any in our language. In his criticisms he is admirably clear. Whether we agree with him or not, we know at once what he means; while his meaning is so strongly supported by argument that we can neither neglect it nor despise it. He may put his reader into a rage, but he sets him thinking. Of his original works, 'Irene' (1749) was the first written, though not the first published. It is a declamatory tragedy. He had little dramatic power, and he followed a bad model, for he took Addison as his master. It was in his two imitations of Juvenal's Satires, 'London' and the 'Vanity of Human Wishes,' that he first showed his great powers. In their kind they are masterpieces. Sir Walter Scott "had more pleasure in reading them than any other poetical composition he could mention. In the 'Rambler' he teaches the same great lesson of life as in his serious poems. He gave variety, however, by lighter papers modeled on the 'Spectator,' and by critical pieces. 'Rasselas,' struck off at a heat when his mother lay dying, tells in prose what the 'Vanity of Human Wishes' tells in verse. It is little known to the modern reader, who is not easily reconciled to its style. At no time could it have been a favorite with the young and thoughtless. Nevertheless, as years steal over us, we own, as we lay it down with a sigh, that it gives a view of life as profound and true as it is sad. His 'Dictionary,' faulty as it is in its etymologies, is a very great performance. Its definitions are admirable; while the quotations are so happily selected that they would afford the most pleasant reading were it possible to read a heavy folio with pleasure. That it should be the work of one man is a marvel. He had hoped to finish it in three years; it took him more than seven. In the notes to his edition of Shakespeare he anticipated modern critics in giving great weight to early readings. He was unwilling to meddle with the text so long as it gave a meaning. Many of his corrections are ingenious, but in this respect he came far behind Theobald. In his 'Journey to the Western Islands' he describes the tour which he made with Boswell in 1773, and takes the part of the oppressed tenants against their chiefs. His narrative is interesting; while the facts which he gathered about a rapidly changing society are curious. His last work was the 'Lives of the English Poets.' It was undertaken at the request of the chief London booksellers, "who had determined to publish a body of English poetry," for which he was to furnish brief prefaces. These prefaces swelled into Lives. For payment he had required only two hundred guineas. "Had he asked one thousand, or even fifteen hundred," said Malone, "the booksellers would doubtless readily have given it." In this great work he traveled over the whole field of English poetry, from Milton who was born in 1608 to Lyttleton who died in 1773. To such a task no man ever came better equipped. In these 'Lives,' and in

his own 'Life' as told by Boswell, we have given us an admirable view of literature and literary men, from the end of the age of Elizabeth to close upon the dawn of the 19th century. Consult: Boswell, 'Life of Johnson' ed. by Hill (1887); Hill, 'Dr. Johnson, his Friends and his Critics' (1878); 'Lives' by Stephen (1878); Grant (1887).

Johnson, Samuel, American preacher and author: b. Salem, Mass., 10 Oct. 1822; d. North Andover 19 Feb. 1882. He was graduated from Harvard in 1842, and from the Harvard Divinity School in 1846. He joined no religious denomination, and save for one year with a Unitarian church in Dorchester, was not settled as a minister until 1853, when he established in Lynn, Mass., an independent society, with which he remained till 1870, then withdrew to complete studies of many years, the results of which appeared later in his publications. With Samuel Longfellow (q.v.) he compiled a 'Book of Hymns' (1846) and 'Hymns of the Spirit' (1864). Some of his own inspiring hymns in these books are now found in the collections of various denominations. His critical study 'The Worship of Jesus' (1868), written in accordance with his views of universal religion, is described by O. B. Frothingham as "perhaps the most penetrating and uplifting essay on that subject in any language." He printed notable essays on religion, reform, etc., in 'The Radical' and other periodicals. His great work 'Oriental Religions,' including 'India' (1872), 'China' (1877), and 'Persia' (1885) — the last containing an introduction and a critical estimate of Johnson by O. B. Frothingham — represents what Johnson himself calls his "purely humanistic point of view." His philosophy was highly transcendental; but being versed in many languages, he was acquainted with all schools, and with the results of history, literature, science, and criticism in every department. 'Oriental Religions,' in the task of writing which scholars have compared his competence, patience, and thoroughness with the same qualities in Darwin, has taken its place among the most learned and liberal contributions to the study of comparative religion and civilization. Prof. E. J. Eitel, the German Orientalist, wrote of "Johnson's pre-eminent merits as the historian of universal religion," and F. Max Müller paid him tribute as the finder of "a religion behind all religions." His 'Theodore Parker' (1890) is a profoundly spiritual interpretation of that preacher and reformer, whose work on the intellectual side was surpassed by Johnson's, while on the moral side, as in the anti-slavery conflict, they stood as equal comrades. A little volume of Johnson's hymns, with other poems, was published in 1899. Consult Longfellow, 'Lectures, Essays, and Sermons by Samuel Johnson, with a Memoir.' This volume contains some of Johnson's best papers, including brilliant lectures on 'Switzerland' and 'Florence,' the outgrowth of searching observations in Europe, 'Equal Opportunity for Woman,' 'Labor Parties and Labor Reform,' and an illuminative essay on 'Transcendentalism.'

Johnson, Samuel Frost, American painter: b. New York 1835. He received his art education in New York, Düsseldorf, Antwerp, and Paris, in which last place he was a pupil at the Ecole des Beaux Arts. He afterward went to Ecouen and worked under the direction of Edouard Frère, the celebrated painter of children. He produces genre, still life and portraits. Among his genre subjects may be mentioned 'Caught at It'; 'Study of an Interior'; 'Roasted Chestnuts'; 'Good Night'; and 'A Thirsty Party.'

Johnson, Samuel William, American chemist: b. Kingsboro, N. Y., 3 July 1830. He studied at Yale Scientific School and the Universities of Leipsic and Munich. In 1856 he became professor of analytical and agricultural chemistry in the Sheffield Scientific School of Yale and since 1896 professor emeritus. He has published 'Essays on Peat Muck and Commercial Manures' (1859); 'How Crops Feed' (1870); etc.

Johnson, Thomas, American statesman: b. St. Leonard's, Md., 1732; d. 1819. He studied law at Annapolis, was elected to the first Continental Congress (1774), was again sent to Congress in 1776, and in the latter year became brigadier-general of Maryland militia. In 1777 he was chosen governor of Maryland, remaining in office until the close of 1779. In 1780 he entered the provincial congress and the house of delegates, in 1781–7 was in the Continental Congress, in 1791 became an associate justice of the United States Supreme Court, and later declined the office of chief justice.

Johnson, Tom Loftin, American capitalist and politician: b. Georgetown, Ky., 18 July 1854. He was clerk in a street railway office (1869–75), and invented several street railway devices; became owner of a street railway in Indianapolis and later acquired large interests in Cleveland and other cities; he was also interested in the iron manufacture in Cleveland. He has been prominent in politics as a member of the Democratic party, and is known as an advocate of the single tax (q.v.), and public ownership of public utilities. Though opposed to the free coinage of silver, he supported Bryan in 1896 and 1900, and the State convention which he controlled unanimously endorsed the Kansas City platform. He was a member of Congress from 1891–5. In 1901 he was elected mayor of Cleveland, and was reelected in 1903 and 1905. In this position he has been an advocate of three cent street railway fares. In the fall of 1903 he was Democratic candidate for governor of Ohio, but was defeated by a large plurality.

Johnson, Virginia Wales, American novelist: b. Brooklyn, N. Y., 28 Dec. 1849. Since 1875 she has lived in Florence, Italy. Her publications include: 'Kettle Club Series' (1870); 'Travels of an American Owl' (1870); 'Joseph the Jew' (1873); 'A Sack of Gold' (1874); 'The Catskill Fairies' (1875); 'The Calderwood Secret' (1875); 'A Foreign Marriage' (1880); 'The Neptune Vase,' her finest work (1881); 'The Fainalls of Tipton' (1885); 'Tulip Place' (1886); 'Miss Nancy's Pilgrimage' (1887); 'The House of the Musician' (1887); and other fictions, and several descriptive works, such as 'Genoa, the Superb'; 'The Lily of the Arno'; 'Lake Como.'

Johnson, Walter Rogers, American chemist: b. Leominster, Mass., 21 June 1794; d. Washington, D. C., 26 April 1852. He was graduated from Harvard in 1818, taught for many years in Framingham, and Salem, Mass., and in

Philadelphia, and was professor of physics in the University of Pennsylvania, 1839–43. He was the first secretary of the Association for the Advancement of Science, and published 'Use of Anthracite' (1841); 'Report on Coals' (1844); 'Coal Trade of British America' (1850); etc.

Johnson, Sir William, British superintendent-general of Indian affairs in North America: b. Smithtown, County Meath, Ireland, 1715; d. near Johnstown, N. Y., 11 July 1774. His uncle, Sir Peter Warner, offered his nephew the management of his entire property in New York, if the latter would undertake its improvement and settlement. Johnson accepted the offer, and in 1738 established himself upon a tract of land on the south side of the Mohawk, about 25 miles from Schenectady, which Sir Peter had called Warrensburgh. In addition to the settling and improving of the country, he embarked in trade with the Indians, whom he always treated with perfect honesty and justice. He became a master of their language, speaking many of their dialects as perfectly as they did themselves, and was thoroughly acquainted with their beliefs and customs. He was adopted by the Mohawks as one of their own tribe, chosen a sachem, and named Wariaghejaghe, or Warraghiaghy, "he who has charge of affairs." In 1744 he was appointed colonel of the Six Nations, in 1746 commissioner of New York for Indian affairs. In 1750 he became a member of the provincial council. In 1754 he attended as one of the delegates from New York the congress of Albany, and also the great council held with the Indians on that occasion, at which they strongly urged his reappointment as their superintendent. At the council of Alexandria, 14 April 1755, he was sent for by Braddock and commissioned by him "sole superintendent of the affairs of the Six United Nations, their allies and dependents." He was also, pursuant to the determination of that council, created a major-general, and commander-in-chief of the provincial forces destined for the expedition against Crown Point. At the head of these forces, in September 1755, he defeated Baron Dieskau at Lake George. This victory saved the colony from the French, and Johnson received the thanks of parliament for his victory, was voted £5,000, and on 27 Nov. 1755, created a baronet of Great Britain. On his arrival at Lac St. Sacrement a few days before this battle, he gave to it the name of Lake George, "not only in honor of his majesty, but to assert his undoubted dominion here." In March 1756 he received from George II. a commission as "colonel, agent, and sole superintendent of the affairs of the Six Nations, and other northern Indians." He held this office for the rest of his life. In 1758 was present with Abercrombie at Ticonderoga. General Prideaux led the expedition against Fort Niagara in 1759. Johnson was second in command, and upon the death of Prideaux, before that fort, succeeded to the command in chief. With upward of 1,000 Indian allies he continued the siege with great vigor and cut to pieces the French army. He led the same Indian allies the following year in the Canadian expedition of Amherst, and was present at the capitulation of Montreal and the surrender of Canada to the British arms in 1760. The war was now at an end, and the king granted to Sir William for his services a tract of about 100,000 acres of land, north of the Mohawk. In 1764, the country being at peace, and the Indians perfectly contented, Sir William erected Johnson hall, a large wooden edifice still standing. The village of Johnstown, with stores, an inn, a court-house, and an Episcopal church, was soon laid out. In 1772 it became the shire town of Tryon County. Johnson lived in the style of an old English baron of former days, and exercised a liberal hospitality. In 1768 he concluded the treaty of Fort Stanwix. Consult the 'Life' by Stone (1865).

Johnson, William Henry, American historical novelist: b. Beaufort, S. C., 29 March 1845. He studied for the Episcopal ministry in the Theological Seminary of Virginia, served in the Confederate army during the Civil War, and in 1872 took orders in the Episcopal Church. In 1886 he withdrew from the Episcopal Church to enter the Unitarian, and was pastor for several years of a Unitarian church at Wilmington, Del. He has published 'The King's Henchman' (1898); 'King or Knave: Which Wins?' (1899); 'The World's Discoverers' (1900).

Johnson, William Samuel, American jurist: b. Stratford, Conn., 7 Oct. 1727; d. there 14 Nov. 1819. He was graduated from Yale in 1744, was admitted to the bar, practised in the New York and Connecticut courts, in 1761 and 1765 represented Stratford in the Connecticut general assembly, or lower house, and in the latter year was a Connecticut delegate to the Stamp-act congress at New York. In 1766 he became a member of the governor's council, or upper house of the Connecticut legislature, in 1766–71 was in England as special agent for the colony in defense of its title to land obtained from the Mohegan Indians, in 1771 re-entered the council, and for a time in 1772 was a judge of the superior court of the colony. After Lexington, he was a member of a committee sent to General Gage on the unsuccessful mission of inquiring into possible means of peace. Opposed to the Revolution, he remained in private life during its progress, but in 1784–7 was a member of the Continental Congress, in 1787–9 sat in the Connecticut assembly, in 1787–1800 was president of Columbia College, and from 1789 to 1791, when he resigned, was the first United States senator from Connecticut. His letters to the governors of Connecticut during his residence in Great Britain have been published in the 'Collections' of the Massachusetts Historical Society, 5th series, Vol. IX. (1885).

Johnson City, Tenn., city in Washington County, on the Southern railroad, 106 miles north of Knoxville. Its elevated location and picturesque mountain scenery make it a favorite summer resort for Southern people. Here is located the mountain branch of the National Soldiers' Home. The manufacturing interests include iron furnaces, rolling mills, machine shops, tanneries and brickmaking plants. The city was settled in 1870 and is governed under a charter of 1897, by a mayor and council elected biennially. Pop. (1890) 4,161; (1900) 4,645.

Johnson Grass. See GRASSES IN THE UNITED STATES.

Johnson's Island, Ohio, an island located at the mouth of Sandusky Bay, overlooking Lake Erie, about a mile long and a mile and a half wide. The island was used during the Civil War as a prison for captured Confederates. It

was an ideal spot for a prison post. No prisoner was ever known to escape from it. The grounds were enclosed within a fence 12 feet high, with a platform top, upon which sentinels paced to and fro day and night. To the north Lake Erie stretches away for 50 miles; on the east, separated by three miles of water, lies Sandusky, while west and south of the island are broad stretches of Sandusky Bay. The island was used almost exclusively as a prison for officers, the total number confined there from first to last aggregating over 15,000. The first prisoners were taken there in April 1862, and in September 1865 the last of them were sent to Fort Lafayette, and Johnson's Island was abandoned as a prison post. The men confined on Johnson's Island represented the flower of the chivalry of the South. They were largely professional men and planters, among them being many who were prominent in science, literature and art.

Johnston, jŏn-stŏn, **Albert Sidney**, American general: b. Mason County, Ky., 3 Feb. 1803; d. Shiloh, Miss., 6 April 1862. General Johnston had but a brief career in the Confederate army, and the first part of that career was one of great disaster and consequently of severe criticism; but he fell "on the field of glory" at Shiloh, and not a few endorse the opinion of President Davis that he was the greatest general whom the war produced. Descended from a long line of illustrious ancestors, he obtained his literary education at Transylvania University, and was graduated at West Point 30 June 1826, being number eight in a brilliant class of which Jefferson Davis was a member. He was brevetted second lieutenant in the 2d infantry, transferred to the 6th infantry in 1827, was regimental adjutant from 1828 to 1832, aid to General Atkinson a year, and acting assistant adjutant-general to Illinois volunteers during the Black Hawk War — in all of which positions he showed the qualities of an accomplished soldier. He resigned his commission in the United States army 31 May 1834, having determined to settle in Texas and cast in his fortunes with the "Lone Star" Republic.

The battle of San Jacinto was fought 21 April 1836, and soon after Johnston arrived in Texas and enlisted as a private soldier in the Texan army. His merit soon brought him promotion, and he was made adjutant-general of the Army of Texas, and not long after brigadier-general and chief commander of the army in the place of General Felix Houston. As a result of jealousy growing out of this promotion there was an unfortunate duel between Houston and Johnston, in which the latter was wounded. He continued in command of the Texan army until 1838, when he was made secretary of war of the Republic of Texas. In 1839 he led an expedition against the hostile Cherokee Indians, and in a battle on the Neches, defeated and routed them with great slaughter. He used all of his abilities and wide influence in bringing about the annexation of Texas to the United States, and promptly enlisted when the Mexican War broke out, being colonel of a regiment of Texas volunteers. He was distinguished in various battles, especially at Monterey, where he had three horses shot from under him, and was highly complimented by General Butler on whose staff he was serving.

On 31 Oct. 1849 he was appointed by President Taylor paymaster in the United States army, with the rank of major, and when the 2d cavalry regiment was formed he was appointed, 3 March 1855, its colonel on the recommendation of his old classmate and lifelong friend, Jefferson Davis, who was at that time the able and efficient secretary of war. In 1857 he was put in command of an expedition to Utah to force the Mormons to submit to the laws of the United States Government, and overcame great difficulties and showed such ability and tact in the delicate mission that he was made brevet brigadier-general. When the War between the States broke out General Johnston was in command of the department of the Pacific, but he very promptly resigned his commission, and with a small party made his way across the plains, passing through New Orleans and reached Richmond on 2 September, where he had a cordial reception and was made a full general, and assigned to the command of the department of Kentucky, whither he went at once, beginning the able and efficient discharge of his duties there.

It could not be published at the time that he had a force barely 20,000 to defend that long line against overwhelming numbers of the enemy, and he was severely criticised in the newspapers for not being more aggressive, and when Forts Henry and Donelson fell, and he was compelled to fall back and abandon to the enemy so large a section of Confederate territory that abuse and severest criticism were heaped upon him, he was denounced as incompetent and his removal from command was demanded. President Davis calmly said: "If Albert Sidney Johnston is not a general, then I have none to put in his place." He wrote his old friend a noble letter, and Johnston replied in the same spirit, concluding with this sentiment: "The test of merit in my profession, with the people, is success. *It is a hard rule, but I think it right.* If I join this corps to the forces of General Beauregard (I confess a hazardous experiment), then those who are now exclaiming against me will be without an argument." He alluded to his plan of uniting with Beauregard to strike Grant before Buell and Mitchel could join him, and in pursuance of which plan he marched from Corinth, Miss., on 3 April, intending to attack Grant at Pittsburg Landing, or Shiloh Church, twenty miles off, on 4 April. There was delay on the part of some of the troops so that the attack could not be made until the morning of the 6th, but with his 40,000 men Johnston attacked Grant's 50,000 with such impetuosity, skill, and dash, that the Federals were driven back at every point, were huddled together at Pittsburg Landing, and there seemed to be lacking at 2.30 P. M. only one more vigorous advance to annihilate Grant's army. But just at this moment the great commander who had just remarked to one of his staff: "The victory is ours. We shall soon water our horses in the Tennessee River," was struck by a minie ball in his leg, and bled to death in 15 minutes. In the confusion which followed, the advance was not made. Beauregard (who had been ill in his ambulance all day and did not appreciate the real situation) ordered the Confederate lines to fall back. Buell and Mitchel came up that night with 55,000 fresh troops, and thus the fruits of Johnston's great

victory were lost, and the next day the Confederates were compelled to fall back to Corinth.

No nobler eulogy could be pronounced on Albert Sidney Johnston than that of President Davis in a special message to the Confederate Congress, in which he said: "Without doing injustice to the living, it may safely be said that our loss is irreparable. Among the shining hosts of the great and good who now cluster around the banner of our country, there exists no purer spirit, no more heroic soul than that of the illustrious man whose death I join you in lamenting. In his death he has illustrated the character for which, through life, he was conspicuous — that of singleness of purpose and devotion to duty with his whole energies. Bent on obtaining the victory which he deemed essential to his country's cause, he rode on to the accomplishment of his object, forgetful of self, while his very life blood was fast ebbing away. His last breath cheered his comrades on to victory. The last sound he heard was their shout of victory. His last thought was his country, and long and deeply did his country mourn its loss."

It is scarcely extravagant to say that had Albert Sidney Johnston lived the victory at Shiloh would have been complete, the whole character of the campaign in the West would have been changed, and with Lee in Virginia and Johnston in the West, the result of the War might have been different. The monument to Albert Sidney Johnston in New Orleans is one of the most beautiful in the country; he is buried in Austin, the capital of his adopted State, and Texas proposes to honor herself by erecting to his memory a fitting monument.

J. Wm. Jones,
Author and Lecturer.

Johnston, Alexander, American historian: b. Brooklyn, L. I., 29 April 1849; d. Princeton, N. J., 21 July 1889. He was graduated from Rutgers College, N. J., in 1870, studied law and was admitted to the bar in 1876. He did not practise, however, and was professor of jurisprudence and political economy at Princeton University from 1883 till his death. He was the author of 'History of American Politics' (1879); 'Connecticut: a Study of a Commonwealth-Democracy' (1887); 'History of the United States for Schools' (1886); and 'The United States: its History and Constitution,' reprinted from the 'Encyclopædia Britannica' (1887).

Johnston, Alexander Keith, Scottish cartographer: b. Kirkhill, Edinburgh, Scotland, 28 Dec. 1804; d. 10 July 1871. His first important work, the 'National Atlas,' was published in 1843. At the suggestion of Humboldt, he visited Germany and gathered material for his 'Physical Atlas of Natural Phenomena' (1847–9), and his 'Royal Atlas of Geography' (1861) was one of the most beautiful and minutely accurate atlases ever published up to that time. His son of the same name (b. 1846; d. 28 June 1879) continued his father's enterprises.

Johnston, Gabriel, American colonial governor of North Carolina: b. Scotland 1699; d. 1752. Very little is known of his personal history. He was educated at the University of St. Andrew's, with a view to the medical profession, which he seems not to have practised. He was for a while professor of Oriental languages at St. Andrew's, and then removed to London, where he was engaged with Pulteney and Bolingbroke in writing for the 'Craftsman.' By the influence of the Earl of Wilmington he was appointed governor of North Carolina, and took the oath of office at Brunswick 2 Nov. 1734. He was the ablest and most successful of all the colonial governors, holding the reins of power up to the time of his death.

Johnston, Harriet Lane, American gentlewoman: b. Mercersburg, Pa., 1833; d. Narragansett Pier, R. I., 3 July 1903. She was the niece of James Buchanan, afterward President of the United States, and on the death of her mother, Buchanan's sister, in 1839, was brought up under the care of her uncle. When the latter was minister to Great Britain, the niece presided over the hospitalities of the legation in London, and during his occupancy of the White House was its mistress, receiving among other distinguished guests the Prince of Wales, now Edward VII. On the occasion of his coronation in 1902 she was among the specially invited guests in recognition of the courtesies extended to him at the White House so long before. In 1866 she was married to Henry Eliott Johnston of Baltimore.

Johnston, Sir Harry Hamilton, English traveler: b. London 12 June 1858. He was educated at King's College, London, and the Royal Academy of Arts, traveled in North Africa, 1879–80, and Portuguese West Africa, and the Kongo region, 1882–3. He commanded a scientific expedition to Mount Kilimanjaro in 1884 and has held various consular posts in Africa. He has published 'Essays on the Tunisian Question' (1880–1); 'The River Congo' (1884); 'Kilimanjaro' (1885); 'History of a Slave' (1889); 'Life of a Livingstone' (1891); 'British Central Africa' (1897); 'History of the Colonization of Africa by Alien Races' (1899); 'The Uganda Protectorate' (1902).

Johnston, Henry Phelps, American historical writer: b. 1842. He is professor of history in the College of the City of New York, and has published 'The Battle of Harlem Heights'; 'Loyalist History of the Revolution'; 'The Yorktown Campaign'; etc.

Johnston, James Steptoe, American Episcopal bishop: b. Church Hill, Miss., 9 June 1843. He was educated at the University of Virginia, served as 2d lieutenant in the Confederate cavalry during the Civil War, subsequently studied law and was admitted to the bar. After practising for a short time he took orders in the Episcopal Church in 1869 and after holding rectorships at Port Gibson, Miss., six years; Mount Sterling, Ky., four years; and Mobile, Ala., eight years, became bishop of western Texas in January 1888.

Johnston, John, American Indian agent: b. Ballyshannon, Ireland, March 1775; d. Washington, D. C., 19 April 1861. He came to Cumberland County, Pa., in 1786, obtained a post in the War Department, in 1792 went to the Ohio Valley, later became a United States factor at Fort Wayne, Ind., and at the beginning of the War of 1812 was appointed Indian agent for Ohio, with headquarters at Piqua. President Harrison appointed him agent to the Senecas, with headquarters at Upper Sandusky, and in that capacity negotiated with the Senecas the

treaty whereby they agreed to move westward across the Mississippi. He was president of the Historical and Philosophical Society of Ohio, and wrote: 'Present State of the Indian Tribes Inhabiting Ohio,' printed in 'Archæologia Americana' (transactions and collections of the American Antiquarian Society), Vol. I. (6 vols., 1820–74).

Johnston, Joseph Eggleston, American soldier: b. Cherry Grove, Va., 3 Feb. 1807; d. Washington, D. C., 21 March 1891. He was graduated at West Point in 1829; and served with distinction in the Black Hawk and Seminole wars. In the Mexican War he distinguished himself also and was brevetted major and colonel United States army for bravery at Cerro Gordo. He was promoted quartermaster-general of the army with the rank of brigadier-general in June 1860, but resigned his commission when Virginia seceded. He was then made major-general of Virginia volunteers and later full general in the Confederate service, taking an active part in the first battle of Bull Run, 21 July 1861, where he personally led a charge with the colors of the 4th Alabama regiment in his hands. At the battle of Fair Oaks, 31 May 1862, Johnston was severely wounded and was disabled for service for several months. In November he again reported for duty and was assigned to the Military Department of Tennessee. In the operations of Grant before Vicksburg he did everything possible to prevent the shutting up of General Pemberton in Vicksburg, telegraphing him May 2: "If Grant crosses, unite all your troops to beat him. Success will give back what was abandoned to win it." Although similar orders were repeatedly sent to Pemberton, they were disregarded; Pemberton allowed himself to be shut up in Vicksburg, and the siege and surrender on 4 July followed. In December of the same year he took command of Bragg's army at Dalton, Ga., and by the spring of 1864 brought it to a state of efficiency which it had not previously had, though it contained only 45,000 men against Sherman's 98,797. The campaign from Dalton to Atlanta, a distance of 100 miles, was a series of severe engagements without a general battle, Johnston's friends claiming "the retreat had been the masterpiece of Johnston's life, and one of the most skilful and successful that had ever been executed." On 17 July 1864 Johnston was superseded in this command by General Hood. In the early part of 1865 he was several times defeated by Sherman, to whom he surrendered at Durham Station, N. C., on 26 April, the terms of capitulation resembling those granted to Lee at Appomattox. After the war Johnston engaged in business, and was member of Congress 1876–8. He was United States Commissioner of Railways 1885–9, and the author of 'A Narrative of Military Operations During the Late War' (1874). Consult: Hughes, 'General Johnston' (1893).

Johnston, Mary, American novelist: b. Buchanan, Botefourt County, Va., 21 Nov. 1870. In 1898 she became suddenly famous through her 'Prisoners of Hope: a Tale of Colonial Virginia,' and her next book 'To Have and to Hold' (1900) was even more popular. She has since published 'Audrey' (1902).

Johnston, Richard Malcolm, American author: b. Powelton, Ga., 8 March 1822; d. Baltimore, Md., 23 Sept. 1898. He was graduated at Mercer University in 1841; was admitted to the bar in 1843; and began practice in Sparta, Ga., the same year. He was professor of literature in the University of Georgia in 1857–61 and served as colonel in the Confederate service during the Civil War. At its close he established a boys' boarding school at Sparta, which he removed in 1867 to Baltimore, and of which he was the head for many years. His publications include: 'Historical Sketch of English Literature'; 'Life of Alexander H. Stephens' (1883); 'Dukesborough Tales' (1883); 'Old Mark Langston'; 'Ogeechee Cross-Firings' (1889); 'Mr. Absalom Billingslea and Other Georgia Folk' (1887); 'Studies Literary and Social' (1891–2); 'The Primes and Their Neighbors'; 'Mr. Billy Downs and his Likes.' The usual theme of his longer as well as his shorter fictions is the life of the middle class Georgian in the ante-bellum period.

Johnston, Samuel, American lawyer and statesman, nephew of Gabriel Johnston (q.v.): b. Dundee, Scotland, 15 Dec. 1733; d. near Edenton, N. C., 18 Aug. 1816. His father, John, came to North Carolina in 1736, became surveyor-general, and acquired large landed estates. The son chose the profession of the law, and was clerk of the superior court in Chowan County for five years from 1767, and served there also as naval officer under the crown. Elected to the assembly in 1769 from the first he espoused the popular side, and in 1773 the assembly placed him on its standing committee of inquiry and correspondence, the organ by which it sought to co-operate with the other provinces. This was the first decisive step toward revolution taken by the legislature of North Carolina. He was an active member of the first two provincial congresses in this province. The 3d and 4th met at his summons, and he presided over the deliberations of both. In the 3d, August 1775, the political organization of the province was decided on, and the supreme executive authority was entrusted to a provincial council, of which he was made the chairman, and so virtually the governor of the province. In September 1775 he was chosen treasurer for the northern district of North Carolina. In 1781–2 he was a member of the Continental Congress. In 1787 he was elected governor of the State, and in 1788 presided over the convention which rejected the Federal Constitution, which, however, he supported with all his influence. He was United States senator 1789–93, and judge of the superior court 1800–03.

Johnston, William Preston, American educator: b. Louisville, Ky., 5 Jan. 1831; d. Lexington, Va., 16 July 1899. He was a son of A. S. Johnston (q.v.) and was graduated at Yale in 1852 and from the Louisville Law School in 1853. He served as colonel and aide-de-camp to Jefferson Davis in the Confederate army during the Civil War, and soon after its close became professor of history and literature at the Washington and Lee University, remaining there till 1877. In 1880 he became president of the Louisiana State University, and after its union with Tulane University, New Orleans, in 1884, was president of that institution till his death. His

publications include: 'Life of General Albert Sidney Johnston'; 'The Johnstons of Salisbury'; 'The Prototype of Hamlet'; and 'Seekers after God' (poem).

Johnstown, jŏnz'town, N. Y., city and county-seat of Fulton County, on Cayadutta Creek, and on the Fonda, J. & G. railroad, 44 miles northwest of Albany. In 1771, a few years after its settlement, it was named after its founder, Sir William Johnson, whose mansion, built here 10 years earlier, still stands almost as it was left by him. In 1808 Johnstown was incorporated as a village, and in 1895 it received a city charter. The court-house and jail, built by Sir William Johnson in 1772, occupy with Johnson Hall an interesting place in local history. The city has a public library building which was the gift of Andrew Carnegie. The industries of Johnstown include a variety of important manufactures, chief among which are those of gloves and mittens, knit goods of different kinds, leather, gelatin, lumber, grist-mill and machine-shop products, etc. The municipal government is well supported by public spirit, and the city's affairs are efficiently managed. The people elect the water board and the school board, and the waterworks are owned and operated by the city. Pop. (1890) 7,768; (1900) 10,130.

Johnstown, Pa., city, county-seat of Cambria County; on the Conemaugh River, and on the Baltimore & O. and the Pennsylvania R.R.'s; about 80 miles east of Pittsburg. The Little Conemaugh River and Stony Creek unite at Johnstown and form the Conemaugh River. The area of the city is about five square miles, and the valley in which it is located is about 1,200 feet above sea-level. Johnstown was settled about 1790, but was not incorporated until 1889. Its situation, in a coal and iron ore region, combined with its great water power, has made it an important manufacturing centre. Fire-clay and limestone are also found in the vicinity. Some of its industrial establishments are the Cambria Steel Company works, where about 10,000 men are employed, the Lorain Steel Company, iron and steel works, iron-plate mills, street-car rail factory, planing-mills, cement works, furniture factories, potteries, breweries, brick-yards, machine-shops, foundries, furnaces, wire works, leather, and woolen goods. Some of the noted public buildings are the Cambria Free Library, the Conemaugh Valley Memorial Hospital, several churches, the Franciscan Monastery, the city hall, and the high school. The number and arrangement of the parks add to the beauty of the place. In Grand View Cemetery are the graves of 800 unidentified dead who perished in the "Johnstown Flood." This disastrous flood occurred on 31 May 1889, and was the result of the destruction of a dam across South Fork, a small branch of the Conemaugh River. Heavy rains had fallen and the mountain streams of the vicinity had become roaring torrents. The dam kept back the waters of Conemaugh Lake, about two and one half miles long, one and one half miles wide, and averaging over 50 feet in depth; in some places the water of the lake was 100 feet in depth. The direct distance from the city was about 12 miles, but along the river the distance was five or six miles longer. In a very short time after the dam had burst, the valley was flooded and Johnstown and several small village were under water. The loss of lives was 2,235 or more, and the loss of property was estimated to be about $10,000,000. Aid for the sufferers came from all parts of the country; and the city was soon rebuilt, and its industries re-established. Pop. (1890) 21,805; (1900) 35,936.

Joint, in anatomy, an articulation or connection between bones. Many of the immovable joints are so close in their union that the two bones practically become one, as in the dovetailed sutures of the skull. In the make-up of a movable joint there are the two bones, and covering the surface of each a layer of tissue of rubbery consistency called cartilage; binding the bones together are firm inelastic bands of tissue called ligaments. Over the surface of the cartilage and the inner surfaces of the ligaments there is a thin smooth layer of tissue, the synovial membrane, which is kept constantly moist with an oily fluid to prevent friction. Joints are classified according to the variety of motions they allow: the freest is the ball-and-socket joint, as seen in the hip and shoulder.

Diseases of Joints.— Joint-diseases are distinguished by names that indicate the principal structure involved and the causes of disease. Where the cause is a specific disorder, as tuberculosis, rheumatism, syphilis or gonorrhœa, the name of that particular malady is given to the inflammation. The only structure of a joint that is apt to be involved alone is the synovial membrane, and inflammation of this structure is called synovitis. Inflammation of all the joint-structures is called arthritis, and where the bone is the primary seat of the trouble, or is principally involved, the name osteo-arthritis is used.

Synovitis.— This condition results from injuries (sprains, bruises, and wounds), from overuse, acting as an injury, and from poisons circulating in the blood. The joint is painful, moves with greater pain, and may be red outside. Blood-serum is poured out, and the synovial sac is distended. (This condition constitutes "water on the knee.") The general symptoms and severity depend on the cause of the trouble. Absolute rest of the joint and pressure by a snug bandage hasten recovery. When such injuries are repeated, or when the inflammation is slight but persistent, painting with iodine tincture may be of value. When the condition of inflammation reaches the suppurative stage all the structures of the joint are involved, and the condition is considered under the term "arthritis."

Arthritis (non-specific).— This is due to the extension of disease of contiguous bone, or it may result from wounds or in the course of various diseases. The joint becomes swollen, red, very painful, and the general symptoms are severe. When the poison is sufficiently virulent, suppurative arthritis results, and the pus collects in the synovial sac. (See INFLAMMATION.) In this condition the joint becomes "boggy," and the poisoning of the entire system is so severe as to warrant the most radical measures for relief. Opening the joint and allowing the escape of the pus, with thorough cleansing, may be sufficient, or the limb may have to be sacrificed. See ARTHRITIS; ARTHRITIS DEFORMANS; GOUT; RHEUMATISM; SYPHILIS.

Knock-knee.— This is a deformity of the legs, consisting in the angular projection of the knee inward, and is sometimes called in-knee. It arises in children learning to walk who are affected with rickets (q.v.). The deformity is due to the faulty growth of the bones which enter into the joint. In early life, correction of it may be secured by splints and braces; but when the bones become less pliable, the femur, the tibia, or both may have to be severed by chiseling and the bones held in the normal line by plaster casts until union has taken place.

Charcot's Disease.— The peculiar form of arthritis thus named occurs in the course of locomotor ataxia, the knee-joint usually being the one affected. The joint swells painlessly, the structures are worn away, and the function of the joint is lost.

Injuries of Joints.— See DISLOCATION.

Sprains.— These are wrenches resulting in more or less stretching or laceration of ligaments, hemorrhage in and around the joint, and sometimes the displacement of tendons. The part usually swells at once, and movement causes severe pain. This injury may closely resemble a joint-fracture. Absolute rest of the joint must be insisted upon, as synovitis may follow. Alternating hot and cold applications, if started early, lessen the damage. The joint should then be snugly bandaged and kept so until swelling and tenderness disappear.

Wounds of Joints.— Injuries of this nature may cause damage directly to the structures or by infecting the joint and producing arthritis. Penetration into the synovial sac is indicated by an escape of the viscid fluid.

Floating Cartilages.— These are rarely seen except in the knee-joint, where they are ordinarily due to a small portion of cartilage being bitten off between the bones; this piece then floats around in the synovial sac, and causes trouble when the bones lock together on it. When this occurs, the patient falls to the ground because of the severe pain. The synovial membrane is injured, and is apt to be mildly inflamed. These bodies may sometimes be felt through the skin, and can be held, by holding the joint in the same position, until an opening is made; but ordinarily when the attacks become so frequent as to be unbearable the joint has to be opened and searched.

Joint or Knot Grass. See GRASSES IN THE UNITED STATES.

Joint-snake. See GLASS-SNAKE.

Joint Tenants, persons who hold or own lands jointly, by title created expressly by one and the same deed or will. It has been uniformly held by the courts that a unity of possession derived by several and distinct conveyances does not constitute a joint tenancy, but rather a tenancy in common. Joint tenants must have the same interest, derived from the same conveyance, commencing at one and the same time, and held by a united possession. The duration of the estates must be alike in both, and also the interest. Should one hold under the conveyance for a term of years, and the other for life, the possession even for a term of years would not be a joint tenancy. The estate must vest in each tenant at the same time. In the case of a will which gives one an interest to commence at a day named and another an interest to commence a year later, no joint tenancy is created thereby. Should one receive an interest absolute and another an interest for life, the relation of joint tenants would not be created. The doctrine of survivorship is the distinguishing incident of title by joint tenancy. In the event of the death of one of the joint tenants, the survivor is entitled to the whole property, and the full title immediately vests in him. This is not an incident of tenancy in common. Many of the States of the Union have abolished title by survivorship in joint tenancy by constitutional provisions or by express statute enactments. In other States acts have been passed abrogating the distinction between joint tenants and tenants in common; and inheritance by survivorship not being an incident of tenancy in common, such acts are construed by the courts as abolishing such inheritance. Such acts do not apply to existing joint tenancies, but only to such as may be created after the enactment.

Joint-worm, the larva of chalcid flies (see CHALCIS) which make galls near the "joints" of grass-plants, and thus are sometimes of great injury to cereal crops, especially wheat and barley. See WHEAT INSECT-PESTS.

Jointure, join'tūr, a settlement of lands and tenements made to a woman in consideration of marriage, as a substitute for dower. Originally it was a joint estate limited to both husband and wife as a joint tenancy and subjected to survivorship. The wife takes nothing under the settlement until after the death of the husband, unless special provisions are incorporated, which in reality modifies the effect of a regular jointure. In some settlements, denominated jointures, provisions are inserted to the effect that they are not to exclude enjoyment of dower; but such provisions are an innovation upon the established province of jointures. A good jointure must provide that it shall take effect, in possession and profit, immediately after the death of the husband; that it shall be for the life of the wife herself, and cannot be left in trust for her use and benefit. It should be provided that it is in settlement of all dower interest, in order to maintain its distinctive features of jointure. The settlement must be executed before marriage, as marriage constitutes the entire consideration for the jointure. Such an instrument properly executed before marriage is binding on the wife and a complete bar to dower in any dowable lands owned or conveyed by the husband during the marital relations. Without the intervention and assistance of legislative action, no other form of agreement is effectual to bar dower. It sometimes happens that the wife is deprived of her jointure by lawful acts to which she is not a party, as by the lands being taken for public purposes, or in some other manner equally legitimate. In such a case the settlement does not bar her claim against the husband's estate to the extent to which she is deprived of her jointure.

Joinville, Jean, zhŏń zhwän-vēl, SIEUR DE, French historian: b. Champagne 1224; d. 11 July 1317. He early entered the service of Thibaut, king of Navarre, and in 1248 raised a troop of 9 knights and 700 armed soldiers, and accompanied Louis IX. in his first crusade to

the Holy Land. He rose high in favor with Louis, shared his captivity, returned with him to France in 1254, and spent much of his time at court. His 'Histoire de St. Louis,' which is one of the most valuable specimens of early French prose, has been often reprinted.

Jokai, yō'kä-ĭ, **Maurus,** Hungarian novelist: b. Komorn 19 Feb. 1825; d. Budapest 5 May 1904. In 1846 he received his advocate's diploma, but never practised, and from a very early age devoted himself to literary work. In 1842 he produced a drama, 'The Jew Boy,' in 1846 his first novel, 'Work-days,' was published, and in 1847 he issued a collection of stories entitled 'Flowers of the Desert.' His 'Revolution and Battle Pictures' appeared in 1849, and after that he devoted himself with extraordinary energy to journalistic and literary work, producing in all more than 300 volumes. He was a member of the Hungarian parliament and the recognized leader of the Liberal opposition since the restoration of the constitution, and in 1897 was appointed a life member of the House of Magnates. He was a successful newspaper editor continuously from 1858 till his death, his last paper being the 'Nemzet' (Nation). He is best known by his numerous romances and novels. Among the latter are 'Transylvania's Golden Age' (1851); 'The Man with Two Horns' (1852); 'The Turks in Hungary' (1852); 'A Hungarian Nabob' (1854); 'Kárpáthy Zoltan' (1855); 'Political Fashions' (1861); 'The New Landlord' (1862); 'Dr. Dumany's Wife' (Eng. trans. 1891); 'In Love With the Czarina' (Eng. trans. 1894); 'The Nameless Castle' (Eng. trans. 1891); 'The Green Book' (Eng. trans. 1897); 'The Lion of Janina' (Eng. trans. 1897); 'The Poor Plutocrats' (Eng. trans. 1899); 'Debts of Honor' (Eng. trans. 1900); 'The Baron's Son' (Eng. trans. 1900); 'The Day of Wrath' (Eng. trans. 1900). His best plays are: 'King Kolomon' (1855); 'Manlius Sinister' (1856); 'Georg Dózsa' (1858); 'The Martyrs of Szigetvár' (1859); and 'Milton' (1878). His 'Political Poems' appeared in 1880. Consult Nevai, 'M. Jokai' (1894).

Joliet, jō'lĭ-ĕt, Fr. zhō-lē-ā, **Louis,** American explorer: b. Quebec 21 Sept. 1645; d. Canada May 1700. He was educated at the Jesuit College of Quebec, and subsequently engaged in the fur trade on the western frontier, thereby becoming familiar with the missionaries and tribes. He was selected by the governor Frontenac to ascertain the direction and mouth of the Mississippi, a few of whose affluents had already been visited by missionaries and traders. Starting with his companion, the illustrious Father Marquette (q.v.), and five other Frenchmen, from Green Bay in June 1673, he ascended the Fox River, and descended the Wisconsin to its confluence with the Mississippi, down which they sailed as far as the country of the Chickasaws, below the entrance of the Arkansas. Having ascertained with tolerable accuracy the general course of the stream, they returned to Green Bay, by the way of Illinois River, Chicago, and Lake Michigan, whence Joliet started alone for Quebec. The whole route traveled by them is estimated at 2,500 miles. He lost his journal and other papers in the rapids above Montreal, but wrote out from recollection a few pages of manuscript, which agree with the narrative of Marquette. In the same manner he prepared a map of the region explored. The French government inadequately rewarded him for his services with the Island of Anticosti at the mouth of the St. Lawrence, where he built a house and fort for his family, intending to embark in trade. He appears, however, to have been subsequently employed in the West. In 1691 his island was captured by a British fleet and his property destroyed. In 1697 the seignory of Joliet, Canada, was assigned to him. Joliet, the capital of Will County, Ill., is named after him. Consult: Parkman, 'La Salle' (1869); Winsor, 'Narrative and Critical History of America' (1884–7).

Joliet, jō'lĭ-ĕt, Ill., city, county-seat of Will County; on the Des Plaines River, and on the Chicago, R. I. & P., the Michigan C., the Atchison, T. & S. F., the Elgin, J. & E., the Lake Shore & E., and the Chicago & A. R.R.'s; about 30 miles southwest of Chicago. The first permanent settlement was made in 1831 and the city was chartered in 1859. The places was named in honor of Louis Joliet, a Canadian navigator and one of the party who with Marquette visited this place in 1673. The Illinois and Michigan Canal and the Joliet River supply the city with good water power. The city is situated in a rich agricultural region, and large limestone quarries are in the vicinity. Its chief manufacturing establishments are the American Steel and Wire Company works, the Illinois Steel Company factory, the American Tin Plate Company, machine-shops, agricultural implement works, foundry and furnace products, breweries, flour-mills, boot and shoe factories, and furniture factories. Some of the public institutions are the State penitentiary, Silver Cross and Saint Joseph's hospitals, Saint Mary and Saint Francis academies, and a public library which contains about 16,000 volumes. The Illinois Steel Company Athenæum, a club-house for workingmen, is a fine institution. The city owns and operates the waterworks. Pop. (1890) 23,264; (1900) 29,353.

Joliette, or Industry Village, Canada, town and county-seat of Joliette County, Quebec; on the L'Assomption River, at the junction of a branch of the Canadian Pacific with the Great Northern Ry. of Canada; 40 miles north of Montreal. It is an important market town, has fine water power, and has a good trade in lumber and farm products. It has large foundries, saw, paper, and grist mills, and manufactories of woolen goods, leather, boots and shoes, biscuit, agricultural implements, carriages, and tobacco and cigars. Limestone for building is quarried in the vicinity. It has two churches, a college, hospital, convent, orphan asylum, and mechanic's institute; an industrial school, banks, and weekly newspapers. The municipality controls the waterworks and electric light. Pop. (1901) 4,220, almost entirely French Canadian.

Jolly Balance, a spring balance devised by Prof. Philipp von Jolly, of the University of Munich, for determining the specific gravities of small objects. In its usual form it consists essentially of a long spiral spring of fine wire, to the lower end of which two pans are attached, one above the other. The lower pan is kept immersed in water, while the upper one remains in the air. The object whose specific gravity is to be determined is placed in the upper

pan first, and the extension of the spring due to the weight of the object in the air is noted. The specimen is then transferred to the lower pan (where it will be under water), and the extension of the spring under these new conditions is also noted. The specific gravity of the specimen is then obtained by dividing the extension of the spring when the object is in the air by the difference between the two extensions as observed for air and water, respectively. The extension of the spring is observed by means of a graduated scale engraved upon a mirror that is placed back of the spring, and parallel to it. In taking a reading, the eye is brought into such a position that the image of the pupil is seen in the mirror directly behind the image of the pointer at the lower end of the spring. In this way errors of parallax are avoided in the readings. The Jolly balance is chiefly used for the rapid determination of the specific gravities of minerals and similar objects, where great precision is not essential.

Jonah, jō'na, a Hebrew prophet: b. Gath-Hepher, Galilee. He flourished in the early years of Jeroboam II., king of Israel, who acceded to the throne 781 B.C. In 2 Kings xiv. 20 we are told that Jonah predicted to Jeroboam his victories over the Syrians. In the narrative of this so-called prophecy of Jonah we see the son of Amittai despatched on an errand of unique importance. He is to go to Nineveh to warn the inhabitants of the destruction of their city, which is to follow within 40 days. The Assyrians at that time were in a reduced condition, their power was broken, and they were inclined to heed the warning. A fast was proclaimed and the threatened judgment was thus averted. Chapter 1st of the book tells the story of Jonah's refusal to obey the command to go to Nineveh; his flight westward, his miraculous arrest, ending in his imprisonment in the belly of a large fish. Then follows a psalm of thanksgiving for deliverance from the fish. The 3d chapter relates to the preaching of Jonah and the repentance of the Ninevites followed by the reprieve of their city. Finally Jonah is rebuked for his anger at the sparing of Nineveh, by which his prophetic reputation ran the risk of being discredited. The book is in no proper sense a prophecy, but is intended to rebuke the haughty exclusiveness of Israel. The Jews were inclined to rejoice at the calamities of the heathen, and the present reprimand is all the more severe because the Assyrians had been and were afterward again to be the most powerful and dangerous foe to the peace of Palestine.

Jonah Crab, a crab of southern New England (*Cancer borealis*) related to the common edible species, but more robust, and with a thicker, harder shell. It is eaten locally.

Jo'nas, Benjamin Franklin, American lawyer and politician: b. Williamston, Ky., 19 July 1834. He was graduated from the law department of the University of Louisiana in 1855, and on the outbreak of the Civil War entered the Confederate army as private and rose to the rank of adjutant. In 1865 he was elected to the Louisiana legislature, to the State senate in 1872, and was then chosen city attorney of New Orleans. After a second term in the State legislature, he was elected to the United States Senate from Louisiana and served from 1879 to 1885. He was appointed by President Cleveland collector of the port of New Orleans (1885–9).

Jonas, yō'näs, Justus (originally JOBST KOCH), German religious reformer: b. Nordhausen, Saxony, 5 June 1493; d. Eisfeldt 9 Oct. 1555. He accompanied Luther to the diet at Worms, assisted him in translating the Old Testament, took part in the Marburg Conference as well as in drawing up the so-called articles of Torgau and was present at the Diet of Augsburg. He did good service to the cause of the Reformation not only by his preaching but by his vigorous translations into German of the Latin works of Luther and Melanchthon.

Jon'athan, son of Saul, king of Israel. He carried on the war against the Philistines for some time with victorious success, but in the battle of Gilboa (1033 B.C.) was slain. His friendship for David is one of the most beautiful incidents in Old Testament history, and the elegy or dirge composed by David on his death — 'The Song of the Bow' — is in the highest strain of Hebrew poetry.

Jonathan. See BROTHER JONATHAN.

Jones, Alexander, American inventor and journalist: b. North Carolina about 1802; d. New York 25 Aug. 1863. He studied medicine in Philadelphia, entered practice in Mississippi, there became interested in cotton cultivation, and made important improvements in the cotton-gin. He invented also a street-sweeping machine. He became an agent of the Associated Press in 1850, and subsequently commercial reporter of the New York *Herald*. His published volumes are: 'Cuba in 1851' (1851); 'Historical Sketch of the Electric Telegraph' (1852); and 'The Cymri of '76' (1855).

Jones, Alfred Gilpin, Canadian statesman: b. Weymouth, Nova Scotia, September 1824; d. Halifax, 15 March 1906. After a secondary education, he entered mercantile life, opposed confederation in 1865, sat in the Dominion Parliament for Halifax in 1867–72 and again in 1874–8, was a member of the privy council, and in 1878 was minister of militia. In 1887–91 he was a third time in Parliament. In 1900 he was appointed Lieutenant-Governor of Nova Scotia. At first a Conservative, he later identified himself with the Liberals, and favored a trade-union with the United States.

Jones, Amanda Theodosia, American poet: b. East Bloomfield, Ontario County, N. Y., 19 Oct. 1835. Some of her war songs were very popular. She published: 'Ulah and Other Poems' (1860); 'Atlantis and Other Poems' (1866); 'A Prairie Idyl, and Other Poems' (1882).

Jones, Anson, last president of the Republic of Texas: b. Great Barrington, Mass., 20 Jan. 1798; d. Houston, Texas, 7 Jan. 1858. He commenced the study of medicine in Litchfield, Conn., in 1817, and in 1820 was licensed to practise. He established himself in 1833 in Brazoria, Texas, and upon the outbreak of the troubles between Texas and Mexico, became one of the earliest advocates of the severance of the two countries. In the succeeding war of independence he served as a private soldier, and as surgeon in the Texan army. In 1837–8 he

was a representative in the Texan congress from Brazoria County; in 1838 was sent as minister to Washington, where he endeavored, though unsuccessfully, to secure the annexation of Texas to the United States, and on his return to Texas took his seat in Congress as senator from Brazoria, and in 1841 was appointed by President Houston his secretary of state, which office he filled three years. In September 1844 he was elected President of Texas for three years from the ensuing December, and held that office until the annexation of Texas to the United States. He succeeded in maintaining a footing of equality in negotiations with England, France, and the United States; and by the intervention of the two former powers the government of Mexico was induced to acknowledge the independence of Texas.

Jones, Charles Colcock, Jr., American author: b. Savannah, Ga., 28 Oct. 1831; d. 19 July 1893. He was graduated at Princeton (1852), at Harvard Law School (1855), and was admitted to the bar in 1856. He served as colonel of artillery in the Confederate army during the War for the Union, and on the return of peace removed to New York, where he practised law. In 1877 he returned to Georgia and devoted his time to the study of the history and archæology of that State. He wrote: 'Negro Myths from the Georgia Coast, Told in the Vernacular' (1888); 'The History of Georgia' (1883).

Jones, David Phillips, American naval engineer: b. Philadelphia 1841; d. Pittsburg 30 Jan. 1903. He entered the navy in 1862, during the Civil War took part in the operations on the James (Va.) and the St. John's (Fla.), and was present at Bermuda Hundred, and in 1889 attained the grade of chief engineer. In 1874–9 he was instructor in steam engineering at the Naval Academy, Annapolis, and from 1889 to 1892, when he was retired, was on duty at the naval training-station at Newport, R. I. He was chief inspector of steel for the district at Pittsburg during the Spanish-American war.

Jones, Edward Franc, American soldier and manufacturer: b. Utica, N. Y., 3 June 1828. He was colonel of the 6th regiment of Massachusetts volunteers, which he led through Baltimore at the opening of the Civil War, and which was attacked by the mob. He was subsequently brevetted a brigadier-general of United States volunteers. He was a member of the Massachusetts Legislature in 1865, but removed to Binghamton, N. Y., the same year. He was lieutenant-governor of New York 1886–91, and originated the phrase, "He pays the freight." He published 'The Origin of the Flag'; etc.

Jones, Henry Arthur, English dramatist: b. Grandborough, Buckinghamshire, England, 28 Sept. 1851. After a secondary education, he took up writing as a means of livelihood, and in 1879 appeared as playwright with 'A Clerical Error,' performed by Wilson Barrett at the Court Theatre. He followed this by a series of comedies of modern life, clever in dialogue and stagecraft, which have been very popular, particularly with English audiences. They include: 'Silver King' (1882); 'Saints and Sinners' (1884); 'Middleman' (1889); 'Judah' (1890); 'The Dancing Girl' (1891); 'The Tempter' (1893); 'The Masqueraders' (1894); 'The Triumph of the Philistines' (1895); 'The Rogues' Comedy' (1896); 'The Liars' (1897); 'The Manœuvres of Jane' (1898); 'Carnac Sahib' (1899); 'The Princess' Nose' (1902); 'Chance, the Idol' (1902); 'Mrs. Dane's Defense' (1904).

Jones, Inigo, English architect: b. London July 1573; d. there 21 July 1652. He was the son of a clothworker and began life as a carpenter, but showing a taste for painting, William, earl of Pembroke, supplied him with the means of visiting Italy for the purpose of studying landscape painting. At Venice, the works of Palladio inspired him with a taste for architecture. He was appointed first architect to Christian IV., king of Denmark, but in 1605 he returned to his native country. After being employed for a time as a scenic and stage artist, he was appointed in 1610 surveyor of the works to Henry, Prince of Wales. After the death of the prince he again visited Italy, and extended his knowledge and improved his taste from the examination of the models of ancient and modern art. The banqueting house at Whitehall is a monument of his skill and science. At Winchester Cathedral he erected a screen in the style of classic antiquity. Like Wren he seems not to have duly appreciated the Pointed style of building. He built the front of Wilton House, in Wiltshire, for Philip, earl of Pembroke, and was much employed by the court and by many of the nobility and gentry. He also designed the scenery and decorations for masks — a species of dramatic entertainment fashionable in the early part of the 17th century. In these pieces the dialogues and songs were composed by Ben Jonson, who quarreled with Jones, and abused him in epigrams and satires. Being a Roman Catholic, and a partisan of royalty, he suffered in the civil war, and in 1646 was forced to pay a heavy fine as a malignant or cavalier. As an author he is known by a work on Stonehenge, composed by command of King James I., in which he undertook to prove that Stonehenge was erected by the Romans, and was a hypæthral temple dedicated to the god Cœlus. He was the reviver of classical architecture in England, but he blended Gothic elements with the Italian style. Among his works besides those mentioned are the Greenwich Hospital, the old London Exchange, and the portico of St. Paul's Church, and Earl Pembroke's house.

Jones, Jacob, American naval officer: b. near Smyrna, Del., March 1768; d. Philadelphia 3 Aug. 1850. He entered the United States navy in 1799 as a midshipman and while serving in the war with Tripoli, was captured in 1803 and held a prisoner for 18 months. In 1812 he became commander of the Wasp and with her captured the English brig Frolic 18 Oct. 1812, but on the following day encountered the English war vessel Poictiers, 74 guns, by which both the Wasp and its prize were taken. He was released on parole at Bermuda and for his victory over the Frolic was voted a gold medal by Congress, and $25,000 was granted to him and his crew in payment of the personal loss they had sustained. He subsequently commanded squadrons in the Mediterranean and the Pacific.

Jones, Jenkin Lloyd, American Unitarian clergyman: b. Llandyssil, Cardiganshire, Wales, 14 Nov. 1843. He came to America with his

parents while an infant, served in a Wisconsin regiment during the Civil War, and was graduated from the Meadville (Pa.) Theological Seminary in 1870. He was pastor of All Souls Unitarian Church, Janesville, Wis., 1874–83; was secretary of the Western Unitarian Conference for nine years, and since 1883 has been pastor of All Souls Church, Chicago. He has been prominent among the more radical members of the Unitarian body, and has published: 'The Faith that Makes Faithful,' with W. C. Gannett (1886); 'Practical Piety' (1890); 'Word of the Spirit' (1897); 'Bits of Wayside Gospel' (1899); etc.

Jones, John, American surgeon; b. Jamaica, L. I., 1729; d. 1791. He studied medicine in Europe, and, returning to America, practised in New York, becoming professor of surgery in King's College, and, with Dr. Bard, founding the New York Hospital in 1771. After the occupation of New York by the English Forces in 1777 he removed to Philadelphia, there being one of the physicians of the Pennsylvania Hospital, and in 1787 vice-president of the College of Physicians. He was the friend and physician of both Washington and Franklin, attending the latter in his last illness. He published 'Plain Remarks upon Wounds and Fractures' (1775).

Jones, John Paul, the first of the great American sea fighters, and not the least splendid in the long line, was born John Paul — the name Jones being a subsequent assumption — on 6 July 1747 on the estate of Arbigland, in the parish of Kirkbean, in the County of Kircudbright, Scotland. His family was obscure, his circumstances narrow, his advantages meagre, his opportunities limited. At the age of 12 he became a sailor. Genius rose superior to adverse circumstances, however, and before he died he was one of the most accomplished officers who ever served the United States. The greatest men of America and France took pleasure in his society and were proud of his friendship.

He progressed rapidly in his chosen career. At 19 he was chief mate of a slaver, a legitimate occupation in his day, but one that filled him with disgust. At 21 he was captain of a trader. In 1773 he came to America, forsook the sea, and settled in Virginia.

He was still poor and obscure when on 7 Dec. 1775 he was appointed a lieutenant in the new Continental Navy, and was ordered to the Alfred, a small converted merchantman, Commodore Hopkins' flagship, on which, in the latter part of December, he had the honor of hoisting with his own hands the first naval flag of an American squadron. This was the famous yellow silk banner with a rattlesnake, and perhaps a pine tree, emblazoned upon it, with the significant legend, "Don't tread on me!"

Hopkins made an abortive expedition to New Providence, in which Jones had but one opportunity to distinguish himself. At the peril of his commission, when the regular pilots refused to do so, he volunteered to take the Alfred through a difficult and dangerous channel. Needless to say, he succeeded — he always succeeded!

His first independent command was the little brig-ship Providence, of 70 men and 12 4-pound guns. In the fall of 1775 he made a notable cruise in this vessel; he skirmished with, and escaped from, by seamanship and daring, two heavy frigates, the Solebay and the Milford; in four months he captured 16 vessels, 8 of which were sent in as prizes, 5 burned, 3 returned to certain poor fishermen; and he destroyed property aggregating $1,000,000.

Later, in command of the Alfred, with a short crew of 150 when he should have had 300, he made another brilliant cruise in which he burned several British transports, captured one storeship laden to the gunwales with priceless munitions of war and supplies, cut out three of the coal fleet from under the guns of the Flora frigate, and had another smart brush with the Milford.

He was commissioned captain in the navy on 10 Oct. 1776, and on 14 June 1777, in the same resolution that established the form of the American flag, he was ordered to the Ranger, a small ship-rigged corvette of 300 tons and 18 6-pounders. In her, at Portsmouth, N. H., on 4 July, he hoisted the first Stars and Stripes that ever flew from the peak of an American man-of-war. Sailing for European waters, he carried to France the official despatches announcing Burgoyne's surrender, which brought about the Franco-American alliance.

In Quiberon Bay, late on the evening of 14 Feb. 1778, in the Ranger, he received the first formal recognition ever given by a foreign fleet to the United States in a salute to the American flag. As it was after sunset when the salutes were exchanged, in order that there should be no mistake about it, the next morning, 15 February, Jones transferred his flag to the Independence, a small privateer, and deliberately sailed through La Motte Piquet's fleet of battleships, saluting and receiving salutes again.

In April 1778, still on the Ranger, he left Brest on a cruise in British waters, which took him around Ireland. During this cruise he made daring but abortive attempts to burn the shipping at Whitehaven, and to capture the Earl of Selkirk at Saint Mary's Isle. On the evening of 24 April, off Carrickfergus, he fought the British sloop-of-war Drake, of equal force and larger crew, to a standstill in an hour and five minutes. When the Drake struck her flag, her rigging, sails, and spars were cut to pieces. She had 42 killed and wounded — more than one fifth of her crew — and was completely helpless. The Ranger lost 2 killed and 6 wounded.

In 1779 Jones hoisted his flag on the Duc de Duras, a condemned East Indiaman, which would have been broken up had he not turned her into a makeshift frigate by mounting 40 guns in her batteries — 14 12-pounders, 20 nines, and 6 eighteens. This, in honor of Franklin, he renamed the Bon Homme Richard. Accompanied by the fine little American-built frigate Alliance, 32, commanded by Pierre Landais, an incompetent and unbalanced French naval officer in the American service, the French corvette Pallas, 30, Captain de Cottineau, with the brig Vengeance, 12, and the cutter Cerf, 16, Jones cruised around England and Scotland, taking many valuable prizes and striking terror all along the shore, in spite of constant mutiny and insubordination among the ships, officers, and men of his heterogeneous squadron.

On the evening of 23 September, off Flamborough Head, he fell in with the valuable Baltic convoy. He was accompanied at the time only by the Alliance and the Pallas. The Baltic convoy was protected by the Serapis and the Scarborough. The Serapis was a brand-new double-banked frigate of 800 tons, carrying 20 18-pounders, 20 nines, and 10 sixes. Inasmuch as the 18-pounders on the Richard burst and were abandoned after the first fire, the Serapis could and did discharge nearly twice as many pounds' weight of broadside as the Richard — say 300 pounds to 175. The Pallas grappled with the Scarborough — a more equal match — and Jones attacked the Serapis, which was not unwilling — quite the contrary — for the fight.

The battle was one of the most memorable and desperate ever fought upon the ocean. The Richard was riddled like a sieve. Her rotten sides were literally blown out to starboard and port by the heavy batteries of the Serapis. Jones had several hundred English prisoners on board. The master-at-arms released them, but with great readiness and presence of mind Jones, who was brilliantly supported by Richard Dale, his first lieutenant, sent them to the pumps while he continued to fight the English frigate, his own ship kept afloat by their efforts.

Captain Pearson, of the Serapis, was a brave man, but no match for the indomitable personality of the American commander. After several hours of such fighting as had scarcely been seen before on the narrow seas, he struck his flag. The Alliance, commanded by a jealous and incapable Frenchman, had contributed nothing to Jones' success. Indeed, she had twice deliberately poured her broadsides into the Richard in spite of frequent warning. The American vessel was so wrecked alow and aloft that she sank alongside, and Jones had to transfer the survivors of his crew to the English frigate. The aggregate of the two crews was nearly 700, of which about 350 were killed or wounded. The Scarborough was captured by the Pallas after a smart action.

Jones took his prizes into the Texel, when, after showing himself as vigorous and able in statecraft in maintaining American honor in diplomatic intrigues as he was at sea in battle, he was forced to turn over the Serapis and Scarborough to France.

The poverty of America did not permit Jones to get to sea in adequate ships thereafter, although he subsequently commanded successively the Alliance and the Ariel, a small sloop-of-war, in which he caused the British letter-of-marque Triumph to strike her flag after a brief action, from which she escaped by a clever ruse, he performed no other conspicuous service.

After the Revolution, he took service under Catherine of Russia, carefully reserving his American citizenship. In her service, in June and July 1788, he fought four brilliant actions in the Black Sea, in which he had to contend with the usual discouragement of indifferent personnel and wretched material, and in which he displayed all his old-time qualities, winning his usual successes, too.

Worn out in unrequited service, disgusted with Russian court intrigues of which he was the victim, resentful of the infamous Potemkin's brutal attempts at coercion, he asked leave of absence from Catherine's service and went to Paris, where in the companionship of his friends and in the society of the beautiful Aimée de Telison, the one woman he loved, he lived two years, and died of dropsy on 18 July 1792, at the age of 45.

Besides the memory of his battles, Paul Jones left a collection of immortal sayings, which are the heritage of the American navy and the admiration of brave men the world over.

"I do not wish to have command of any ship that does not sail fast, for I intend to go in harm's way!"

"I have ever looked out for the honor of the American flag."

"I can never renounce the glorious title of a citizen of the United States."

Last, but not least, the curt phrase which comes ringing through the centuries like a trumpet call to battle; the words with which he replied to the demand of the astonished Pearson, who saw the enemy's ship beaten to a pulp, and wondered why he did not yield:

"I have not yet begun to fight!"

Never in his long career did Jones have a decent ship or a respectable crew. His materials were always of the very poorest. His officers, with the exception of Richard Dale, were but little to boast of. What he accomplished he accomplished by the exercise of his own indomitable will, his serene courage, his matchless skill as a sailor, and his devotion to the cause he had espoused. After his death, among his papers, the following little memorandum of his services, written in his own hand, was found:

In 1775, J. Paul Jones armed and embarked in the first American ship of war. In the Revolution he had 23 battles and solemn rencontres by sea; made 7 descents in Britain and her colonies; took of her navy two ships of equal, and two of superior force, many store-ships, and others; constrained her to fortify her ports; suffer the Irish volunteers; desist from her cruel burnings in America, and exchange, as prisoners of war, the American citizens taken on the ocean, and cast into prisons of England, as "traitors, pirates, and felons!"

Paul Jones was accused of being a pirate. The charge was a long time dying, but it is to-day generally withdrawn. His status was clear and unequivocal. He was a regularly commissioned officer in the navy.

In person Jones was a small, slender, well-made man, about 5 feet 7 inches high. His complexion was dark, his features were regular, and his eyes black and brilliant. He had acquired a charming manner, especially with women, and not a little education and polish in his varied career. He wrote and spoke fluently, and, like Nelson, sometimes amused himself by making indifferent verse. His chief fault was his vanity. In morals he was rather above the custom of the time and the society in which he mingled. He had one child by Aimée de Telison, which died in infancy.

As a strategist, tactician, and fighter he stands high among naval captains. Louis XVI. conferred on him the Order of Military Merit and presented him with a magnificent sword; the Empress Catherine appointed him a rear admiral and created him a knight of Sainte Anne, and Congress formally thanked him and awarded him a gold medal for his services. He was accorded the honor of a public funeral by the French Assembly, and was buried in a Protestant cemetery at the corner of the Rue

de la Grange aux Belles and the Rue des Ecluses Saint Martin, in Paris. In the spring of 1905, through the efforts of Gen. Horace Porter, American ambassador to France, his remains were discovered and identified and brought to America in the armored cruiser Brooklyn, flagship of Rear Admiral Charles D. Sigsbee's accompanying squadron. They are interred at the United States Naval Academy at Annapolis, Md., awaiting the completion of a suitable resting place for them.

There is one mystery connected with Jones' life which has never been cleared up. No one knows why John Paul assumed the name Jones. There have been two attempts at explanation: one that he took it in testamentary succession to his brother, William Paul, who had taken the name Jones to inherit property from one William Jones, a Virginia planter. This is now disproved, and the prevailing theory is that the name was assumed by John Paul out of respect and affection for the Jones family of North Carolina, from whom he had received much kindness.

Consult: Brady, 'Commodore Paul Jones'; Buell, 'John Paul Jones, the Founder of the American Navy'; Hapgood, 'Paul Jones'; Laughton, 'Studies in Naval History'; etc.

CYRUS TOWNSEND BRADY.

Jones, John Percival, American politician: b. Herefordshire, England, 1830. He came to the United States in 1831, was educated in the schools of Cleveland, Ohio, in the early days of California gold-mining went to that State where he acquired mining interests, and in 1863–7 was a member of the State senate. In 1867 he removed to Nevada, where he became a proprietor and the superintendent of the "Crown Point" silver mine, through which he realized a fortune. He was elected to the United States Senate from Nevada in 1873, and this office he held by re-election until 1903. He was originally a Republican, was elected to the Senate as a "Silverite" in 1897, and from 1900 was a "Silver" Republican.

Jones, John William, American Baptist clergyman and author: b. Louisa, Va., 25 Sept. 1836. He was graduated from the University of Virginia in 1859 and from the Southern Baptist Theological Seminary, and during the Civil War served as private and then chaplain in the Confederate army. He was pastor of a Baptist church in Lexington, Va., 1865–71, and chaplain of Washington College during Lee's presidency, and since the last named date has been successively agent of various Southern institutions, chaplain of the University of Virginia, and pastor of several churches. Besides editing 14 volumes of the 'Southern Historical Papers' he has published 'Personal Reminiscences, Anecdotes and Letters of R. E. Lee' (1874); 'Christ in the Camp, or Religion in Lee's Army'; 'Memorial Volume of Jefferson Davis'; 'School History of the United States'; etc.

Jones, Joseph Stevens, American playwright: b. 1811; d. Boston, Mass., 30 Dec. 1877. After his graduation from the Harvard Medical School in 1843, he practised medicine for several years; but was subsequently proprietor and manager of the Tremont, Old National, and other theatres in Boston at various times. Among the nearly 200 plays of which he was the author may be named: 'Solon Shingle'; 'The Liberty Tree'; 'The Siege of Boston'; 'Moll Pitcher'; 'The Last Dollar'; 'The People's Lawyer'; 'Paul Revere'; 'The Silver Spoon.'

Jones, Leonard Augustus, American jurist: b. Templeton, Mass., 13 Jan. 1832. He was graduated from Harvard in 1855 and from Harvard Law School in 1858. He was admitted to the Suffolk bar in 1858 and since 1884 has been one of the editors of the 'American Law Review.' Among his many legal works are: 'Law of Mortgages and Real Property' (1878–94); 'Law of Mortgages of Personal Property' (1881–94); 'Law of Easements' (1898). He was appointed judge of the court of land registrations in 1898.

Jones, Owen, English architect: b. London 15 Feb. 1809; d. there 19 April 1874. In 1834 he traveled in Spain and studied the art monuments of Granada, after which he visited Egypt. On returning to England he published his great work on the Alhambra. In 1851 he undertook the decoration of the Crystal Palace at the first Universal Exhibition. He also furnished the various courts of different architecture, notably the "Alhambra Court." His researches and publications had a wonderful influence on the decorative art of England, especially his 'Grammar of Ornament,' in which he illustrated the decorative devices of all nations. He published 'Plans, Elevations, Sections and Details of the Alhambra' (1845).

Jones, Samuel M., American manufacturer and politician: b. 3 Aug. 1846 in Wales; d. Toledo, Ohio, 12 July 1904. He came to the United States with his parents when three years old; at 18 he was working in the oil-fields of Titusville, Pa. In 1893 he invented improved oil-well apparatus and set up the Acme Sucker Rod Factory in Toledo, Ohio. Here he introduced reforms in the condition of his employees, fixed a minimum wage, gave an eight-hour day, and introduced a system of profit-sharing; he also opened a pleasure ground adjoining the factory, known as "Golden Rule" Park. In 1897 he was nominated for mayor of Toledo by the Republican party and elected; but his subsequent advocacy of municipal ownership of public utilities and of the abolition of the system of private contract in doing city work alienated the support of his party. His administration was, however, very popular, and he was re-elected as independent candidate in 1899 and 1901. In 1900 he was non-partisan candidate by petition for governor of Ohio, but was defeated.

Jones, Samuel Porter, commonly known as SAM JONES, American Methodist revival preacher: b. Chambers County, Ala., 16 Oct. 1847. He was admitted to the Georgia bar in 1869, but his drinking habits put an end to his career as a lawyer. Becoming converted in 1872 he was admitted to the ministry of the Methodist Church South, the same year, and has since devoted himself to evangelistic work, his marked eccentricities of speech and manner probably contributing somewhat to his popularity. He has published: 'Sermons and Sayings'; 'Music Hall Sermons'; 'Sam Jones' Own Book'; etc.

Jones, Thomas ap Catesby, American naval officer: b. Virginia 1787; d. 1858. Having entered the navy in 1805, he was employed in

police duty in the Gulf, saw service in the latter part of the War of 1812, and was unsuccessful in an attempt to prevent the passage of Vice-Admiral Cochrane's fleet across Lake Borgne. In 1826 he was sent to the Hawaiian Islands to settle the difficulties arising through the efforts of a local party to make the islands a British dependency. Upon the declaration of war between the United States and Mexico, he feared that the British man-of-war Dublin intended the annexation of California, and imprudently landed at Monterey and took possession. He was therefore removed temporarily from his command.

Jones, Sir William, English lawyer and Oriental scholar: b. London 28 Sept. 1746; d. Calcutta 27 April 1794. He was educated at Harrow and Oxford, and early acquired a reputation as a linguist, Hebrew, Persian, Arabic, and even Chinese, besides German, Italian, French, Spanish, and Portuguese, being among his acquisitions. In 1770 his translation (in French) of the life of Nadir Shah from the Persian appeared; in 1771 his grammar of the Persian language; in 1774 his 'Poeseos Asiaticæ Commentariorum Libri Sex,' and in 1781 his translation of the seven Arabic poems known as the 'Moallákat.' He had been called to the bar in 1774, and in 1783 was nominated judge in the supreme court of judicature, Bengal, and knighted. Here he did much for the furtherance of Oriental studies, being one of the first Europeans to study Sanskrit, founding the Royal Asiatic Society, in 1784 translating the Sakuntala, the Ordinances of Manu, besides tales, poems, extracts from the Vedas, etc. He also undertook a digest of the Hindu and Mohammedan laws, which he did not, however, live to complete.

Jonesboro, jōnz'bŭr-ō, Ark., city, county-seat of Craighead County; on the Kansas City, Ft. S. & M., the St. Louis S. W., and the Jonesboro L. E. R.R.'s; about 120 miles northeast of Little Rock. It was first settled in 1870, although some settlements had been made earlier on farms in the vicinity. It was incorporated in 1882. It is situated in an agricultural and lumbering region, and the railroad facilities make it the trade centre for quite an extent of country. The chief manufactures are flour, lumber, staves and headings, boxes, and wagons. In addition to the manufactures there is considerable trade in grain, live stock, and some dairy products. Pop. (1890) 2,065; (1900) 4,508.

Jonesboro, Ga., city, county-seat of Clayton County; on the Central of Georgia railroad; about 16 miles south of Atlanta. It is situated in a fertile agricultural region, but its nearness to Atlanta and lack of water power are hindrances to manufacturing. Its chief trade is in fertilizers, cotton, and farm products. At this point, August 1864, was fought a hotly contested battle with Gen. Howard of Sherman's army, in command of the Federal troops, and Gen. Hardee of Hood's army, in command of the Confederates. See Jonesboro, Battle of.

Jonesboro, Battle of, and Fall of Atlanta. After the battle of Ezra Church (q.v.), 28 July 1864, Gen. Sherman, unable fully to invest Atlanta, drew the Fourteenth corps and Schofield's Army of the Ohio from the left, and extended his lines on the right nearly to East Point, about six miles below Atlanta, the junction of the two railroads leading from the south, upon which the city and Hood's army depended for supplies. Hood made a corresponding movement to cover the roads, meeting Sherman's advance with strong, well-intrenched lines, and, 6 August, severely handling two of Schofield's brigades that had crossed Utoy Creek, killing and wounding over 300 men and taking two colors. To compel Sherman to relinquish his movement and raise the siege of Atlanta, Hood, 10 August, sent Wheeler with about 5,000 cavalry to operate upon his line of communication with Nashville. Wheeler moved promptly, struck and destroyed the railroad near Marietta, Calhoun, Adairsville, and Dalton, captured over 1,000 head of beef-cattle and other supplies, and, after demonstrating on Dalton and Resaca, was driven into East Tennessee. Sherman had issued an order, 16 August, for a general movement on the 18th upon the West Point and Macon railroads, for the purpose of forcing Hood from Atlanta, but hearing of Wheeler's raid, he suspended the order, and directed Gen. Kilpatrick, with 5,000 cavalry, to move on the night of the 18th against the West Point and Macon roads and destroy them completely. Kilpatrick started from near Sandtown, crossed the West Point road at Fairburn, and struck the Macon road a short distance north of Jonesboro, some 26 miles from Atlanta, where he encountered Ross' brigade of cavalry, which was driven through Jonesboro. But little of the railroad had been destroyed when Jackson's brigade of cavalry and an infantry brigade, coming up from the south, compelled Kilpatrick to retreat. Making a circuit, he again struck the railroad at Lovejoy's, about six miles south of Jonesboro, and encountered a Confederate force, through which he cut his way and reached Decatur, near Atlanta, on the 22d. As Sherman was satisfied that Kilpatrick had not greatly damaged the railroad, he renewed his order for the movement of the whole army. On the night of the 25th the siege of Atlanta was raised. The sick and wounded, spare artillery, and surplus transportation were sent back to the Chattahoochee bridge; Stanley's Fourth corps drew out from the left and moved to the right, closing up with the Fourteenth near Utoy, and the Twentieth corps fell back to an intrenched position covering the Chattahoochee bridge and the hospitals. On the night of the 26th the Army of the Tennessee (Gen. Howard) drew out, rapidly made a wide circuit, and came up on the right of the Army of the Cumberland, under Gen. Thomas, along Utoy Creek, facing south. The Army of the Ohio remained in position, now on the extreme left. On the 28th, making a general left wheel, pivoting on Schofield's army, both Thomas and Howard reached the West Point road extending from East Point to Red Oak and Fairburn, Schofield closing in upon the left of Thomas, but a short distance from the Confederate works covering the junction of the road at East Point. The next day was devoted to the railroad, of which nearly 13 miles was destroyed, and on the 30th the entire army moved eastward for the Macon railroad. Schofield, on the left, approached it near Rough and Ready, and presented a bold front toward East Point; Thomas, in the centre, reached Couch's, on the Fayetteville and Decatur road, with but little opposition; and Howard, on the right, driving before him the enemy's cavalry, saved the bridge

over Flint River after a sharp engagement, then, crossing part of his command, halted at night within half a mile of Jonesboro. On the morning of the 31st Howard, finding himself in the presence of a large force, disposed the Army of the Tennessee for battle and intrenched: Logan's Fifteenth corps on the left, Ransom's Sixteenth corps on the right, and Blair's Seventeenth corps in rear of Logan's left. When Sherman began his movement on the night of the 25th S. D. Lee's corps of Hood's army covered the railroad from near Atlanta to a place nearly a mile south of East Point. Hardee's corps was on Lee's left, while Hood held Atlanta with Stewart's corps and the Georgia militia. Hood had been deceived; he knew of Sherman's earlier movement, but misinterpreted it as preliminary to a retreat across the Chattahoochee; but when undeceived on the 30th, he ordered Hardee with his own corps and Lee's to move rapidly to Jonesboro and crush Howard on the morning of the 31st. Hardee, who was near Rough and Ready, four miles below East Point, began moving about 4 P.M., followed later by Lee, and at noon of the 31st both were in Howard's front. At 3 P.M. Hardee attacked with Lee's corps and part of his own, under Cleburne, with the expectation of driving Howard into the river, and for two hours the fighting was severe, but Hardee was repulsed. Lee, who, on the Confederate side, bore the brunt of the fight, says: "The attack was a feeble one and a failure, with a loss to my corps of about 1,300 men killed and wounded." Hardee's entire loss was about 1,700. The Union loss was 179 killed and wounded, almost entirely of Logan's corps.

When Sherman heard the noise of this battle he was with Thomas, who, with Schofield, had reached and was destroying the road from Rough and Ready southward. Thomas and Schofield were marched to the assistance of Howard, and Kilpatrick was sent down the western bank of the Flint to strike the road south of Jonesboro. Davis' Fourteenth corps joined Howard's left at noon of 1 September, relieving Blair, who was disposed to support Kilpatrick. Lee's corps had gone, but Hardee's was still in position and intrenched, covering Jonesboro on the north. At 4 P.M. Davis charged Hardee's works and, after a hard fight, carried parts of them, capturing Gen. Govan and the greater part of his brigade and two batteries of four guns each. Stanley and Schofield reached the field too late to take part in the engagement. During the night Hardee retreated to Lovejoy's station, and next morning Sherman started in pursuit. The Union loss 1 September was 223 killed, 946 wounded, and 105 missing. The Confederate loss is not fully known; of the three divisions engaged Cleburne's sustained a loss of 55 killed, 197 wounded, and 659 missing. There is no return of losses in the other two divisions.

The result of the battle of Jonesboro was the fall of Atlanta. Six hours before Hood heard of the result of Hardee's attack 31 August, he sent an order to Lee to return in the direction of Atlanta, to make a movement on Sherman's flank, or to cover the evacuation of the city. Lee received the order at midnight, and was halted next morning about six miles from Atlanta. Meanwhile Hood had heard of the result of Hardee's attack; its "failure necessitated the evacuation of Atlanta." Lee was ordered to join Hardee, which he did on the 2d, and at 5 P.M. of the 1st Hood marched out of the city with Stewart's corps on the McDonough road; the Georgia militia was sent to Covington, and at night the rear-guard blew up some abandoned ammunition-trains. Slocum's Twentieth corps entered the city on the morning of the 2d. Sherman received the news on the 4th, and, turning his back on the Confederates at Lovejoy's, marched his army to East Point and Atlanta.

The campaign for Atlanta, which began 6 May 1864, was marked by brilliant flanking movements, on both sides, by almost uninterrupted skirmishing, growing at times to the dimensions of a battle, and by many heavy engagements, most of them of a desperate character. The Union losses in the entire campaign were 4,423 killed, 22,822 wounded, and 4,442 missing, a grand aggregate of 31,687. The Confederate losses were 3,044 killed and 18,952 wounded. Add to this the number of prisoners captured, 12,938, makes a grand aggregate of 34,979. Consult: 'Official Records,' Vol. XXXVIII.; Cox, 'Atlanta'; Van Horne, 'History of the Army of the Cumberland,' Vol. II.; 'Life of Gen. George H. Thomas'; Bowman, 'Sherman and his Campaigns'; Sherman, 'Personal Memoirs,' Vol. II.; the Century Company's 'Battles and Leaders of the Civil War,' Vol. IV.

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Jonesville, jōnz'vĭl, Va., the scene of a Civil War action. On 1 Jan. 1864 Major Beeres, who had been operating with a battalion of the 16th Illinois cavalry and a battery, near Cumberland Gap, attacked and drove a small Confederate cavalry force from Jonesville and occupied the place. On the morning of the 3d he was attacked by Gen. W. E. Jones' cavalry brigade and, after a spirited resistance, continuing nearly the entire day, in which he lost 10 killed and over 40 wounded, was finally surrounded and obliged to surrender. The Confederates reported that he surrendered 383 officers and men, 45 of whom were wounded, 3 pieces of artillery, and 27 wagons. The Confederate loss was about 30 killed and wounded. Consult 'Official Records,' Vol. XXXII.

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Jonquil, jŏn'kwĭl. See NARCISSUS.

Jon'son, Ben or **Benjamin,** English dramatic poet, the contemporary and friend of Shakespeare: b. Westminster 1573; d. London 6 Aug. 1637. He was the posthumous son of a clergyman, and was placed at the Westminster grammar-school, where he laid the foundation of his learning, but was ultimately withdrawn, it is said, by his stepfather, a master bricklayer, who wanted his assistance in the business. He soon tired of this occupation, entered the army as a private soldier, and showed much personal courage during a campaign in Holland. Returning to England he began his career as an actor, and in 1598 his drama, 'Every Man in his Humour,' was performed at the Globe, with Shakespeare in the cast. About this time Jonson killed an actor, Spenser by name, in a duel, was branded on the left thumb, and deprived of his personal effects. In 1599 he brought out his comedy of 'Every Man out of his Humor,' followed by 'Cynthia's Revels' (1600); the 'Poetaster' (1601); 'Sejanus,' a tragedy (1603); 'Volpone' (1605); 'Epicœne, or the Silent Woman' (1609), the best of his comedies; 'The

Alchemist' (1610); and 'Bartholomew Fair' (1614). The festivities which welcomed the new king, James I., gave a new impulse to the representation of masques, in the composition of which the ready talent of Jonson was employed by the court itself, the celebrated Inigo Jones doing the decorations. In 1604 he had some share with Chapman and Marston in writing 'Eastward Ho,' certain passages of which, reflecting satirically on the Scottish nation, drew down the anger of the king. Chapman and Marston were imprisoned, and Jonson voluntarily served the sentence with them. In 1613 Jonson made a tour in France as governor of Sir Walter Raleigh's eldest son. In 1618 he visited Scotland, staying for some time with Drummond of Hawthornden, whose notes of his guest's conversation are amongst the best accounts we have of Jonson's personality. In 1619 he returned to England, and on the death of the poet laureate was appointed his successor, and the salary raised to the sum of £100 by Charles I. Much of his time was spent at the Apollo, Mermaid, and other taverns, engaging in those brilliant contests of wit in which in earlier days Shakespeare also took part. His latter days were spent in fame and honor, as the acknowledged chief of English literature, and he enjoyed a pension of £200 from the crown. He died leaving behind him an unfinished pastoral drama of great beauty, 'The Sad Shepherd.' He was buried in Westminster Abbey, where a monument was erected to his memory with the inscription, 'O rare Ben Jonson.' Jonson's best dramas are based on the method of ancient comedy, are excellent in plot and development, and have strongly conceived characters and excellent traits of humor. He is sometimes forced and unnatural, and deals perhaps too much with passing manners and eccentricities. He had a genuine lyrical power, seen in his short poems and the songs such as 'Still to be neat, still to be drest,' interspersed in his masques. Jonson was also considered one of the leading scholars of his time, and his own dramatic works evince profound knowledge of the classical literatures. There is a collective edition by Gifford (9 vols. 1716; 2d ed. 1875). Consult the 'Life' by Symonds (1886); Swinburne, 'Study of Jonson' (1889); Fleay, 'English Drama' (1891); Koeppel, 'Quellen-Studien zu den Dramen Ben Jonsons' (1895).

Jop'lin, Mo., city and one of the county-seats of Jasper County, in the southwestern portion of the State. It is the metropolis of the richest zinc and lead mining camp in the world and the largest city in Jasper County or southwest Missouri. The county of Jasper, in which it is located, is the richest county in the State of Missouri in surplus products, having produced during the year ending July, 1904, a surplus of all products amounting to about $15,000,000, which was about four times the surplus product of any other county in the State of Missouri, except one, and was more than double the surplus produced by that county. The larger portion of this surplus was derived from the zinc and lead mines in and around the city of Joplin. Joplin is only six miles from the eastern line of the State of Kansas and about ten miles north of the Indian Territory. It was first settled in 1870 by native American citizens, and was organized as a city in 1873. The city government is composed of a mayor and city council, who are alternately elected annually; the mayor being elected every two years. There are four railroads entering Joplin at the present time as follows: Missouri Pacific; St. Louis & San Francisco; Missouri Kansas & Texas, and the Kansas City Southern; the Arkansas, Missouri & Kansas Ry. is now under construction and is expected to be in operation during 1905. There are six banks, four of which are State banks, and the other two national banks, all having a combined capital of $400,000, with deposits amounting to $2,500,000 annually. The chief business of the city is zinc and lead mining. There are a number of large foundries and other industries supported by the zinc and lead industry. Joplin has a very fine system of public schools, consisting of a high school and 14 other graded schools. It has a Carnegie public library (cost about $50,000); a United States government building (cost $150,000); a county circuit court-house, a Y. M. C. A. building, and a public hospital, and is well supplied with churches. Pop. (1900) 26,023; (1904 est.) 30,000.

HORACE MERRITT.

Jop'pa. See JAFFA.

Jo'ram, or **Jehoram**, name of two Hebrew kings, one of Israel (851–842 B.C.) and the other of Judah (848–844 B.C.). (1) JEHORAM king of Israel was the second son of Ahab, and succeeded his brother Ahaziah. He revived the worship of Jehovah, and repressed the worship of Baal. He joined with the king of Judah in a war with the Moabites. In his reign Benhadad king of Damascus invaded Israel, and besieged Samaria, but retreated to meet a hostile invasion in his own country. In a battle with Hazan king of Syria Jehoram was wounded and retired to Jezreel, where he was slain by Jehu whom Elisha had anointed king over Israel.

(2) JORAM king of Judah was the son and successor of Jehosaphat and for four years from 848 B.C had a luckless reign. The Edomites revolted in the land and Libna joined them, while Bedouin tribes of Arabia sacked Jerusalem and carried off the wives and son of the king, who died horribly of an intestinal disease, as had been foretold by the prophet Elisha.

Jordaens, Jacob, yä'kōb yōr'däns, Flemish painter: b. Antwerp 19 May 1593; d. there 18 Oct. 1679. From his early boyhood in 1607 he was the pupil of Van Noort, whose daughter he afterward married, and in 1615 was made master in the Guild of St. Luke at Antwerp. He was the most eminent painter of the Flemish school next to Rubens. While he painted religious pictures his strength lies in his humorous delineations of popular life. These spirited, genial and lifelike genres are found in all the principal galleries of Europe. The most renowned among his religious pictures are 'The Last Supper' in the Antwerp Museum; and 'The Martyrdom of St. Apollonia' in the church of the Augustines, Antwerp.

Jordan, Conrad N., American financier: b. New York 20 April 1830; d. there 26 Fed. 1903. He entered a printing office, but soon exchanged this for a banking establishment, was cashier of a New York bank in 1864–80, and in 1880–4 was treasurer of the New York, Ontario and Western railroad. In 1885–7 he was treasurer of the United States, and introduced in the accounts of the treasury a revised

DAVID STARR JORDAN.

PRESIDENT LELAND STANFORD JUNIOR UNIVERSITY

SCENE ON THE JORDAN RIVER.

form of debt and cash statements. He was an organizer of the Western National Bank of New York and for a time its president. In 1893 at the recommendation of all important New York banks, he was appointed assistant United States treasurer in New York, and this post he held until his death.

Jordan, David Starr, American college president and naturalist: b. Gainesville, N. Y., 19 Jan. 1851. He was graduated from Cornell University in 1872 and was instructor in botany there 1871–2. He was professor of natural history at Lombard University, Ill., 1872–3, and taught the same subject in the Indianapolis High School, 1874–5. From 1875 to 1879 he was professor of biology at Butler University, Indianapolis; professor of zoology at Indiana University 1879–85, and president of the last named institution, 1885–91. Since 1891 he has been president of Leland Stanford Junior University. Beside innumerable scientific monographs and reports, among which may be named 'Synopsis of the Fishes of North America' with C. H. Gilbert (1882); enlarged in 1896 with title 'Check List of the Fishes and Fish-Like Vertebrates of North and Middle America'; and 'Report of Fur Seal Investigations'; he has published 'Science Sketches' (1896); 'Footnotes to Evolution' (1898); 'Imperial Democracy' (1899); etc. He was president of the California Academy of Sciences 1896–8 and 1901–3, and has been commissioner in charge of the United States Fish Commission investigations in the Pacific Ocean from 1901, and of the salmon investigations for Alaska from 1903.

Jordan, Elizabeth Garver, American journalist: b. Milwaukee, Wis., 9 May 1867. She is editor of 'Harper's Bazaar' and has published 'Tales of the City Room' (1898).

Jordan, Jules, American composer: b. Willimantic, Conn., 10 Nov. 1850. He is the author of several cantatas, including 'Barbara Frietchie' and 'Wind Swept Wheat'; and many sacred and secular songs.

Jordan, Thomas, American soldier: b. Luray, Va., 30 Sept. 1819; d. New York 27 Nov. 1895. He was graduated from West Point in 1840; and distinguishing himself in the Mexican War, was promoted captain in March 1847. He was stationed on the Pacific coast in 1856–60, during which time he introduced steam navigation above the Dalles, on the Columbia River. He served in the Confederate army during the Civil War and was promoted brigadier-general for gallantry at the battle of Shiloh. In 1869 he went to Cuba, where he was made chief of the general staff of the insurgent army and soon afterward commander-in-chief of the revolutionists, winning a battle at Guarmaro, in January 1870. In the following year he resigned and settled in New York, where he became editor of 'The Financial and Mining Record.' He published 'Campaigns of Lieutenant-General Forrest' (with J. B. Pryor, 1868).

Jordan, William George, American journalist: b. New York 6 March 1864. He was graduated at the College of the City of New York; and became managing editor of the 'Ladies' Home Journal' in 1897, and was editor of 'The Saturday Evening Post' in 1898–9. He has published 'Mental Training by Analysis, Law and Analogy'; 'Mental Training a Remedy for Education'; 'The Kingship of Self Control'; and 'The Majesty of Calmness.'

Jordan, the largest river of Palestine, and one of the most celebrated in the world. It rises from three main sources at the foot of Hermon, and these upper streams unite in Lake Hulch, the ancient Waters of Merom. From this point it sinks with a rapid current in a narrow rocky bed below the level of the sea, and falls after a course of 9 miles into the Lake of Galilee. Shortly after leaving the south end of this lake it enters a broad valley called by the Arabs Ghôr, and in the Bible "the plain"; and continuing a singularly crooked course of about 65 miles direct distance, or 200 including windings, falls into the north end of the Dead Sea, having received the Zerka or Jabbok and numerous smaller affluents. The Ghôr expands at Bethlehem and Jericho into a wide plain, but elsewhere is from three to five miles across. The upper part of the valley of the Jordan is hilly, arid, and barren, but it becomes more level and fertile as it approaches the Zerka. The river is muddy and full of small fish. In the dry season it is shallow, with an average width of from 30 to 50 yards. At its mouth it is about 180 yards broad and about 3 feet deep. It is subject to great inundations during the winter season. The valley of the Jordan forms one of the most remarkable depressions in the world, the Dead Sea being 1,312 feet below sea-level, and the total fall of the river being about 2,300 feet.

Consult: 'Official Report' (Washington, 1852); 'Survey of Western Palestine' (London, 1859); Smith, 'Historical Geography of the Holy Land'; Molyneux (in the 'Journal' of the Royal Geographic Society 1848); Lynch, 'Narrative of the United States Expedition to the River Jordan and the Dead Sea' (1849); McGregor, 'Rob Roy on the Jordan' (1870); Costello, 'Gospel Story'; Macmillan, 'Guide to Palestine and Egypt'; Thomas, 'Two Years in Palestine.'

Jorullo, hō-rool'yō, a volcano of Mexico in the State of Michoacan, 160 miles southwest of Mexico, and 80 miles from the Pacific. The district had continued undisturbed from the discovery of the New World when, in June 1759, earthquakes occurred, followed 29 September by one more violent. On the line of a chasm which was made, six volcanic cones were formed, the loftiest, Jorullo, 1,600 feet above the plain. The total height of the volcano above the sea is 4,265 feet. It shows but few signs of activity at present.

Joseffy, yō-sĕf'ĭ, **Rafael,** Hungarian-American pianist: b. Miskolcz, Hungary, 1853. He was a pupil of Moscheles at the Leipsic Conservatory and of Tausig at Berlin, won distinction in a concert tour of Holland and Germany, and later appeared with large success throughout Europe and the United States. For several years he was a professor in the National Conservatory at New York, where he resided from about 1880. As a virtuoso he evinces great facility and technical finish, and won particular recognition through his interpretations of Chopin. His compositions include: 'Ungarisches Album' (6 works for pianoforte); 'Die Mühle' (op. 23); a 'Marche Turque'; and 'Concert-Studien nach Chopin.'

Joseph, Saint, the husband of Mary the mother of Jesus Christ, was a descendant of the

house of David, born at Bethlehem, but resident at Nazareth, where he practised the trade of a carpenter. Tradition and art represent him as an old man at the time of Christ's birth and he is said to have died before the beginning of Christ's public ministry. His day in the Roman Catholic calendar is 19 March.

Joseph, a son of the patriarch Jacob by his favorite wife Rachel. His father's preference for him and his own relation of dreams which predicted his future exaltation above those of his household drew upon him the envy of his brothers, who sold him to Ishmaelitish and Midianite slave-dealers, by whom he was sold to Potiphar, a captain of the guard in Egypt. The story of his condemnation to prison on the false accusation of Potiphar's wife, of his release and subsequent elevation to the position of vice-regent of Egypt and the final settlement there of his father and brothers is related in the Book of Genesis. Authorities still differ as to the period in Egyptian history to which Joseph's life belongs, but the majority agree in placing it under the Hyksos or shepherd kings.

Joseph of Arimathæa, member of the Jewish Sanhedrim, who believed in Jesus, but had not the courage to make profession of faith. He was born in Rathaim, a city of Benjamin, near Lydda. After the crucifixion he went to Pilate, begged the body of Jesus, wound it in fine linen and buried it in his own new tomb. According to tradition he came as apostle to Glastonbury, England. His day is 17 March in the Roman Catholic calendar, and 31 July in the Greek Church.

Joseph I., emperor of Germany: b. Vienna 26 July 1678; d. 17 April 1711. He succeeded his father, Leopold I., and was employed for nearly the whole of his reign in war. With England and Holland he continued the war against France, to seat the Archduke Charles on the throne of Spain. The great victories gained by the allies under Marlborough in the Low Countries, and Prince Eugene on the Rhine, made the reign of Joseph especially noteworthy. He was equally triumphant in Italy and Hungary; in the latter kingdom driving the revolted Bagotski from the country, and forcing him to seek safety in Turkey; while in the Italian peninsula, great cities from Mantua to Genoa were laid under heavy contributions.

Joseph II., German emperor, son of Francis I. and Maria Theresa: b. Vienna 13 March 1741; d. there 20 Feb. 1790. He was elected king of the Romans in 1764, and on the death of his father, 1765, German emperor. His mother declared him co-regent in the hereditary states of the house of Austria, and gave him the command of the army; but the real authority remained in her hands. In the earlier part of his reign he employed his time in traveling and becoming acquainted with his states. In 1780 Joseph came into the possession of full dominion over his hereditary states. He allowed a greater freedom of the press, put an end to the connection between Rome and the religious orders, diminished the pensions, placed the Jews on a better footing, abolished bondage, suppressed all nunneries, and many monasteries, particularly those of the purely contemplative orders. All branches of the government, public education, the police, and the peasantry, were reformed. By a new code of laws capital punishments were abolished. On 9 Feb. 1788 he declared war against the Turks. By the defeat at Lugos (20 Sept. 1788) the army was obliged to retreat, but in the following year fortune favored the Austrian arms, and Belgrade surrendered. With the tax law, introduced in November 1789, nobility and peasantry showed themselves equally dissatisfied, and the signal was given for open rebellion. The Netherlands declared themselves independent, and expelled the imperial forces from all the provinces, and Luxemburg alone remained in the possession of the imperial troops. The Hungarians also rebelled, and demanded the restoration of their ancient rights and constitution. Joseph, in January, 1790, declared all the acts of his government in that country revoked, even to the edict of toleration (22 June, 1781). Joseph was a man of considerable ability, but arbitrary and despotic. Whatever his own reflections or his knowledge of other countries showed to be useful, he wished to introduce. But he did not sufficiently consider that he had to do with men who would not see things in the same light as himself; and that long habit rendered it difficult to change, at once, usages sanctified by time. Being a freethinker he often grossly overrode the rights of the Church. Consult Gross-Hoffinger, 'Lebens- und Regierungs-Geschichte Josephs II.' (1835–7); Brunner, 'Joseph II.' (1885); Schlitter, 'Pius VI. und Joseph II.' (1894).

Josephine (Fr. zhō-zĕ-fēn), empress of the French: b. Trois Islets, Martinique, 24 June 1763; d. Malmaison, near Paris, 29 May 1814. She was the daughter of Lieutenant Tascher de la Pagerie, and was married in 1779 to Vicomte Alexandre Beauharnais, by whom she had two children, Eugène and Hortense. In 1794 her husband, who had been commander of the army of the Rhine, was executed by order of the Convention. She herself had a narrow escape, having been included in the list of proscription. After the fall of Robespierre she paid a visit to Napoleon to thank him for restoring the sword of her husband, and so pleased him that he soon after married her (1796). When Napoleon became emperor in 1804 she was crowned with him. But the fact that the union was childless stood in the way of Napoleon's ambition to become the founder of a dynasty, and accordingly in 1809 Josephine was divorced, retiring to her seat of Malmaison, with the title of empress-queen-dowager and an annual grant of two million francs. Consult: Aubenas, 'Histoire de l'Impératrice Josephine' (1859); Welschinger, 'Le Divorce de Napoléon I.' (1889); Ober, 'Josephine, Empress of the French' (1901).

Josephus, jō-sē'fus, **Flavius** (Jewish name, JOSEPH BEN MATTHIAS), Jewish historian: b. Jerusalem 37 A.D.; d. about 95 A.D. He was carefully educated and in 64 A.D. he made a journey to Rome. On his return he found his countrymen preparing to throw off the Roman yoke, and having tried in vain to persuade them of the hopelessness of such a struggle, accepted the post of defending the province of Galilee, and actually held the fortified town of Jotapata against the whole Roman army for 47 days. He was captured at the fall of the city, was afterward present in the Roman army at the destruction of Jerusalem (70 A.D.), and went with Titus to Rome, where, assuming the family name

of his patron, Flavius, he lived in learned leisure. Here he wrote (in Greek) 'The History of the Jewish War' and 'The Antiquities of the Jews,' giving a history of the Jews from the earliest times to the reign of Nero.

Josh Billings. See SHAW, HENRY WHEELER.

Joshua, the leader of the Israelites after the death of Moses. He was the son of Nun, of the tribe of Ephraim, and upon him fell the task of conducting the people over the Jordan, and commanding their armies in battle against the heathen they were ordained to dispossess. He succeeded in ravaging a large portion of Palestine, and dividing it among the people. He died at the age of 110 and was buried at Timnath-Serah, in Mount Ephraim.

Joshua, Book of, a historical book of the Old Testament, sometimes classified as the last division of a Hexateuch, and containing an account of Joshua's leadership in Israel from the death of Moses until his own death. While it has many resemblances in style and arrangement to the Pentateuch, or first five books of Moses, it must have been early separated from them, if ever it was included in the same series, for the Samaritans, though they have had the Pentateuch since the 8th century before Christ, have never acknowledged the Book of Joshua. The contents of the book may be divided into three parts: the conquest of Canaan; the partition of the land among the 12 tribes; and the parting address made by Joshua to the assembled people. The first part is a narrative of the manner in which Joshua prepared to cross the Jordan at the head of the Israelites. The miraculous passage of the Jordan is accomplished, circumcision is performed, and the Passover observed on the soil of the Promised Land. Jericho and Ai are captured; the covenant confirmed at Ebal and Gerizim; the Gibeonites secure a treaty of peace through guile. The decisive battle of Bethhoron ends in the rout of the leagued kings. The second part is topographical and statistical, gives a general view of the land, with some account of its apportionment, and the setting aside of the Cities of Refuge. The third and concluding section is in the style of Deuteronomy. The people are exhorted to remain faithful to Jehovah, to eschew idolatry, and at Shechem, to which place the bones of Joseph had been brought, the covenant is renewed. The death and burial of Joshua and Eleazar make up a narrative which closes the book.

Josiah, king of Judah. He succeeded his father Amon (638 B.C.). He is said in the Scriptures to have done "that which was right in the sight of the Lord." He took an active part in the reform of temple worship, and in the abolition of idolatry throughout the land, and commenced the restoration of the temple, during the progress of which the high-priest Hilkiah discovered the book of the law, that is, the book of Deuteronomy. In his 30th year he marched out against Pharaoh Necho, king of Egypt, who was on his way to attack the kingdom of Assyria. Josiah was slain in the battle at Megiddo where he had attempted to check the northward march of the Egyptians.

Josiah Allen's Wife. See HOLLEY, MARIETTA.

Joss, the penates of the Chinese; every family has its joss. A temple is called a joss house. The joss is an idol, usually of wood and decorated in colors, mostly in gold and red. There are three large joss houses in San Francisco, one in Chicago and two in New York. A Chinese upon entering the presence of a joss falls upon his knees, and touches his forehead thrice upon the floor, as a preliminary of worshipping the joss. See CHINESE; IDOLATRY; IMAGE WORSHIP.

Jo'tham, king of Israel and Judah, who succeeded (735 B.C.) Uzziah, his father. He ascended the throne at the age of 25 and reigned 16 years.

Joubert, yow'bĕrt, **Petrus Jacobus,** Boer military officer: b. Cape Colony 1831; d. Pretoria 27 March 1900. After an elementary education he settled as a farmer in the Wakkerstroom district of the Transvaal, about 1863 was elected for that district to the Volksraad, and in 1870 became attorney-general of the South African Republic. During the visit of President Burgers to Europe in 1874 he was acting president. In 1880 he became commander-in-chief of the Boer forces at the outbreak of the war with England, and three times defeated the British, at Laing's Nek, Ingogo, and Majuba Hill, the last battle (27 Feb. 1881) deciding the war in favor of the Boers. He was again acting president during the absence of President Kruger in Europe in 1883–4. He twice unsuccessfully contested the presidency with Kruger, the vote being 7,881 to 7,009 in 1893 and 12,858 to 2,001 in 1898. In the second Boer war also he was commandant-general, and directed the campaign in northern Natal which resulted in a succession of disasters for the British. He became ill early in 1900, however, and was obliged to withdraw from active service. He was the ablest of the Boer military leaders.

Jouett, jow'ĕt, **James Edward,** American naval officer: b. Lexington, Ky., 27 Feb. 1828; d. Sandy Spring, Md., 1 Oct. 1902. He entered the navy in 1841, served during the Mexican War, was graduated from the United States Naval Academy in 1847, in 1861 with a detachment of marines entered Galveston harbor and destroyed the Confederate war-vessel Royal Yacht, and for his services was appointed to the command of the United States steamship Montgomery. As lieutenant-commander, he was prominent in Farragut's entrance of Mobile Bay (August 1864), and in 1885, when in command of the North Atlantic squadron he opened the transit across the Isthmus of Panama, closed by the rebels. He was promoted rear-admiral in 1886, subsequently president of the Board of Inspection and Survey, and in 1890 was retired.

Jouffroy d'Abbans, Claude François Dorothée, klōd frăn-swä dō-ro-tā zhoo-frwä däb-băn, MARQUIS DE, French inventor: b. Franche-Comte 30 Sept. 1751; d. Paris 1832. He is claimed by the French as the inventor of steam navigation. He served in the army, and in 1783 succeeded in propelling a small paddle-wheel steamboat up the Rhone at Lyons — the connection between piston and paddle-wheel axle being rack-and-pinion.

Joule, James Prescott, English physicist: b. Salford, Lancashire, 24 Dec. 1818; d. Sale, Cheshire, 11 Oct. 1889. He was chiefly his own educator, but received special instruction in

physics from John Dalton (q.v.). While associated in business with his father, a brewer, he early developed an enthusiasm for original scientific research, and described in the 'Annals of Electricity' (January 1838) an electromagnetic engine he had invented. While it was afterward found that this invention was impracticable as a substitute for the steam-engine, the further investigation to which it led brought to light many important facts concerning the laws of heat, its electrical and mechanical nature and evolution, chemical affinity as related to heat, etc. The mechanical equivalent of heat (see HEAT) was first ascertained by Joule, who also, in 1847, announced the doctrine of the correlation and conservation of energy, in a paper read at Manchester which failed at the time to impress men of science, as did also an address of like import before the British Association, but which was taken up by William Thomson (Lord Kelvin), by whom its momentous significance was brought home to the scientific world. No principle of science is now more fully established than Joule's law for determining the energy developed by an electric current in overcoming the resistance of a circuit, a law which he verified by experiment. He received the highest honors of scientific bodies and universities, and in 1873 was made president of the British Asociation for the Advancement of Science. His writings are to be found mainly in the proceedings of scientific societies and in English periodicals, but in 1885 and 1887 appeared, in two volumes, his 'Scientific Papers.'

Journalism. Journalism is a comprehensive term which signifies the business of producing a public journal. In a general way it is applied to the vocation of making newspapers. Broadly speaking it is both a business and a profession, though the name of journalist as commonly understood is limited to those who are engaged on the editorial or news or literary side of the production rather than on the business side. While editor and journalist are not strictly synonymous — the former meaning the head of a paper or a department and the latter any literary worker on a newspaper — they are often used as convertible terms.

In a large sense the subject involves the functions of journalism as collector and purveyor of news and as leader and exponent of public opinion; the ethics of journalism in its various fields of political, religious, literary, social and commercial aim and representation; the relations of the counting room to the editorial department; the training and qualifications of the journalist; in short, the mission, methods, responsibilities and obligations of journalism. All of these general phases are deeply affected by the physical conditions of the business. Within the last twenty-five years these conditions have been practically revolutionized. In the mechanical facilities of production, in the cheapening of white paper and in the instrumentalities of news collection there has been an extraordinary advance. This great change in the material factors has wrought a corresponding change in the scope and character of journalism. Not only as a business enterprise but as a public influence it takes on new aspects.

The remarkable development of later years touches every side of the material production of a newspaper. The old, limited, slow-moving printing press has been transformed into the ingenious and gigantic quadruple or octuple which converts the plain white roll into complete, folded papers, at the rate of thirty to forty thousand an hour. The number of pages may be determined at will, even at the last moment before going to press, thus responding to the exigencies of the news; and the application of the half tone and of color at undiminished speed permits pictorial effects. Simultaneously with this improvement in the printing press has come the linotype which substitutes machine type setting for hand composition. A third vital advance has been the perfection of the process of making paper out of wood-pulp which has vastly increased the supply and greatly decreased the cost of white paper.

These radical changes in the elemental business factors have largely modified the conditions of journalism. They have opened the way to unlimited production and have enormously cheapened the cost of the single copy. Penny and two-cent papers have become the prevailing rule. Immense circulations have thus been rendered possible, and where twenty-five years ago the edition even of the most widely read papers was comparatively limited, not a few now issue scores and even hundreds of thousands of copies a day. At the same time the initial cost of the newspaper plant with its expensive machinery and the magnitude of the daily transactions require a far larger outlay than in the earlier time and the business has come to be one demanding much greater capital.

All of these circumstances have inevitably and powerfully moulded the course and character of journalism. They have given increased importance to its business side, and have tended to make business considerations in the publication still more dominant. The effect has been two-fold and somewhat contradictory. The great capabilities of the business with the reduced cost of telegraphing have stimulated and quickened journalistic enterprise and have broadened the range of the journalistic field. The scope of journalism has been enlarged and in many cases its standard has been elevated. Within a sphere, perhaps too limited, the best and worthiest effort is accepted as the best business. But, on the other hand, the competition for great circulations has bred sensationalism and a pandering to the taste for personal and piquant matters. There is an eager and feverish struggle for the unusual, the dramatic and the spectacular, a constant straining for effect, a lavishness of "scareheads" and garish pictures, a studied and persistent search for objects of criticism and attack. The appetite for the effervescent grows by what it feeds on, and must be met by new excitation. This rivalry of explosive and paroxysmal journalism is carried on with too little sense of responsibility and verification, and while the notable manifestations are exceptional, and it would not be just to say that the infection has extended through journalism, it is nevertheless true that its injurious influence is widely perceptible.

In one important and conspicuous respect the development of journalism as a business has palpably improved its character. It has produced a greater degree of independence than

ever distinguished it before. In the earlier days political and official advertising might be a large item in the income of a newspaper. Its monetary value gave it potency in controlling editorial policy. But in the expansion of the business under modern conditions official patronage is unimportant compared with general commercial advertising, and its relative decline in value has greatly reduced its power of influencing newspaper expression. The favor of the public is far more advantageous than that of the party manager. It brings popular circulation and consequently business advertising, and there is less concern about the crumbs that fall from the official table. Even party journalism has greatly advanced in independence. While standing as the recognized exponents of party principles and policies the important party papers have become much more free in their judgment of men, methods and measures. A more critical standard is applied and a more rigorous public accountability is enforced under which there has been a visible improvement in general civic administration.

Under the same influences distinctive independent journalism has increased. It professes to have no connection with any party and disclaims a representative party position. Its theory is that it addresses itself not to party sentiment but to independent public judgment, and its claim for support is based on its journalistic quality without regard to political association. It is the extraordinary advance of newspaper-making as a business that has rendered independent journalism on a large scale possible. A quarter of a century ago it would have been difficult to name more than two or three important examples in the United States. Now there are many conspicuous and successful papers which are thus classed, and even more significant of the change in journalism is the greater independence of the party journals already referred to. Indeed, in essential independence, which consists of free judgment and candid expression on public questions, the line of demarcation between the better class of party papers and the professedly independent papers is scarcely perceptible and it would be hard to distinguish between them.

There has been a signal advance in other directions. Against the false and meretricious tendencies to sensationalism which have been indicated must be placed a higher and broader treatment of all the varied interests of life. In news collection the journalism of to-day is as much ahead of that of 25 years ago as the railroad express is ahead of the stage coach. It spares no expense, reaches everywhere, sends its correspondents to all parts of the world, employs the best experts and specialists, caters equally to the lover of literature and the lover of sports, keeps pace with scientific discovery and development, rivals the best periodicals in commanding the most famous writers and artists, makes its own special missions of public service, reports all business, social, educational, philanthropic and religious movements, and, in short, treats whatever concerns mankind as within its boundless domain. Its range, enterprise and comprehensiveness are a constant marvel. With all its faults the breadth, fullness and accuracy which are combined with so much celerity of action attest a thoroughness of organization and extent of resources never before equalled.

There are marked differences, however, in its development in different lands. Continental journalism in Europe is of a type quite distinct from English journalism, and that again is unlike American. In Paris the news is not the conspicuous feature of the newspapers. It holds a subordinate place and is limited in its quantity. Literary and dramatic criticism and political discussion command the first rank, and the feuilleton is a popular and important part. Literary excellence with a flavor of characteristic French wit is the dominant trait. The Parisian type with variations, generally soberer and heavier, is the prevailing continental model. English journalism is weightier and more enterprising in news. It covers the field of international politics and war with special thoroughness. It lacks the variety and vivacity of American newspapers, but within its chosen and more limited range it is more complete. Its reports of parliamentary proceedings and of important political, social and scientific meetings are copious and intelligent, and its discussions are distinguished by sobriety and information.

In life, spirit, minuteness of news gleaning, emphasis of display, and preponderance of personal flavor American journalism far outstrips all others. It does not surpass, oftentimes does not equal, British journalism in the presentation of great events, but in the multiplicity of its news of all sorts not only from its own country, but from all the world, there is no approach to it elsewhere. Its dominant tone is a light and airy freedom. There is a manifest tendency even on the part of the most respectable newspapers to avoid being heavy. The general aim is to be breezy, pungent and picturesque, and this often leads to the flippancy which is remarked in American papers. Perhaps the public taste which is thus indicated and cultivated will serve to explain in part why there are no serious and masterful weekly journals of literary and political discussion in the United States like the 'Spectator' and the 'Saturday Review,' and why even the monthly periodicals run chiefly to fiction and light matter. There are excellent trade journals of a high grade, showing a demand for the searching and careful treatment of special interests, but outside of these immediate respresentatives of the stupendous material enterprises of the land, the trend is towards the lighter vein.

Somewhat analogous is the explanation of the fact that journalism has grown more impersonal in its sources and impress. It is no longer distinguished by the great overshadowing personalities which marked it a generation ago. No editorial chief puts his individual stamp on a paper as Horace Greeley did, with his controversial power, his moral earnestness and his incisive force, which seemed to make the whole paper breathe his spirit and speak his voice. There are no successors to Raymond, Bennett, Weed, Bowles, and Dana. Henry Watterson is perhaps the only survivor of the old school of journalists. The difference is due, however, not so much to the lack of men as to the change of conditions. In its immeasurably wider range and larger demands the great journal of to-day is the product of no single mind, but of a vast organization and of a whole galaxy of stars. The elder journalism was largely political

pamphleteering. The later journalism is the complete mirror of daily life, and no individual throws so great a shadow across its comprehensive face.

It is a question much mooted whether journalism has declined in influence. It never was as universally read as now; it never was so much a common practice to read several newspapers; and whether in this multiplicity of reading and frequent contrariety of representation as serious an impression is made as when the appeal was more earnest and less divided may well be doubted. The editorial page has not actually fallen off in interest and importance; on the contrary, it is all in all better written, more varied and more instructive than when it had more of a polemic character. But in the broad development and great advance of the news departments the editorial page has receded in relative importance, and the drift to the light treatment of topics has tended to detract from its distinct and superior position. The greater absorption of the public mind in multiplied interests operates in the same direction. In the stress of modern business life and in the variety of diversions the body of readers have less time to follow public discussion. If it be true, as it often is, that the favorite journal does the thinking for its readers on current questions, it is equally true that many of the questions take less hold than when life was more simple and feeling more tense. When the press is in substantial accord on any public matter, except where party tradition rules, it generally carries the public judgment, and united expression makes it invincible; but when there is a discord of journalistic voices little heed is apt to be paid to any. The power of the press in its aggregate force, in the sweep of its activities and in a certain apprehension of its publicity, has steadily augmented; but at the same time the impression that it is too intrusive, too little restrained, too little governed by a just sense of responsibility, has grown and has impaired the influence it would otherwise exert.

It remains true, however, and probably grows more true with the decadence of other influences, that the press is the most effective force in protecting the moral and social well-being of the community. It is the belief of many observers that under our modern conditions the weight of mere authority is declining. In the intense strife and eagerness of the times the efficacy of the old standards in enforcing true principles and restraining wrongdoing grows weaker. With this advance of individual assertion and independence the power of public opinion is becoming the surest defence of social and business morality. The blaze of publicity gives a protection which nothing else furnishes. In the financial and social world there is a wide margin along the shadowy and undefined line between law and lawlessness, between ethical duty and questionable interest, where the search-light of exposure is the only security. Much would be done under cover of darkness which fears the light. Despite a freedom which often degenerates into license the press is thus recognized not only as the most effective safeguard against political and administrative debauchery but as the best bulwark against that social and business misconduct which becomes a public offence.

The relation of the counting-room to the editorial department involves both the business and the ethics of journalism. The business side cannot be disregarded. In its ultimate purpose it is a commercial proposition. Newspapers are published to make money. The counting-room considers both income and outgo. It adjusts expenditures to receipts. It properly studies to augment revenue in every legitimate way. But while newspapers are business enterprises they are such with recognized limitations and obligations. They are not simply business undertakings but public representatives, and the former object, while consistent with the latter, is subordinate to it. The foundation of the newspaper is the confidence of the public. It is the history of yesterday and the interpreter and teacher of to-day. In the very nature of the relation it assumes distinct obligations. It is bound to give the news and to treat public questions in absolute good faith. The counting-room is warranted in doing business in every way compatible with the fulfillment of that duty, but in all legitimate journalism it is a fundamental rule that editorial opinion and news publication must be beyond the reach of any questionable influence. The editorial department must be entirely free from commercialism. Public confidence and moral power depend on full faith that editorial and news conduct is honest, fearless and upright. The publication of a newspaper, like any other enterprise, is founded on business principles; its sphere or field of operations, whether general, political, literary or other, is chosen; the relation of counting room and editorial room in organizing and maintaining it on a sound business basis is of the most intimate character; but when the general lines of the enterprise are determined, the independence and integrity of the editorial management and fidelity to its declared aim as a public representative within its chosen sphere are absolutely indispensable. This rule lies at the foundation of the whole ethical code of journalism.

The question of the training and qualifications of the journalist has assumed new interest and importance both through the general growth of the profession and through special movements for its advancement. Schools or chairs of journalism have been established in a few instances and in a limited way, and the munificent endowment by Mr. Pulitzer of a College of Journalism in Columbia University — the first large and distinct project of the kind — has presented the proposition in a practical and definite form. There are two systems of thought on the subject. The first holds that the best and most efficient school of journalism is the newspaper office. It believes that the true journalist is born, not made; that knack, aptitude, native talent, the sense of news and proportion lie at the foundation of success; and that the most useful training is that of actual experience. It does not dispute that broad education and culture are essential to the journalist, and recognizes that particular studies, like history, political economy, the fundamentals of law, social science, and kindred matters, may be followed with special advantage. But it urges that these may be gathered from the general college course, and that the college or university has no distinctive professional knowledge to teach journalists in the special sense that it has to teach lawyers or physicians. The technical-

ities of the newspaper art — a suitable style, phonography, proof reading, the treatment of news and the like — are best acquired in practice, and the rest is the quickest and surest application of knowledge which is power, and of instinct or intuition which in dealing with public intelligence and currents is no less power, to the activities of the world.

The other system of opinion is represented in the scheme and scope of Mr. Pulitzer's College of Journalism. It is based on the theory that the journalist can be prepared for his vocation, like the lawyer, by a special course of study adapted to its requirements. Its aim and its tendency are to elevate and dignify the profession, and to establish a higher standard both of obligation and of performance. It seeks to teach not merely the technical necessities in newspaper-making but the true ideals of public service to which the newspaper should be dedicated, and the wide range of knowledge with which the journalist should be equipped. This includes style, ethics, law, literature, history, sociology, statistics, and particularly the principles and methods of journalism. It embraces an examination and comparison of existing newspapers by experts, an exposition of the functions of editor, correspondent and reporter, and the production of an experimental journal under the necessary limitations with its practical application of the instruction. In its main features this plan is an enlargement of the ordinary academic course directed to a particular end, and it is claimed that the establishment of such a college with liberal endowment would not only provide a large body of trained journalists but would set a standard for the profession.

On the whole, notwithstanding the faults of the "new journalism," the position of the press in the public estimate is increasing. One evidence of this truth is the more liberal character of libel legislation. In some States the greater license has prompted efforts at more restrictive measures, but the general trend of legislation has been toward reasonable liberality with just accountability. The prevailing movement has been to provide reparation for any wrong or injury that may be done, to assure just restitution for actual damages, but not to permit punitive damages or trammel the free expression of opinion. Journalism is advancing and is acquiring a higher position and recognition as a distinct profession. With the enlightened spirit of the age and with the marvellous agencies of instant and united expression the power of public opinion steadily grows, and the journalist is its medium and prophet. See American Newspapers; Periodical Literature.

Charles Emory Smith,
Editor 'The Press,' Philadelphia

Journalism, School of, a college of journalism, endowed by a gift of $2,000,000 by Joseph Pulitzer, editor and proprietor of the New York *World,* to Columbia University, New York, in 1903. With the advance of civilization and general culture and intelligence the demands upon the journalists of the present day are constantly becoming greater and this college is the recognition of the importance and place of journalism as a profession, and a practical endeavor to equip those who adopt it, by a course of thorough instruction for its exacting and laborious duties. Mr. Pulitzer considers the creation and rendering effective of public opinion (see Public Opinion, Power of) a task of which the press alone is capable of successfully accomplishing. The College of Journalism will therefore be a means to an end — to raise the character and standing of journalism, to increase its power and prestige, and to attract to the profession men of the highest capacity and the loftiest ideals, who, because of special training, will advance the professional to a higher standard of thought and action. This school is the first institution of the kind in the world. See Journalism.

Joveite, jōv'īt, is a nitro-substitution explosive used in blasting, and as charges for high-explosive shells, which was invented by J. E. Blomen, Washington, D. C. It consists of nitro-naphthalenes 6 to 8 per cent, nitro-phenols, 16 to 30 per cent, and nitrate of soda 64 to 76 per cent. It is made by melting the nitro-naphthalenes in a steam-jacketed kettle, adding the nitro-phenols and continuing the heating until they are melted, and then stirring into this liquid mixture the solid nitrate of soda in a finely ground and perfectly dry condition until each of the solid particles of the nitrate is coated and impregnated with the liquid. On cooling, the particles of the nitrate are protected from deliquescence by the coating of scarcely soluble nitro-substitution compounds, while on explosion, the nitrate causes the reaction to be most complete. For blasting purposes this explosive is used in a granulated condition, but in loading armor-piercing projectiles it is poured into the shell while in the plastic condition and on cooling sets to a hard mass which completely fills the cavity except for a canal in the centre where the fuse is placed. For blasting purposes the explosive is fired by means of a mercuric fulminate detonator, but the charges in shells are fired by means of gunpowder fuses. In tests of the explosive by the United States navy, made at Indian Head, Md., in 1897, a 10-inch Carpenter armor-piercing shell containing 8.25 pounds of joveite, fired with a velocity of 1,860 foot-seconds at a Harveyized nickel-steel armor plate, 14.5 inches thick, passed completely through the plate and burst on the other side. See Explosives.

Jovianus, jō-vī-ā-nŭs, **Flavius Claudius,** Roman emperor: d. Dadastana, Bithynia, 17 Feb. 364 A.D. He was originally captain of the household troops of the emperor Julian, whom he accompanied in the disastrous campaign against the Persians in which Julian lost his life (363 A.D.). After Julian's death he was proclaimed emperor by the troops, but could only extricate his army by ceding to the Persian monarch the five provinces beyond the Tigris. He was succeeded by Valentinianus I.

Jovellanos, hō-vĕl-yā'nōs, **Gaspar Melchior de,** Spanish statesman and writer: b. Gijon, Spain, 5 Jan. 1744; d. Vega, Spain, 27 Nov. 1811. He was educated at the universities of Oviedo, Avila, and Alcalá, became in 1770 a member of the Royal Academy, in 1778 chief justice of the criminal court at Madrid, and in 1780 a member of the council of state. Subsequently he was for a time minister of justice, but in 1801, through the agency of his enemy, Don Manuel Godoy (q.v.), was imprisoned at Majorca. Released at the French invasion (1808),

he joined the patriots, and became a member of the supreme junta. His writings are various, including treatises on political economy, a dissertation on English architecture, a 'Memoir on Law Applied to Agriculture,' the tragedy 'El Pelayo,' and 'El Delincuente Honrado' ('The Honorable Delinquent'), a comedy.

Jow'ett, Benjamin, English scholar and educator: b. Camberwell, London, 1817; d. Oxford 1 Oct. 1893. He studied at Oxford, was ordained in 1842, and became regius professor of Greek in 1855. In 1855 he published a notable commentary on the Epistles of St. Paul. In 1860 he contributed an essay 'On the Interpretation of Scripture' to the celebrated volume 'Essays and Reviews,' for which he was tried on a charge of heresy before the chancellor's court, but was acquitted. In 1870 he became master of Balliol College, and in 1871 published his most important work, a translation of the 'Dialogues of Plato,' of which a fifth edition was issued in 1892. He subsequently published translations of Thucydides (1881) and the 'Politics' of Aristotle (1885). He was vice-chancellor of the university in 1882–6.

Joy, Charles Arad, American chemist: b. Ludlowville, N. Y., 1823. He was educated at Union College and the Harvard Law School, and after a few years spent as professor of chemistry at Union, became in 1857 professor of chemistry at Columbia, where he remained for 20 years. In 1866 he became president of the Lyceum of Natural History and was long one of the editorial staff of the 'Scientific American.'

Joy, George William, English painter: b. Dublin, Ireland, 1844. He was educated at Harrow, and studied art at Kensington, at the Royal Academy, and under Charles Jalabert and Bonnat, at Paris. He has won gold medals at Paris, Munich and Berlin. His principal pictures are 'Domenica'; 'Chess Players'; 'Laodamia'; 'Young Nelson's First Farewell'; 'Wellington at Angers'; 'Prince Charlie and Flora Macdonald'; 'The Death of General Gordon'; 'Princess Alice of Albany' (for Queen Victoria); 'Reverie' (for the New Zealand Government); 'Truth' (German Government); 'Joan of Arc' (bought by French Government); 'Lear and Cordelia'; etc.

Joy, Thomas, American colonist: b. Norfolk, England, 1610; d. Boston 1678. Upon emigrating to America in 1635 he established himself in Boston as an architect and builder, and in 1657 erected the Townhouse of Boston, the earliest civic structure of any note in New England. In 1646 for his share in the 'Child Memorial,' protesting against both the civil and ecclesiastical government of the Bay Colony, he was fined and imprisoned.

Joyce, Robert Dwyer, Irish poet and physician: b. in County Limerick, September 1836; d. Dublin 23 Oct. 1883. In 1866 he came to the United States and practised medicine for several years in Boston, Mass., contributing during that period to the 'Pilot' and other Irish journals. He published 'Ballads, Romances, and Songs' (1872); 'Deirdré,' a much admired epic poem, which appeared anonymously as one of the 'No Name Series' (1876); Legends of the Wars in Ireland' (1868); 'Fireside Stories of Ireland' (1871); 'Blanid,' a poem (1879); 'The Squire of Castleton'; etc.

Joyeuse Entrée, zhwä-yēz ŏn-trā, the name given to the important privileges of the estates of Brabant and Limburg, with Antwerp, which the dukes were obliged to swear to maintain before they were allowed to enter the ducal residence, from which circumstance the name was taken. The most important of these privileges was that the people were released from an allegiance whenever the duke should attempt to violate their rights. So important were these privileges considered that many women went to Brabant to be confined there, that their children might enjoy the rights of a citizen of Brabant.

Joynes, Edward Southey, American educator: b. Accomac County, Va., 2 March 1834. He was educated at the University of Virginia and at Berlin, in 1858 was appointed professor of Greek at William and Mary College, in 1866–75 was professor of modern languages at Washington College (now Washington and Lee University, Lexington, Va.), and subsequently held chairs in Vanderbilt University and the University of Tennessee. In 1882 he became professor of modern languages in South Carolina College (Columbia). He published text-books of French and German, most important of which is the 'Joynes-Meissner German Grammar' (1887).

Juan Fernandez, joo'ăn fĕr-năn'dēz (Sp. hoo-ăn' fĕr-năn'dĕth), so called from the name of its discoverer, also sometimes Más-á-Tierra, an island in the South Pacific Ocean, about 350 miles west of the coast of Chile, to which it belongs. It is 12½ miles long and 5 miles broad at the broadest part, mountainous, and of rugged aspect. Parts of it are fertile, producing various kinds of timber, peaches, figs, grapes, cherries, etc. There are excellent fish. The island is inhabited by a few settlers, whose chief occupation is the providing of fresh vegetables, water, and wood for the whaling or other vessels that call here. Defoe is said to have founded his 'Robinson Crusoe' on the history of the solitary residence here for over four years (1704–9) of a Scotch sailor, Alexander Selkirk.

Juan de Fuca, joo'ăn dĕ fū'kă (Sp. hoo-ăn' dā foo'kä), **Strait of,** an ocean passage between the State of Washington and Vancouver Island. It connects the Pacific with the Strait of Georgia on the north and Puget Sound on the south. It is 100 miles long and about 15 miles wide. It contains several islands, some of which were at one time in dispute between the United States and Great Britain.

Juarez, Benito Pablo, bā-nē'tō păb'lō hoo-ä'rĕth, Mexican statesman: b. San Pueblo Guelatao, Oajaca, 21 March 1806; d. Mexico 18 July 1872. He was admitted to the bar in 1834; became a judge of the civil court in 1842; in 1847–52 was governor of the state of Oajaca, in which post he greatly improved provincial conditions; and after a period of exile (1853–5) joined the revolutionists under Alvarez, by whom he was later made minister of justice and ecclesiastical affairs. In 1855 he was appointed provisional governor of Oajaca by Comonfort, the successor of Alvarez, and in 1857 elected constitutional governor. He was made secretary of the interior and chief justice in the latter

year (the office of chief justice being by the constitution the equivalent of a vice-presidency), and when Comonfort was driven from power (1858), duly succeeded to the presidency, was recognized by the Mexican states and the United States, but was opposed by the conservatives in a long civil war, and did not enter Mexico City until 11 Jan. 1861. In March he was elected president for a four-years' term. The bankrupt government published a decree suspending for two years the payment on the foreign debt, and an alliance of intervention was at once entered into by England, Spain, and France. On Juarez' agreement to protect the interests of foreign debtors, the English and Spanish troops evacuated the country, but France proceeded to a war of conquest. Juarez was driven to the extreme north and Maximilian assumed imperial power. Upon the interference of the United States, however, the French troops were withdrawn in 1867, and in the same year Maximilian was executed and Juarez elected president. He was re-elected in 1871. His vigorous and liberal policy was of great benefit to the nation, and he has sometimes been called the "Mexican Washington." Consult Baz, 'Vida de Benito Juarez' (1874); and the 'Life' by Burke (1894).

Juarez Celman, Miguel, mē-gĕl' hoo-ā'rĕth sāl-mān', Argentine statesman: b. Cordoba, Argentina, 29 Sept. 1844. He was graduated from the university of Cordoba in 1870 and after holding several political posts became governor of his province of Cordoba, and in 1884 a senator in the national Congress. In 1886 he was chosen president and the speculation rife during his administration, as well as the inflation of the currency and the magnitude of the public works undertaken at this time, induced a financial panic in 1890. The Celman administration was held responsible for this disaster and the president himself charged with having amassed a fortune from sums known to have been taken from the treasury. The cabinet resigned, but revolt broke out in Buenos Ayres 26 July 1890, and fighting in the streets continued for several days. On 6 August, however, the president resigned and the vice-president, Pellegrini, assumed his duties for the remainder of the term.

Juba (joo'bä) **Islands.** See DUNDAS ISLANDS.

Juba River, in eastern Africa, a large stream which flows into the Indian Ocean at about lat. 0° 5′ S. Its mouth marks the north boundary of the coast placed under British control by the agreement with Germany in 1890. The river has been explored to beyond lat. 3° N., and Cecchi identifies the Umo as its upper waters; so that it probably takes its rise in the same mountains as the feeders of the Nile.

Jubal, joo'bal, or **Jabal,** son of Lamech and Adah. According to Genesis iv. 21, the inventor of the reed-flute and harp or lyre, and the father, or predecessor, of all them who play upon such instruments, that is, the discoverer of musical science.

Ju'bilee, an observance among the Jews which recurred every fiftieth year; the land was to rest, as in sabbatical years; land and houses in the open country and in unwalled villages reverted to their original owners or the heirs of such; all slaves were to go free. The law as a whole was distinctly theocratic; it vindicated the absolutism of Jehovah; it meant that Hebrews were the servants of Him, and could not therefore continue to be the slaves of their fellow men; the land belonged to Him, and was only lent to the Hebrew tribes and families, who could not therefore be driven out by any human arrangement.

In the Roman Catholic Church a Jubilee occurs every twenty-fifth year in which the Pope proclaims a remission, from Christmas to Christmas, of the penal consequences of sin, on condition of repentance, restitution and the performance of certain pious works. The first Roman Catholic Jubilee was given in 1300.

Juch, yook, Emma Johanna Antonia, American opera singer: b. Vienna 4 July 1863. She came with her parents to the United States when an infant and was educated in the public schools of New York. She studied singing under Murio-Celli for three years, making her concert début in Chickering Hall, New York, and her operatic début as Felina in 'Mignon' in London 1881. She sang for three seasons in the Mapleson opera company, and under the management of Theodore Thomas in the United States sang the part of Elsa in 'Lohengrin' on alternate nights with Nilsson. She was the prima donna of the American Opera Company for three seasons, and has sung in the Emma Juch English Opera Company and other organizations. She was married in 1894 to Francis L. Wellman, of New York.

Judaism, Reformed, in America finds its roots in the beginning of the Reform movement that took place in Germany in the first quarter of the 19th century. The cause of the religious advance of the Jew in Europe was the breaking up of the Ghetto in the latter half of the 18th century. As long as the Jew was excluded from the world, its culture and its opportunities, he found his greatest comfort in his Hebrew studies and in his religion. The latter developed only along its own narrow lines and was protected from every admixture of foreign elements. The Jew, as it were, built a "fence around the law." When the bars of the Ghetto fell and the Jew was initiated into a new world of thought, language, literature and activity, he found the old religion incongruous with modern life and the rabbinical law too rigid for the new conditions. Reconciliation between the two was difficult. A bitter struggle ensued between the old religion and the new life. A compromise was the only solution. Judaism was equal to the demand. Heartburnings, personalities, domestic schism, often followed in the wake of innovations. The wheels of progress, however, could not be stayed.

Moses Mendelssohn translated parts of the Bible into German and thus opened up a new field of study for the Jew. This was followed by a translation of the Prayer Book into German by David Friedlander. The Talmudic regulations were either openly isolated or interpreted in a liberal spirit. Religious schools for instructing the younger generation in the principles and practices of Judaism as well as in the literature and history of Israel, were instituted and conducted according to modern pedagogical methods. Religious services in many

synagogues were modified, rituals were shortened, objectionable features were omitted, and prayers, sermons and hymns in the vernacular were introduced. Israel Jacobson was the first who successfully established reformed religious schools and services in Germany and later built a Reform Temple at Sessan, which was consecrated 17 July 1810. This Reform movement soon spread to Berlin and Hamburg and before long it reached America and found expression here in 1788 in the city of Charleston in the organization of the "Reform Society" of Israelites, which instituted divine services that consisted of a short ritual with sermons, etc., in English and the abolition of offerings during the divine service. A great ecclesiastical battle resulted and many questions of reform were delayed for several years. An organ was purchased and the system of family pews adopted in spite of much opposition. It may here be mentioned to the everlasting credit of Reformed Judaism, that it instituted family pews and gave to women the right to worship in the same pew with their husband and sons. The practice of the orthodox wing, which still prevails in many congregations, of isolating women in a screened gallery, is both improper and without warrant in this age of enlightenment. Reform differs further from Orthodoxy in the interpretations put upon the Scriptures and the Talmud and the authority with which they are severally credited. Orthodoxy gives to both Scripture and Talmud a binding authority over Jews without regard to circumstances of time and place. Reform seeks to set up a higher standard of authority than merely the literal texts and to find a way of reconciling ancient laws and traditions, if possible, with modern requirements. The usual custom of Reformers is to be reasonable and to discriminate between the essentials and the non-essentials of Judaism. Reformed Judaism has discarded belief in bodily resurrection, in the coming of a personal Messiah, in the national restoration of Palestine and the re-institution of the ancient temple with its Levitical cults. Reformed Judaism is also manifested in a refusal to abide by the rigorous enforcement of the Mosaic and Rabbinical dietary laws and in certain changes in the ritual and religious observances. The reform instituted at Charleston soon spread to the North where in the city of New York the Temple Emanu-El was organized in 1845 under the leadership of Rev. Dr. Leo Merzbader who formed his own ritual for the congregation. Temple Emanu-El has led the van of the Reformed Jewish congregations of America for over half a century and has given much impetus to the progress of Israel. Under Dr. Samuel Adler and Dr. Gustav Gottheil, this congregation made vast strides and is now the largest and wealthiest Jewish congregation of the world. Its place of worship is situated at the corner of Fifth Avenue and 43d Street, and its present rabbi is the Rev. Dr. Joseph Silverman. Har Sinai congregation was soon organized in Baltimore under the banner of Reform and adopted the prayer book of the Hamburg Temple. Some of its noted rabbis were Dr. David Einhorn, Dr. Samuel Sale, Dr. D. Philipson, and Dr. F. Shanfarher. The present incumbent is Rabbi Charles Rubenstein. A stronger note than all these, however, was sounded in the early days of reform at Albany where Rev. Dr. I. M. Wise officiated from 1846 to 1854. He had come from Germany, impregnated with the new spirit of progress, and at once carried his cherished ideals into practice in this country. He fought some of the early battles of Reform in America which went far beyond the expectations or desires of the Reformers of Europe. He contended for choir and organ and for a prayer book in the vernacular and his *Minhag America* (the American Ritual) was acceptable to most American Reform congregations for almost 50 years. It later became the basis of the Union Prayer Book now generally in use. Wise was not alone in his strenuous battles for progress. Leo Merzbacher, Max Libienthal, Samuel Adler, David Einhorn, and Samuel Hirsch ably entered the lists and contributed valuable aid to the new movement. These men were later reinforced by such valiant Reform leaders as B. Felsenthal, J. K. Gutheim, and Gustav Gottheil. Rev. Dr. Isaac M. Wise rightly called the father of American Reformed Judaism, gave to this movement a greater impetus than it had ever received, when in 1873 he organized the Union of American Hebrew Congregations and under its auspices, in 1875, the Hebrew Union College, a theological seminary for the training of American rabbis. A great drawback to the progress of the reform element was the lack of leaders and rabbis with modern scholastic education who could enter into the spirit of American conditions and the needs of Israel in this country. In the last 25 years over 100 graduates of this college have found pulpits in reform congregations where, with their modern culture and the ability to appeal to the younger generation, they have had eminent success and have given reformed (or Progressive Judaism, as it is sometimes called) a firm foothold on American soil. The Union of American Hebrew Congregations is now actively engaged in providing circuit preachers for small congregations and in organizing congregations and religious schools in communities where none exist. Another source of active strength to Reformed Judaism has been the Central Conference of American Rabbis, which the late Rev. Dr. I. M. Wise called into existence in Detroit in July 1889. This had been preceded by several Reformed Rabbinical Conferences which from time to time discussed burning ecclesiastical and ritual questions. The most noted of the conferences was the Pittsburg Conference held in November, 1885, at which the following platform of Reformed Judaism was adopted and which in the main, has been approved by nearly all Reformed Rabbis and teachers and been generally accepted by the laity.

Act. 1.— Judaism conveys the highest conception of God and of his relation to Man. God is the Creator and Ruler of the world, Father and Educator of the human race.

Act. 2.— The Holy Scriptures are the record of Divine Revelation and of the consecration of the Jewish people as the missionaries of the one God. In composition and literary arrangement the Scriptures are only the work of men with the unavoidable limitations of their age.

Act 3.— The results of natural science are the best helps to the understanding of the working of Divine Love in the world, the Bible serv-

ing as guides to illustrate the working of Divine Power within us.

Act 4.—The Mosaic laws are intended for the training of the Jews of Palestine in their former surroundings; only the moral laws are divine; all social, political, and priestly statutes, inconsistent with our modern habits and views, are to be rejected.

Act 5.—The Mosaic-rabbinical laws on diet, purity and dress fail to imbue modern Jews with the spirit of priestly holiness; their observance to-day would obstruct rather than enhance moral and spiritual elevation.

Act 6.—Israel's Messianic hope relates to the establishment of the authority of peace, truth, justice and love among men. No return to Palestine is expected, nor the re-institution there of a Jewish state, or of a worship conducted by descendants of Aaron.

Act 7.—Judaism is an ever growing, progressive and rational religion of modern civilization and asserts the necessity of preserving identity with the great past of the Jewish nation.

Act 8.—Judaism hails the efforts made by various religious denominations toward removing the barriers separating sect from sect.

Act 9.—It is the duty of Jews to spread the knowledge of their religious truths and mission amongst Jews and non-Jews.

Act 10.—The present agitated state of Judaism is a period of transition from a blind belief in authority and exclusion to a rational and humanitarian conception of religion; the masses, therefore, should be enlightened as to the history and mission of the Jewish people and their social and spiritual condition elevated through press, pulpit, and school.

The Central Conference of American Rabbis has, under the regime of its founder and first president, Dr. I. M. Wise (1889–1898), and its second president, Dr. Joseph Silverman (1899–1903), formulated many decisions which have been put into practice by the people at large, the most important of which are the abrogation of circumcision for adult proselytes, permission to the rabbis to officiate at cremations, the interdiction of rabbis from officiating at intermarriages (between Jews and non-Jews), etc. The most important work of the Conference has been the publication of the Union Prayer Book and Union Hymnal both of which have become very popular and have been the means of bringing unity into the religious services of almost 200 reformed congregations and of abolishing the many different rituals which had been a source of confusion in modern Judaism. Of late years some reformed congregations have been holding Sunday services in addition to the regular Sabbath services and many people have had grave fears lest this movement might lead to the substitution of Sunday for the Jewish Sabbath. The Central Conference of American Rabbis at its convention at Detroit July 1903, allayed those fears by adopting a resolution to the effect that this Conference favors adherence to the historical Sabbath as the fundamental institution of Judaism, and that Sunday services, whenever held, must only be regarded as supplementary to the regular Sabbath services. The future of Reformed Judaism in this country is pregnant with great possibilities. It is to be shaped, in the main, by the Union of American Hebrew Congregations, the Central Conference of American Rabbis and the Hebrew Union College (Cincinnati, O.) presided over by Dr. K. Kohler, the successor of Dr. I. M. Wise, and by the graduates of this college of whom the older and more prominent are: A. Aaron, H. Berkowitz, Jos. Krauskopf, Louis Grossman, R. Grossman, M. Heller, David Phillipson, Jos. Stolz, Jos. Silverman. Among the scholarly and leading Reform rabbis of America may be counted E. G. Hirsch, K. Kohler, S. Sale, Leon Harrison, I. S. Moses, M. Samfield, J. Voorsanger, S. Shulman, M. H. Harris. It is hoped that the new Jewish Theological Seminary of America (New York), Dr. S. Schechter, President, will also in time add power and influence to progressive Judaism in America, notwithstanding its present conservative tendency. The main problem for the reformers of the future will be how to promote assimilation with modern conditions without sacrificing the integrity of Judaism. Consult: 'Reports of the Union of American Hebrew Congregations'; 'Reports of the Central Conference of American Rabbis'; 'Yearbooks of the American Jewish Historical Society'; 'Reminiscences of I. M. Wise'; Philipson Grossman, 'Life and Writings of I. M. Wise'; Kohler, 'Settlement of Jews in North America'; and 'The Jewish Encyclopedia.'

JOSEPH SILVERMAN, D.D.,
Temple Emanu-El, New York City.

Judas, or **Jude,** one of the twelve apostles. He appears in the apostolic catalogue of St. Luke as "Judas of James," that is, son or brother of James; in St. Mark's and St. Matthew's list he is styled Thaddæus, of which Judas may be an abbreviation. Nothing is known of his life except what is ascribed to him by widely spread tradition. According to western legend he went in company with Simon the Canaanite to evangelize the Persians, and closed his life by martyrdom. In the calendar of the Book of Common Prayer as well as in the Roman Catholic calendar the festivals of St. Simon and St. Jude occur together on 28 October, and in the Greek Church on 16 May.

Judas Iscariot, ĭs-kăr'ĭ-ŏt (that is, of the family of Cariot in the tribe of Judah). One of the twelve apostles of Christ. He is styled the son of Simon, and was treasurer to the little company that attended Jesus, whom he betrayed with a kiss into the hands of the Jewish priests, for thirty pieces of silver. His divine Master addressed to him the mild reproof—"Dost thou betray the Son of Man with a kiss?" Remorse drove him to suicide. Nothing is known of his life previous to the appearance of his name in the lists of the apostles.

Judas Maccabæus, măk-ạ-bē'ŭs. See MACCABEES.

Judas-tree. See CERCIS.

Judd, Garritt Parmlee, Hawaiian statesman: b. Paris, Oneida County, N. Y., 23 April 1803; d. Honolulu, Hawaiian Islands, 12 July 1873. In 1828 he went to Honolulu as a medical missionary, and in 1842 was appointed recorder and interpreter to the native government. He organized the first Hawaiian ministry for Kamehamaha III. in 1843, and held the portfolio of finance from 1844 until his retirement in 1853. He placed Hawaiian finance on a sound basis,

and was a predominant influence in native politics.

Judd, Norman Buel, American lawyer and politician: b. Rome, N. Y., 1815; d. 1878. After studying law he was admitted to the New York bar in 1836 and at once going to Chicago began practice there, being the first city attorney of that city. He sat in the Illinois legislature 1844–60, becoming a member of the Republican party in 1856. He was minister to Prussia 1861–5, and was successful in preventing Prussia from recognizing the Confederacy. He was collector of the United States customs at Chicago in 1873 and was long prominent as one of the foremost railway lawyers in the country.

Judd, Orange, American journalist: b. near Niagara Falls, N. Y., 26 July 1822; d. Chicago, Ill., 27 Dec. 1892. He was graduated from Wesleyan University in 1847, became editor of the 'American Agriculturist' in 1853, was its owner and publisher in 1856–81, and in 1855–63 was also agricultural editor of the New York *Times*. At Chicago he edited the 'Prairie Farmer' (1883–8), which became the 'Orange Judd Farmer.' In 1871 he gave to Wesleyan University the Orange Judd hall of natural science, in which he established in 1875 the first State agricultural experiment station. He did much to promote American agriculture.

Judd, Sylvester, American author and Unitarian clergyman: b. Westhampton, Mass., 23 July 1813; d. Augusta, Maine, 26 Jan. 1853. He was graduated at Yale College in 1836, and subsequently becoming a Unitarian studied theology at the Harvard Divinity School. In 1840 he was ordained as pastor of the East parish in Augusta, Maine, and continued to hold that pastorate till his death. In 1845 he published 'Margaret, a Tale of the Real and Ideal,' a very noteworthy example of American fiction, to which Lowell in his 'Fable for Critics' makes extended allusion and which was illustrated by a much admired series of outline drawings by Felix O. C. Darley (q.v.) (1856). In 1850 he published 'Philo, and Evangeliad,' a didactic poem in blank verse, and in the same year 'Richard Edney,' a romance. 'The Church,' a collection of sermons, appeared in 1855.

Jude, jood. See JUDAS.

Jude, Epistle of, a general or ecumenical letter reckoned among the canonical writings of the New Testament. The writer, while speaking with something like apostolic authority, does not claim to be an apostle. He is merely "the brother of James," probably James the Just, the author of another general epistle. Difficulties have been raised about this book because of its resemblance to II. Peter, and it is quite uncertain which epistle was written first. It also contains references to two apocryphal books, the 'Assumption of Moses' and the 'Book of Enoch,' but as in the New Testament citations are made not only from uninspired, but even from heathen writers, this does not impair the authority or authenticity of the epistle. As to its date, the earliest probable is 64 A.D. and the latest 67 or 68 A.D. The contents include address and salutation; false teachers are condemned, their fate illustrated by Biblical examples; their wickedness specifically described and woe is pronounced upon them. The letter concludes with an exhortation, to consider how the apostles predicted the coming of these mockers; to cling to the love of God; to treat such perverted ones with discrimination.

Judge, a public officer to whom is committed the exercise of judicial power of the State in the administration of justice in its courts. It is his province to decide questions of law, and in cases in which facts are to be decided by a jury to instruct the jury as to the law which is applicable and to point out to them what the exact questions for their determination are. (See JURY.) He pronounces the sentence, or enters the judgment, of the court. It is to be understood that the foregoing is an attempt to state the functions of a modern judge. In the early stages of society there are complexities of social relations which disappear with advancing civilization. In England, for example, there were formerly local courts and ecclesiastical courts, the judges of which can scarcely be said to have exercised the power of the state, if by state we mean the general government; nor were the judicial powers entirely distinct from the administrative. (See JURISDICTION.) But from the time when the King's Court began to assume importance in the 12th century, and to be held by professional judges, the judicial office began to approach its modern character. This character had long been established when the United States government was formed.

The word is not a technical one. The officers of the King's Court, when that tribunal began to take definite shape, were known officially as justices. Until the recent Judicature Acts in England it was customary formally, as well as popularly, to speak of the Judges of the superior courts at Westminster, though the members of the courts of King's Bench and Common Pleas were properly justices, and of the Court of Exchequer barons, and at the present time the members of the Supreme Court of Judicature, including the Lord Chancellor, the Lord Chief Justice, the Master of the Rolls and the Lords of Appeal are spoken of as the judges of that court. English judges are appointed by the Crown (this patronage being exercised by the Lord Chancellor, who is the head of the legal profession) from the leaders of the Bar, and hold office during good behavior.

In all the Federal courts, in all the higher courts of the several States and in most of the inferior courts, judges must be trained in the law, though lay judges were common in the State courts of first instance until quite recent times. Federal judges are appointed by the President, by and with the advice and consent of the Senate, and hold office during good behavior, being removable only by impeachment. Any Federal judge who has served for ten years and is 70 years of age may retire on full pay for life. The choice of judges in the States is determined by the State constitutions. As a general rule they are elected for a term of years. The fear was quite generally expressed at the time the tendency to make the office an elective one became general, that judges so chosen would be inferior to those apointed by the State governors, but does not seem to have been justified by the result. In most of the State courts the small salaries paid and

the limited terms of office prevent the leading members of the bar from seeking, and in many cases from accepting, the office of judge.

A judge must be impartial and any interest in the cause or the parties will disqualify him from presiding at the trial. While in office he is precluded from practising before the court of which he is a member, and he is commonly, and should be universally, precluded from practising before any court. He is not answerable to any suitor for the correctness of his rulings or decisions, and in the absence of positive fraud is not answerable in damages for any decision he may render. Every judge has power to punish for contempt of court in case of acts committed during the court's session, and even of such acts committed outside the court, though this latter power is to be exercised with care, and its limits are naturally not defined with certainty. For the peculiar functions exercised by American judges as interpreters of the Federal and State constitutions, see JURISDICTION.

Consult: Pollock and Maitland, 'History of English Law'; Blackstone, 'Commentaries' (Bk. III., ch. 4); Brodie-Innes, 'Comparative Principles of the Laws of England and Scotland' (Bk. I.); Kent, 'Commentaries'; Cooley, 'Constitutional Limitations.'

JOHN DOUGLASS BROWN,
Philadelphia.

Judge-advocate, a title given the prosecutor in a court-martial or military commission. In the United States the judge-advocate is generally a member of the judge-advocate-general's department. In Great Britain the duties of judge-advocate usually devolve upon a detailed staff officer, or the prisoner's commanding officer. The prisoner has a right to call on any regimental officer to speak in his behalf. See LAW, MILITARY.

Judge Lynch. See LYNCH LAW.

Judges, Book of, a book of the Hebrew scriptures which relates the exploits of successive rulers of Israel who delivered the land from the heathen, 'judge' in the Hebrew sense being used to designate the defender of a cause, and not necessarily a judicial magistrate. These judges were raised up at times of national emergency to assert the independence of the nation. Abimelech attempted to maintain the succession to this office as being the son of Gideon, but he failed, and the office was never hereditary. Samuel did indeed appoint his sons judges, but the government was at that time undergoing a transition to the settled form of hereditary dynasty.

The period comprised in the book of Judges is from Joshua to Samuel and Saul. In 1 Kings vi. 1, it is stated that from the Exodus to the building of the first temple was 480 years, and the time enumerated by the writer of the Book of Judges amounts to 410 years, but on the very probable hypothesis that some of these judges were of merely local authority, and judged Israel contemporaneously, this will be reduced to 299 years. As the accession of Saul is reckoned at 1037 B.C., we may roughly estimate that the judges ruled Palestine from 1336 to 1037 B.C. The book opens with a preliminary review of the condition of the tribes at the close of Joshua's wars, for the purpose of showing how imperfectly they had carried out the command "Go in and possess the land." The succession of judges, occupied in repelling the encroachments, is the result of this dilatoriness and neglect. The main section of the work is taken up with the exploits of the judges, namely Othniel, who broke the yoke of Mesopotamia; Ehud, who threw off the oppression of Moab; Deborah and Barak, who drove off the northern Canaanites; Gideon, who repelled the Midianites; Jephthah, who fought with the Canaanites; and Samson, who contended with the Philistines. In regard to the public services of the other six we are told little. These are Shamgar, Tola, Jair, Ibzan, Elon, and Abdon. As an epilogue or appendix comes in the stories of idolatrous Micah, and the hideous outrage at Gibeah. The experience of Israel under the judges was educative. In their distress they appeal to Jehovah for deliverance and every answer to their prayer is a rebuke to their forgetfulness and a reminder of their duty to conquer and possess the land.

Judges' Cave, a crevice between some large fallen rocks on West Rock, New Haven, Conn., now a municipal park, which in 1661 was a temporary hiding-place for Goffe and Whalley, two of the English regicides.

Judgment, the decision rendered by the authority to which a question or issue has been submitted for determination. In a more restricted sense, the decision by a court of law of an issue raised by parties litigant, or the determination and declaration by such court of a legal right. There are many rulings by such a court which are not judgments, but determine merely some incidental question, and there are judgments which are interlocutory, as well as final judgments which put an end to the controversy. But every judgment in a judicial proceeding is an adjudication by the court of some right of a suitor, and until set aside or reversed, is the law governing such right.

In early times the solemn character of a court record and the means which the law furnished for the enforcement of an obligation thus established caused such a record to be adopted for the purpose of entering into an obligation as distinguished from resort to a court for the vindication of the obligation when disputed by the other party. A modern survival is found in the confession of judgment, by which a man causes his obligation to pay a sum of money to be entered upon the court records in the form of a judgment against him for the amount due. In consequence of the early practice — aided also by the fact that a judgment may be sued upon outside the jurisdiction of the court in which it was entered, like a contract — the older legal writers speak of judgments as a species of contract. But this classification has been shown to be unscientific by recent writers, since the courts have pointed out that these obligations are not contractual in either their origin or their incidents, and it is now customary to speak of them as *quasi*-contracts.

It is stated above that a judgment is interlocutory or final. In a suit for partition of real estate a judgment that partition be made is interlocutory, and is the basis of further

proceedings which result in the final judgment establishing the partition. A final judgment is one which ends the controversy, at least as to some of the parties. It is a general rule that no appeal can be taken, except from a final judgment, and while there can rarely be a case of doubt as to the finality of a technical judgment, that is the decision rendered by a court of common law jurisdiction, questions frequently arise as to the finality of decrees (which correspond to judgments) entered by courts of equity. The test is whether the right is finally settled by the decree; for example, when a creditor has claimed to intervene in an equity proceeding to establish his right to share in a fund being distributed, a decree excluding him is final as to him and appealable, though in all other respects the suit remains undetermined by the court below.

A judgment of a competent court having jurisdiction of the parties and the subject matter is conclusive, except so far as it may be the subject of appeal to a higher court. The direct issue thus determined will not be re-tried by another court, and such a determination cannot be attacked collaterally except on the ground of fraud or lack of jurisdiction of the court in which the judgment was rendered. A judgment *in personam* binds only parties to the cause and those in privity with them; a judgment *in rem*, which is a judgment determining the *status* of person or property, binds all the world. Decrees of courts of admiralty are judgments *in rem* and conclusive of the *status* of the subject-matter of the cause upon every one. Decrees of divorce are judgments *in rem*, and determine the *status* of the parties to the proceeding. In the United States they are pronounced by the State courts in the administration of very diverse statutes relating to the subject of divorce, and as the courts of all the States, in addition to the general principles of comity observed between courts of different jurisdictions, are bound by the mandate of the Federal constitution requiring that "Full faith and credit shall be given in each State to the public acts, records, and judicial proceedings of every other State" many perplexing questions have arisen. These cases afford good illustrations of successful collateral attacks upon judgments on the ground of fraud or lack of jurisdiction of the court entering the judgment. It is now well settled that a decree of divorce may be successfully attacked collaterally on the ground of fraudulent collusion between the parties or lack of jurisdiction of the court pronouncing it over the person of the defendant. It is to be observed that a final judgment is conclusive of the particular cause, and finally determines the right therein litigated, and may be pleaded in bar of any future attempt to assert the right, except in a case in which there has been no determination on the merits; as for example, where the plaintiff has suffered a voluntary non-suit, that is, has elected in advance of a verdict to abandon his case. He loses that particular case and must pay the costs, but is not prevented from bringing another action.

In most of the United States a judgment for a sum of money found to be due, from the date of its entry, and without the issuance of a writ of execution, constitutes a lien upon the real estate of the judgment debtor; that is, a claim which must be paid out of the proceeds of any judicial sale of the property in its due order of priority as compared with other liens upon the same property. This lien usually extends only to real estate within the jurisdiction of the court in which the judgment was entered with provision for filing a transcript to create a lien in other counties of the same State in which the debtor owns real estate. A foreign judgment, in which are included the judgments of others of the United States, must be sued on and a judgment recovered upon it to make it effective in any of the States. In such suit no defense which could have been interposed in the original suit will be allowed to the judgment debtor.

JOHN DOUGLASS BROWN,
Philadelphia.

Judica, joo'dī-ka ("judge," or "give sentence"), the first word in the 43d Psalm, used as an introit in the Church of England (1549) for the 3d Sunday in Lent, and in the Roman Catholic Church for the 5th Sunday in Lent. Hence "Judica Sunday" as a term to designate those several days.

Judic'iary, that branch of government concerned with the administration of justice, in cases civil or criminal; the system of courts of justice in a country; the judges collectively. For judiciary in the United States, see COURT.

Judiciary in the Philippines. The United States government organized in 1902 a complete judicial system covering the whole archipelago, the municipal code providing for the trial of violators of municipal ordinances by the local *presidente*, other special laws authorizing the appointment of justices of the peace for trial of minor offenses, civil actions involving small amounts and the preliminary investigation of higher crimes, creating courts of first instance that are courts of record and of general jurisdiction, one being provided for each province, except in the city of Manila, where there are two judges. The courts of first instance hold sessions at least twice a year in the smaller provinces and in the more important ones three or four times. The archipelago is divided into 14 judicial districts outside the city of Manila, one judge for each judicial district, with a special tribunal for disposing of arrearages of litigation in the island of Negros. There is a Supreme Court, consisting of a chief justice and six associate justices, with adequate provisions for reporting the decisions of the court, and for representation of the government, general and local, in all litigation by the attorney-general, solicitor-general and their assistants, and provincial fiscals, with a special municipal system of courts for the city of Manila and with a notarial system for the archipelago. A considerable number of the judges in the various courts are native Filipinos. All the fiscals, or prosecuting officers in the islands are natives.

Judith, Jewish heroine. She was the widow of Manasses, a citizen of Bethulia. When Holofernes, general of King Nebuchadnezzar, according to the Book of Judith, besieged Bethulia, a city of unknown geographical position, she went armed with faith in Jehovah to the tent of the invader and was admitted because of her stately beauty. While he slept she cut off his head with his own sword, and thus de-

livered Israel. This incident has been a favorite subject with artists, for in the first place the Book of Judith is written with abundant literary point and skill and is naturally suggestive to the sculptor or painter. It is the subject of Donatello's bronze group in the Lanzi palace at Florence, and of many pictures, notably that of Cranach in the Dresden gallery, and those of Horace Vernet, 'Judith on Her Way to Holofernes'; and 'Judith in the Tent of Holofernes.'

Jud'son, Adoniram, American Baptist missionary: b. Malden, Mass., 9 Aug. 1788; d. at sea 12 April 1850. He was graduated from Brown University in 1807, and immediately after opened a private school in Plymouth, Mass. Skeptical views which he had held were overcome by his examination of the evidences of Christianity, and he was graduated from Andover Theological Seminary in 1810. With some of his fellow students at Andover he addressed a letter to the General Congregational association of Massachusetts which ultimately led to the formation of the American board of commissioners for foreign missions. Impatient at the slow progress of the American movement he embarked for England to consult with the directors of the London Missionary Society in regard to co-operation with that society by the newly formed American board. On his return to America he and three others were appointed missionaries to the Burman empire by the American board; they were ordained 6 Feb. 1812 and Dr. Judson, with his wife, sailed on the 19th for Calcutta. They were subjected for a full year to much annoyance by the East India Company's regulations, and finally took refuge in Rangoon (July 1813). Meanwhile they had adopted Baptist views, and had surrendered their connection with the American board. The Baptist general convention (now the American Baptist Missionary Union) organized in 1814 and immediately appointed Mr. and Mrs. Judson its missionaries. Established in Rangoon they applied themselves to the learning of the language, without grammar or dictionary; in April 1819 the first *zayat* was opened for Christian worship, and in 1820 the number of baptized converts was 10. The growth of the mission had excited the displeasure of the new viceroy, and Dr. Judson determined to appeal to the king for protection, but the plea was unavailing; later, however, their mission was transferred to Ava, at the request of the king. The sudden breaking out of war between the East India Company and the Burman government brought upon the missionaries the severest privations; in June 1824 Dr. Judson was arrested and thrown into prison, enduring the most brutal treatment until February 1826, when he was released on the demand of Sir Archibald Campbell, the English general. Removing to territory ceded by the Burman government to the English, he and his wife commenced missionary work at Amherst; shortly after Judson went with an embassy to Ava to negotiate a new treaty, and during his absence his wife died. On his return to Amherst he took up again his missionary work, where he was chiefly occupied in the translation of the Bible (completed 1834); and the preparation of a Burman-English dictionary. In April 1834, he married Mrs. Sarah Hall Boardman, and remained in Burma till 1845, when he visited the United States. Mrs. Judson died on the voyage. He was received in the United States with distinguished marks of respect by public meetings in many cities, especially by the Baptist missionary conventions at New York and Richmond. In July 1846, he again sailed for Burma with his third wife, Emily Chubbuck, and settled at Maulmain; took the pastorate of the Burman church there, and continued his work on the dictionary. In 1849, illness forced him to leave Maulmain, and he died on the voyage to the Isle of Bourbon. Consult: Lives by his son, Edward Judson (q.v.) (1883); Wayland (1853); Conant, 'The Earnest Man' (1856).

Judson, Ann Hasseltine, American missionary, wife of Adoniram Judson (q.v.): b. Bradford, Mass., 22 Dec. 1789; d. Amherst, Burma, 24 Oct. 1826. She was married to Dr. Judson in 1812, and sailed with him to Burma, where she took active part in all his missionary work. Her health compelled her to visit the United States in 1822–3, where her personal appeals were the means of largely increasing the missionary interest in the churches. Shortly after her return to Burma, her husband and other foreign residents at Ava were imprisoned, and she herself suffered many indignities; but by constant appeals to the king and the wise use of money and presents she was successful in relieving somewhat the sufferings of her husband and the other prisoners. She wrote 'History of the Burman Missions' (1822).

Judson, Edward, American Baptist clergyman: b. Maulmain, Burma, 27 Dec. 1844. He is the son of Adoniram Judson (q.v.) and came to the United States in 1850 after the death of his father. He studied at Madison (now Colgate) University, and was graduated from Brown in 1865. He was principal of the academy at Townsend, Vt. (1865–7) and subsequently professor of Latin at Madison (now Colgate) University. In 1875 he accepted the pastorate of the Baptist Church at Orange, N. J., then became pastor of the Berean Baptist Church, New York city, and later secured a site on Washington Square, New York, and erected the Judson Memorial Church (in memory of his father) of which he is pastor. Here he has built up an institutional church, with many different lines of work, including gymnasium classes, a dispensary, and a children's fresh air fund.

Judson, Emily Chubbuck ("Fanny Forrester"), American writer: b. Eaton, Madison County, N. Y., 22 Aug. 1817; d. Hamilton, N. Y., 1 June 1854. She was the third wife of Rev. Adoniram Judson (q.v.) to whom she was married in 1846. As "Fanny Forrester" she achieved some little reputation as a writer of graceful sketches and poems, and besides the life of the second Mrs. Judson (1850), published 'Alderbrook' (1846); 'The Kathayan Slave' (1853); 'An Olio of Domestic Verses' (1852); 'Trippings in Author Land' (1846); 'My Two Sisters' (1854).

Judson, Harry Pratt, American educator: b. Jamestown, N. Y., 20 Dec. 1849. He was graduated from Williams College in 1870, was professor of history in the University of Minnesota 1885–92, and has been professor of political science in the University of Chicago since the

latter date. His works include: 'Cæsar's Army, a Study of the Military Art of the Romans' (1888); 'Europe in the Nineteenth Century'; 'The Growth of the American Nation' (1895); 'The Higher Education as a Training for Business' (1896); 'The Government of Illinois' (1900); etc.

Judson, Sarah Hall Boardman, American missionary: b. Alstead, N. H., 4 Nov. 1803; d. St. Helena 1 Sept. 1845. She was married on 4 July 1825, to Rev. George Dana Boardman, and on 16 July they embarked for Calcutta. They established the mission station at Maulmain, and Mrs. Boardman made rapid progress in the acquisition of the language. Transferred to Tavoy for a similar service, they worked among the Karens partly at the schools at Tavoy and partly by visiting their villages in the wilderness. After two years Mr. Boardman died, but she continued her missionary labors, and beside managing a school with great success, was accustomed to make long journeys among the mountains. In these excursions, assemblies of hundreds gathered around her and she conducted the worship and gave them religious instruction. In April 1834, she became the wife of Adoniram Judson (q.v.). She was perfectly familiar with the Burman language, and translated into Burmese the first part of Bunyan's 'Pilgrim's Progress' and various tracts, prepared a hymn book, and several volumes of Scripture questions for Sunday schools. Before the Peguans had a missionary, she acquired their language, and translated or superintended the translation of the New Testament and the principal Burman tracts into the Peguan tongue.

Juggernaut, jŭg'ėr-nât. See JAGANNATH.

Jugular (joo'gū-lạr) **Vein,** one of the large trunks by which the greater part of the blood that has circulated in the head, face and neck is returned to the heart. There are two on each side, an external or superficial, and an internal or deeper.

Jugurtha, joo-gėr'thạ, king of Numidia: d. Rome 104 B.C. He was a natural son of Masinissa. Micipsa, his father's brother, and king of Numidia after Masinissa (149 B.C.), adopted him and brought him up with his own sons, Adherbal and Hiempsal. Micipsa did his best to conciliate him, and declared him joint-heir to the crown with his two sons. But after the death of Micipsa, Jugurtha had Hiempsal murdered and drove Adherbal from the country. Adherbal appealed to Rome, and after several Roman expeditions into Numidia, Jugurtha was captured (106 B.C.), led in the triumph of Marius at Rome, and finally thrown into a dungeon, where he was starved to death.

Jujube, joo'joob, a spiny and deciduous shrub of the order *Rhamnaceæ* and genus *Zisyphus,* a native of Syria, whence it was introduced into Europe. The fruit is blood-red or saffron-colored, with a sweet, granular pulp. The species are numerous, and of several the fruit is wholesome and pleasant to eat, both fresh and dried, and forms an article of commerce; and in southern Europe it is used at table in desserts as a dry sweetmeat. *Z. Lotus,* which gave its name to the ancient Lotophagi, a shrub 2 or 3 feet high, is a native of Persia and the north of Africa. Its berries, which are about as large as a sloe, are collected for food by the Arabs of Barbary, are made into cakes, and a kind of wine is sometimes made from them. *Z. spina-christi,* or Christ's thorn, is said to have furnished the branches of which Jesus' crown of thorns was made.

Jujuy, hoo-hwē', Argentine, a province situated in the extreme northwest of the republic, between Bolivia and the province of Saltá. Nearly the entire area, estimated at 18,977 square miles, is occupied by mountains in which are extensive deposits of gold, silver, copper, mercury, salt, petroleum, and asphalt. Fertile valleys in the eastern part of the province produce sugar-cane, wheat, tobacco, and rice. There are immense forests and an abundant supply of water. The provincial capital, also called Jujuy, a town of about 10,000 inhabitants, is connected by railway with Buenos Ayres, and has two banks, a custom-house, a national college, a normal school for girls, and 7 public schools. The population of the province, according to the census of 1895, was 49,713. Estimated population in 1903, about 57,000.

Jukes, The, the name given to a family of New York State that had an unusual record of crime and pauperism. In 1874, Mr. R. L. Dugdale, while making investigations in behalf of the New York Prison Association, found several of the same family imprisoned for various crimes. Becoming interested in the subject, he traced the history of the family through several generations; they were descendants of the two sons of a backwoodsman, called Max, who married two of the Jukes sisters, one of whom is known as "Margaret, the Mother of Criminals." Exact information was obtained in relation to 709 out of the 1,200 descendants and blood relations; of these, 140 had been imprisoned for crime, 280 had been paupers, dependent upon public support, and the large majority were of low physical and moral standard. Consult: Dugdale, 'The Jukes.'

Julia, only child of the emperor Augustus; b. 39 B.C.; d. 14 A.D. She was his daughter by his second wife Scribonia, and was first married (25 B.C.) to her cousin, the young Marcellus, and afterward to Marcus Vipsanius Agrippa, to whom she bore three sons and two daughters. On Agrippa's death, in 12 B.C., she was married to Tiberius, who left her on account of her licentiousness. Augustus banished her to Pandataria, a desolate island on the coast of Campania, ultimately allowing her to live in Rhegium. After the death of the emperor, Tiberius treated her with great severity. She died in poverty and distress. Her son, Agrippa, had been put to death by Tiberius shortly before.

Julia Domna, Roman empress: b. Emesa, Syria, 170 A.D.; d. 217 A.D. She was the second wife of the Emperor Severus, and mother of Caracalla and Geta, and a distinguished patroness of art and science.

Julian, joo'lyan, FLAVIUS CLAUDIUS JULIANUS), Roman emperor, surnamed the Apostate: b. Constantinople 17 November 331; d. 26 June 363. When hardly six years old his father and several members of his family were murdered by the soldiers of his cousin, the Emperor Constantius. He was brought up in the Christian religion, studied philosophy and letters,

and resided in Athens, where he was induced to embrace Paganism. Having received command of an army against the Germans, he defeated them at Strasburg, and drove them beyond the Rhine. He also displayed great talent as an administrator in Gaul. The emperor now became jealous of Julian, and recalled his best troops under pretense that he wanted to employ them against the Persians. This order caused a rebellion among the soldiers, who proclaimed their leader Julian emperor in March 360, in spite of his own resistance. Constantius prepared to proceed against him, but soon after died, and Julian was generally recognized as emperor. He began by putting a stop to many abuses, and limiting the splendor of his court, and was thus able to remit to the people the fifth part of all their taxes. He sought to restore the heathen worship in all its splendor, and on that account opposed Christianity as much as was in his power, without, however, persecuting the Christians themselves. In 363 he headed an expedition against the Persians and took several cities. He was an able ruler, and had also a reputation as an author. Some of his works have come down to us, including speeches, letters, and satirical pieces; the latter are distinguished for wit and humor. He wrote also a work against the Christian religion, of which we have yet some extracts. Consult: Schwartz, 'De Vita et Scriptis Iuliani Imperatoris' (1888); Hoffmann, 'Julianus der Abtrünnige' (1880); Gardner, 'Julian: Philosopher and Emperor' (1895); Dill, 'Roman Society' (1899).

Julian, George Washington, American politician: b. Centerville, Ind., 5 May 1817; d. Irvington, Ind., 7 July 1899. He studied law and was admitted to the bar at the age of 21. In 1845 he was elected to the State legislature, as a Whig, but being a strong opponent of slavery he severed his party connection with the Whigs and became one of the founders of the Free Soil party in 1848. In 1849 he was elected to Congress; in 1852 was candidate for vice-president of the Free Soil party, and in 1856 a delegate to the first national convention of the Republican party, where he was vice-president of the convention and chairman of the committee on organization. In 1860 he was again elected to Congress, and served continuously for ten years. He was a member of the committees on the conduct of the war, on reconstruction, on the preparation of the articles of impeachment against President Johnson, and on public lands, being chairman of the latter. He opposed any monopoly of the public lands, was an advocate of the homestead system, and strongly favored giving the franchise to the negro. In 1868 he proposed a constitutional amendment providing for woman's suffrage. In 1872 he joined the Liberal Republicans, and after that became a Democrat; in 1885–9 was surveyor-general of New Mexico; and after 1889 retired from public life. He published 'Speeches on Political Questions' (1872); 'Political Recollections' (1884); and 'Life of Joshua R. Giddings' (1892).

Julian Calendar. See CALENDAR; EPOCH.

Julien, Alexis Anastay, American geologist: b. New York 13 Feb. 1840. He was graduated from Union College in 1859, was resident chemist at the guano island of Sombrero 1860–4, studied geology and natural history there, and on the establishment of the Columbia School of Mines became an assistant in the quantitative laboratory. He was in charge of the department of microscopy there, 1885–97, and subsequently became instructor in geology. He has published valuable scientific reports included in the Geological Survey's 'Geology of Michigan,' vol. II. (1872); and 'Geology of Wisconsin,' vol. III. (1880); etc.

Julien, zhü-lĭ-ăn', **Stanislas Aignan,** French sinologist: b. Orleans 20 Sept. 1799; d. Paris 14 Feb. 1873. Possessed of an extraordinary linguistic faculty, he taught himself Greek, English, Italian, Spanish, Portuguese, and German, and in 1823 commenced the study of Chinese. At the end of a year he published a Latin translation of the philosopher Mencius. Henceforth ancient and modern Chinese, Manchu, the Mongolian tongues, and Sanskrit, were the subjects of exact and profound study. In 1832 he became professor of Chinese at the Collège de France; librarian at the Bibliothèque Nationale, 1839; president of the college, 1855; commander of the Legion of Honor, 1863. His most important works are: 'Voyages des Pérelins Boudhistes' (1853–8); 'Syntaxe nouvelle de Langue chinoise' (1869–70). Julien was the foremost Chinese scholar of his time.

Julius I., pope: d. 12 April 352. He became pope in February, 337, and was a staunch defender of Athanasius, who, under the protection of Julius, sought refuge in Rome against the enmity of the Eastern prelates.

Julius II., pope (GIULIANO DELLA ROVERE, joo-le-ä'nō dĕl'lä rō-vā'rā): b. Albezuola 1443; d. Rome 21 Feb. 1513. He was elevated by his uncle Sixtus IV. to the rank of a bishop and cardinal in 1471, and subsequently held eight bishopries and the archbishopric of Avignon. He was appointed papal legate to France in 1480 and in 1503 was elected pope. Immediately on his elevation to the pontificate he planned the complete re-establishment of the papal sovereignty in its ancient territory, and the extinction of foreign domination, and influence in Italy. Refusing to attend the Council of Pisa convened by the king of France, he in 1511 formed the "Holy League," to which Spain, England, and Switzerland were parties. In 1512 he made open war against Louis XII., and the Fifth Lateran Council was convoked by him in the same year. The French defeated the papal army near Ravenna, but were soon after driven out of Italy. He was a far-sighted and patriotic sovereign, and a liberal and judicious patron of art and literature, Michelangelo, Raphael, and other great artists of the time receiving commissions from him. To procure means for building St. Peter's he ordered the preaching of indulgences, which was one of the immediate causes of the Reformation. Consult: 'Life,' by Du Mesnil (1873); Brosch, 'Papst Julius II., und die Gründung des Kirchenstaates' (1878).

Julius III., pope (GIOVANNI MARIA DEL MONTE, gō-van'nē mä-rē'ä dĕl mōn'tā): b. Arezzo 10 Sept. 1487; d. Rome 23 March 1555. He was made archbishop of Siponto in 1512 and of Pavia in 1520, and was appointed cardinal by Paul III. in 1536. He took an active part in the Council of Trent as papal legate, was

elected pope in 1550, and in the following year reopened the Council of Trent, which had been suspended for two years. He endeavored to effect a union with the Nestorians, and commissioned Cardinal Pole to organize, in conjunction with Mary, the reunion of England with Rome.

Julius Cæsar. See CÆSAR, GAIUS JULIUS.

Julius Cæsar, Play of. The material for this stately drama, the noblest of Shakespeare's historical plays, was taken from Plutarch. The action covers nearly two years,—46 to 44 B.C. See CÆSAR, GAIUS JULIUS.

July, the 7th month of the calendar, which in the Roman year bore the name of *Quintilis,* as the fifth in the computation of Romulus, even after Numa had prefixed January and February. Mark Antony effected a change in its name in honor of Julius Cæsar, who was born on the 12th of the month, and thenceforward by a decree of the senate it was called *Julius.* It originally contained 36 days. It is said that Romulus reduced them to 31 and Numa to 30. Julius Cæsar fixed the number at 31, which is still retained. The Dog-days are supposed to commence on the 3d of this month.

Jumbo, the name of a large African elephant for 25 years on exhibition at the Royal Zoological Gardens in London. The animal was purchased in 1882 by P. T. Barnum (q.v.), American showman, for $10,000, and for three years was exhibited in the United States. Jumbo was killed in 1885 by a railroad train in Canada. He was 11 feet 6 inches in height, and weighed 6 tons. His skeleton is preserved at the Smithsonian Institution, Washington, D. C.

Jumel, zhū'mĕl, **Eliza,** American heiress: b. at sea 1769; d. New York 16 July 1865. Her maiden name was Capet, and after her mother's death she was adopted by Mrs. Thompson, of Newport. She was a wayward, beautiful girl; at 17 she eloped with a British officer named Peter Croix, with whom she lived in New York. There she was greatly admired, and soon after her first husband's death married Stephen Jumel, who took her to Paris, where her social success was as great as in New York. After Jumel's death, she married at 61 Aaron Burr (q.v.), from whom she separated soon afterward. Her home during her last years was the famous Jumel mansion, built by Roger Morris in 1758, the home of Mary Philipse Rogers (q.v.) and Washington's headquarters during the New York campaign. It was bought by Madame Jumel in 1810, and is still preserved, its site being in Roger Morris Park, New York, which was opened 28 Dec. 1903.

Jum'na, or **Jamna** (Sanskrit YAMUNA), a river of India which rises in the Himalayas, at the height of 10,849 feet. It flows in its upper course in a generally southwest direction, then bends to the southeast and, passing the cities of Delhi and Agra, falls into the Ganges, of which it is the chief tributary, at Allahabad (q.v.) after a course of 860 miles. Important irrigation works derive their supply of water from this river.

Jumpers, a class of religionists who manifest their devotion and feeling by jumping from the ground during the time they are assembled for worship and exhortation. They are said to have originated in the Methodist congregations of Wales during the preaching of Whitfield (1760). They were also called "Barkers" from the incoherent guttural sounds they uttered during their excitement. They still exist in some parts of the Eastern States, having emigrated to America after being repudiated by English Methodists.

Jumping Beans, various large seeds of euphorbiaceous plants infested with the larvæ of certain small moths (*Carpocapsa saltitans* and *Grapholitha sebastianæ*), which by their movements make the seeds roll, and even jump as if alive. The larvæ spin cocoons in the seeds, a large part of the interior of which they have devoured, and when ready to emerge as adults, push open a previously cut circular door which has been held shut by silken threads. Both species are found in Central America, Mexico, and the southwestern United States, where they are called "broncho beans."

Jumping Hare, or **Springhaas,** a jerboa-like animal (*Pedetes caffer*) of South Africa, as large as a hare, and much resembling one, which is now set apart in a family (*Pedetidæ*) by itself. It will leap 25 or more times its own length, and where numerous does great damage at night to growing crops.

Jumping Mouse. See JERBOA.

Jumping Shrew, a curious little animal of Africa, one of the insectivora of the Elephant-shrew family (*Macroscelidæ*), which has very large hindquarters and moves by leaping like a jerboa. They inhabit rocky and desert places, remain in holes and hiding places during the day and go abroad at night in search of insect food. The best known, perhaps, is the Cape jumping-shrew of South Africa (*Macroscelidus typicus*), which is tawny brown, about five inches in length, has a long, flexible proboscis and a long naked tail.

Jumping Spiders, small spiders of the family *Attidæ,* which dwell in low vegetation, and are exceedingly agile. They are usually short and stout in form, rarely more than a quarter of an inch long, and are often brightly colored, especially in the case of the males, which take curious attitudes in order to display their ornaments to the females. Consult Emerton, 'Common Spiders of the United States' (1902).

Jun'co, a genus of slate-colored and white sparrows, present in the United States mostly in winter. See SNOWBIRDS.

Junction City, Kan., city and county-seat of Geary County, at the junction of the Republican and Smoky Hill rivers, 135 miles west of Kansas City; and on the Missouri, K. & T. and the Union P. R.R.'s. The two rivers here form the Kansas River, and make an important shipping point for grain, flour and limestone. A government military post, Fort Riley, is located three miles east of the city. It was settled in 1858 and under a charter of 1870 is governed by a mayor and city council.

The city owns the waterworks. Pop. (1890) 4,502; (1900) 4,695.

June, Jennie. See CROLY, JANE G.

June, the 6th month in the calendar. The etymology is uncertain. Vossius gives three etymologies of the name — one from Juno; another from *jungo* (to join), referring to the union between the Romans and Sabines under Romulus and Titus Tatius; a third from *juniores* (the young men), Romulus having been said to have assigned the month of May to the elders, and that of June to the young men, when he divided the people into these two great classes, the former to serve in counsel, the latter in war. The name has also been traced to Junius Brutus, the first consul. It consisted originally of 26 days, to which it is said Romulus added four, and Numa took away one. Julius Cæsar again lengthened it to 30 days, and it has ever since remained unaltered.

June Beetle, or **Fig-eater,** a green and brown beetle (*Allorhina nitida*) of the family *Scarabæidæ* common in the central and southern United States. The adults often eat figs, peaches, small fruits, corn, etc. The larvæ are white grubs which resemble their northern relatives (see MAY BEETLE), but are far less injurious since they normally feed upon decaying vegetable matter in the soil and not on living roots of plants. The adults may be decoyed away from ripe fruit by placing little piles of decaying fruit within their reach; but since they are probably beneficial they should not be destroyed.

June Berry. See AMELANCHIER.

June Bug. See MAY BEETLE.

June Grass. See BLUE GRASS; GRASSES IN THE UNITED STATES.

Juneau, joo-nō', **Laurent Solomon,** American pioneer: b. L'Assumption parish, near Montreal, Canada, 9 Aug. 1793; d. Shawano, Wis., 14 Nov. 1856. He emigrated to Green Bay, Wis., and thence in 1818 to Milwaukee, where he was active in trade with the Indians. He was not, as has been sometimes stated, the first white settler on the site of Milwaukee. A grant of considerable land had there been made by the Indians to one Mirandeau, a previous resident, and of this grant, Juneau, on Mirandeau's death, secured possession. Juneau made the first survey of Milwaukee village, was its first postmaster and president, and the first mayor of the subsequent city. On ground presented by him, he helped to build the first court-house in the State. For years he was agent for the American Fur Company. A heroic statue of him was placed in Juneau Park, Milwaukee, in 1884. See MILWAUKEE.

Juneau, Alaska, city in the southern district, on a promontory between the Taku River and Lynn Canal, opposite Douglas Island, about 80 miles north of Sitka. It was settled in 1880, is incorporated, and has been selected by Congress as the capital of Alaska. From its situation in the mining region it has become a centre of trade in outfitters' articles and general supplies; while its exports, including gold, furs, and other products of Alaska, have grown to a considerable commerce. Among the manufactories are iron-works, breweries, sawmills, cigar factories, etc. In the vicinity are the Treadwell gold mine and the Silver Bow mines. Villages of the Auk and Taku Indians in the neighborhood are of interest to tourists. At Juneau is the United States land office for Alaska. Its public schools are well conducted, and its waterworks, electric-light system, and other public improvements give it all the essential conveniences of a modern American city. Cable service is established here. Pop. (1890) 1,253; (1900) 1,864.

Jung-Stilling, Johann Heinrich, yō'hän hin'riH yoong stil'ling, German mystical author: b. Grund, Hesse Nassau, Germany, 12 Sept. 1740; d. Carlsruhe, Baden, 2 April 1817. In the early part of his career he was by turns, a charcoal burner, school master, and tailor, and in 1771 went to Strasburg to study medicine. Here he became acquainted with Goethe, who has sketched him in 'Aus meinem Leben.' He was professor of political economy in the Universities of Marburg and Heidelberg, 1787–1806, and the remainder of his life was passed at the court of the Grand Duke of Baden. His writings, which include several romances as well as distinctly religious works, are more or less mystical in tone. Among them are 'Geschichte des Herrn von Morgenthau' (1770); 'Geschichte Florentins von Fahlendorn' (1783); 'Theobald' (1784–5, an English version of which appeared in New York 1846); 'Das Heimweh'; 'Theorie der Geisterkunde' (1808, in English 1834); 'Scenen aus dem Geisterreiche' (1797–1801), and his famous autobiography 'Heinrich Stillings Leben' (1806). In the publication of this he was aided by Goethe. The work was completed in 'Heinrich Stillings Alter' (1817).

Jungfrau, yoong'frow (Ger. "virgin," or "maiden"), a mountain of Switzerland, in the Bernese or Helvetic Alps, on the frontiers between the cantons of Bern and Valais, 12 miles southeast of Interlaken. It is one of the most magnificent mountains in Switzerland and the loftiest calcareous mountain in Europe; height 13,670 feet. It was first ascended in 1811.

Junghaus, yoong'hows, **Sophie,** German novelist: b. Cassel, 3 Dec. 1845. She became well known by the publication of 'Kathe, the Story of a Modern Maid' (1876). Later works of hers are: 'The House of Eckberg,' a study of life during the Thirty Years' War (1878); 'Die Erbin wider Willen' (1881); 'Die Gäste der Madame Santines' (1884); 'Der Bergrat' (1888); 'Zwei Brüder' (1889); 'Zu rechter Zeit' (1892); 'Um das Glück' (1896); 'Junge Leiden' (1900).

Jungle, an Indian term applied to a desert and uncultivated region whether covered with wood and dense vegetation or not, but in English it is applied to land covered with forest trees, thick impenetrable brushwood, or any coarse rank vegetation.

Jungle Books, The (1895), by Rudyard Kipling. The central figure in these books is the boy Mowgli, who, straying from his village home when an infant, had been lost in the forest, and there sheltered and nursed with her own cubs by a mother-wolf, and the hairy Orson. Joined to this element of human interest, and with the coloring of high romance, these

stories picture the personal characteristics and social and political life of the gaunt wolf-family in their cave and the free republic of wolves. Unlike the talking beasts in Æsop's fables, those of the 'Jungle Books' are not men in hides and on all fours discussing human problems. Kipling's genius represents them thinking and behaving each according to his own peculiar beastly habit and experience, with great dramatic skill.

Jungle-cat, or **Chaus,** the common wildcat of India (*Felis chaus*). It is 26 inches long in head and body, has a short tail, reaching only to the heel, and is yellowish gray, more or less dark and unspotted, tinged with reddish on the sides, marked by a dark stripe from the eyes to the muzzle, and with reddish black ears slightly tufted. Another Indian "jungle-cat" is the handsome *F. ornata,* which is profusely spotted; it dwells in the desert regions of the Northwestern provinces. Both these cats are said to interbreed with domestic cats, and thus no doubt long ago influenced the varieties of the tamed stock.

Jungle-fever, a severe variety of remittent fever, prevalent in the East Indies and other tropical regions. It is characterized by the recurrence of paroxysms and of cold and hot stages. The remissions occur usually in the morning and last from 8 to 12 hours, the fever being mostly typically developed at night.

Jungle-fowl, the English book-name of a genus of pheasants, the source of domestic fowls, characterized by a fleshy frontal comb and wattles, and the peculiarly laterally compressed tail with its long, drooping, curved feathers. This genus (*Gallus*) is represented by several species in southern Asia, especially India, and the Malay and Philippine Islands. The common jungle-fowl (*Gallus gallus* or *bankiva*) is especially noteworthy as the original stock of our barnyard fowls. The wild birds, which are quite common in cultivated parts of central India and about the bases of the Himalayas up to an elevation of 5,000 feet, closely resemble some of the varieties of game cocks and hens. The sexes differ as in the domestic birds in size, character of tail feathers, combs, wattles, spurs and color. Although naturally living in flocks in the jungles and forests, these haunts are often forsaken for the purpose of feeding upon grain in the cultivated fields. They run with great speed, are tolerably good flyers and roost in trees. The cock crows and the hen clucks and cackles much as domestic fowls do. In the wild state the jungle-fowl is said to be monogamous; eggs to the number of 10 or 12 are laid in a simple depression in the ground lined with leaves and grass. Consult Darwin, 'Animals and Plants under Domestication'; Tegetmeier, 'Ibis' (1891); and Blanford, 'Fauna of British India.'

In Australia this name is often given to the mound-birds.

Juniata, joo-nĭ-ăt'a, a river of Pennsylvania formed at Petersburg, about six miles northeast of Huntingdon, near the centre of the State, by two streams rising in the Alleghany Mountains — the Little Juniata and the Franks-town Branch. Its course is winding, but it flows in a generally eastern direction for about 150 miles, entering the Susquehanna at Duncannon, 14 miles above Harrisburg. Along the greater part of its course the scenery is picturesque, often marked by grandeur where the river breaks through the mountains that rise in parallel ridges across its path. The Juniata is not a navigable stream, but from its source to its mouth its banks are followed by the Pennsylvania Canal and the Pennsylvania Railroad, the latter crossing the river several times.

Juniata College, a coeducational institution, located at Huntingdon, Pa.; established in 1876 under the auspices of the German Baptist Brethren. Special attention is given to the religious education of the students; one of its principal courses is the history and literature of the Bible. It has art, music, normal, and commercial departments, also a preparatory school. The courses lead to the degrees of bachelor of arts, and of English and sacred literature. In 1903 there were in attendance 350 students, and 21 professors and instructors were connected with the school. There were about 21,000 bound volumes and over 4,000 pamphlets in the library.

Junin, hoo-nēn, Peru, department in the interior; has an area of 23,347 square miles. It is located in the wildest parts of the Cordilleras. Agriculture is neglected and large deposits of silver remain unworked. A railroad connects the southern part with Lima on the coast. The capital city is Cerro de Pasco. Pop. of the department 394,393.

Junior Order of United American Mechanics. See UNITED AMERICAN MECHANICS, JUNIOR ORDER OF.

Ju'niper, a genus (*Juniperus*) of ornamental evergreen trees and shrubs of the order *Coniferæ,* consisting of about 35 species distributed mainly throughout the cooler parts of the northern hemisphere, but also in America extending to Mexico and the West Indies. The species have branches which spread in all directions from the main trunk and limbs, small, rigid, needle-like or scale-like opposite leaves; unisexual flowers, the two sexes usually upon separate plants, the staminate, yellow and in catkins, the greenish pistillate ones followed by fleshy, berry-like cones containing from one to six, sometimes 12 seeds, which may not attain maturity until the second or third year. The best known species in the United States is probably the Virginian juniper, red cedar or savin (*Juniperus virginiana*), to be found everywhere east of the Rocky Mountains, upon rocky and sandy soils, mountain sides, etc. It often attains 100 feet in height, its upright or spreading branches forming a handsome conical head. Its numerous attractive horticultural varieties are largely planted in parks and cemeteries. The trunks are highly prized for fence posts, being exceedingly durable; the handsome, red, heart-wood is valued for turning, cabinet work, cooperage, and especially for lead-pencils; but the tree is looked upon with disfavor by the orchardist, because it is one of the hosts of apple rust. See APPLE, paragraph *Diseases.*

The common juniper (*J. communis*) is a smaller species, rarely reaching 50 feet in height and usually less than 25 feet tall, and many of its numerous varieties less than 10 feet. It is

widely distributed throughout the northern hemisphere, especially in the colder latitudes and altitudes. Like the preceding species its wood is valued, when of sufficient size, for posts, veneers, pencils, and for turning. The tree itself is also used for ornamental planting. Its bark is sometimes twisted into ropes and its long, tough, fibrous roots are used for making baskets. Its blue-black fruit, which it yields profusely, is used for flavoring certain liquors, as is also the oil obtained from them and from the twigs by distillation with water. This oil has been used in medicine as a stimulant, but is less popular than formerly. The Bermuda cedar (*J. bermudiana*) resembles the Virginian juniper, but is of stouter build, though it rarely exceeds 40 feet in height. Its wood is rather more fragrant than that of the preceding species, like which it is used. Formerly it was employed in the ships built in the Bermudas, but the forests which supplied this industry were mismanaged and the industry perished. Several other species are of more or less economic importance; for instance, the Spanish juniper (*J. oxycedrus*), a shrub which attains a height of about 12 feet, whose fruits yield a disagreeable smelling oil (oil of cade), used in veterinary medicine; and African juniper (*J. procera*), a useful timber species and probably the largest of the genus, often attaining heights of 150 feet in the mountains of eastern Africa, where it is native.

Junipers succeed best in moderately moist, sandy loam in open, sunny situations. They make excellent windbreaks and shelter belts, especially where the soil is too dry, rocky or gravelly for other trees. They may be propagated by seeds which, however, usually require two, sometimes three, years to germinate. Cuttings of almost mature wood are taken in the autumn from the needle-leaved kinds and grown under glass or in the open; species with scale-like leaves are generally side-grafted in the greenhouse during winter. Some of the shrubby species are propagated by layers.

Junipero, Miguel José Serra, mē-gĕl' hō-sā' sĕr'rä hoo-nē'pā-rō, Spanish missionary in America: b. island of Majorca 24 Nov. 1713; d. Monterey, Cal., 28 Aug. 1784. He became a member of the Franciscan order in 1729, in 1750 arrived in Mexico City as a missionary, and in 1750–69 was active among the native tribes. In 1769 he went to the site of San Diego Cal., where he founded a mission. He gathered about him a band of sixteen of his order, and these missionaries converted over 3,000 Indians, of whom Junipero himself is said to have baptized more than 1,000. Junipero instructed the natives in the arts of civilization, and the colonies which assembled about the mission stations constituted the first settlements in California. His headquarters were at Monterey, but he founded several other missions. Bret Harte incorrectly gives his name as Serro.

Ju'nius Letters, The. During the period between November 1768 and 21 Jan. 1772, there appeared in the London *Daily Advertiser* a series of mysterious letters aimed at the British ministry of that day, and signed by various pennames — the most remarkable of them by that of one "Junius." During the century ensuing, the authorship of these epistles has been assigned with some degree of probability. The merits of the 'Letters' have been sufficient to give them a life all the more vigorous, perhaps, because they have been conjecturally assigned to Sir Philip Francis. The author was a man thoroughly cognizant of British politics; a vehement opponent of the government, and a fiery pleader for popular liberty. The dominant message is sounded in these words from the first letter of the series: "The admission of a free people to the executive authority of government is no more than compliance with laws which they themselves have enacted." Much constitutional knowledge is shown in these trenchant attacks, which continually refer to the British Constitution as the bulwark of the people's rights. In manner, the letters are vigorous, bold, and among the finest specimens of impassioned invective and irony in English literature.

Junkers, yoong'kĕrz, a name given to the younger members of the nobility of Prussia and the adjoining states. "Junkerthum" was a term of reproach used in the 19th century to designate the party of reaction in Prussia, which found its most strenuous supporters among the nobility.

Junk'in, George, American Presbyterian clergyman: b. near Carlisle, Pa., 1790; d. 1868. He was graduated from Jefferson College (Pa.) in 1813 and entered the Presbyterian ministry in which he became prominent as a leader of the party known as Old School Presbyterians. He founded Lafayette College at Easton, Pa., in 1832, and was its president till 1841, returning thither in 1845, after three years spent as president of Miami College at Oxford, Ohio. In 1848 he became president of Washington College (now Washington and Lee). He was an outspoken upholder of slavery, but was opposed to secession, and on account of his Union sentiments resigned the presidency of the college in 1861. Consult: 'Life' by D. X. Junkin (1871).

Junks, large flat-bottomed vessels, from 100 to 150 tons burden, used by the Chinese. They have three masts, and a short bowsprit placed on the starboard bow. The masts are supported by two or three shrouds, which, at times, are all carried on the windward side. On the fore and main mast is a sort of lug-sail, of cane or bamboo.

Ju'no, the most exalted divinity of the Latin races in Italy next to Jupiter, of whom she was the sister and wife; the equivalent of the Greek Hera. She was the queen of heaven, and under the name of Regina (queen) was worshiped in Italy at an early period. She bore the same relation to women that Jupiter did to men. She was regarded as the special protectress of whatever was connected with marriage. She was also the guardian of the national finances, and a temple, which contained the mint, was erected to her under the name of Juno Moneta on the Capitoline.

Junot, Andoche, äṅ-dōsh zhü-nō, Duke of Abrantes, French marshal: b. Bussy-le-Grand 23 Oct. 1771; d. Montbard 22 July 1813. He was intended for the bar, but on the outbreak of the revolution joined a volunteer battalion,

and soon attracted notice. At the siege of Toulon, in 1793, he became secretary to Napoleon, and went with him into Italy and Egypt in the capacity of aide-de-camp. In Egypt he was advanced to the rank of general of brigade. In 1800 he was made commandant of Paris, and he particularly distinguished himself at the battle of Austerlitz in 1805. In 1807 he was sent with an army into Portugal, and made his entry without opposition into Lisbon, his success being rewarded with the title of Duke of Abrantes. On the arrival of the British he was defeated at Vimeira, and was then obliged to submit to the humiliating convention of Cintra. Although he subsequently took part in the campaigns (1809) against Austria, (1810) against Spain, and (1812) against Russia, he failed to retrieve his reputation. In 1813 he became insane, and lost his life by leaping from a window.

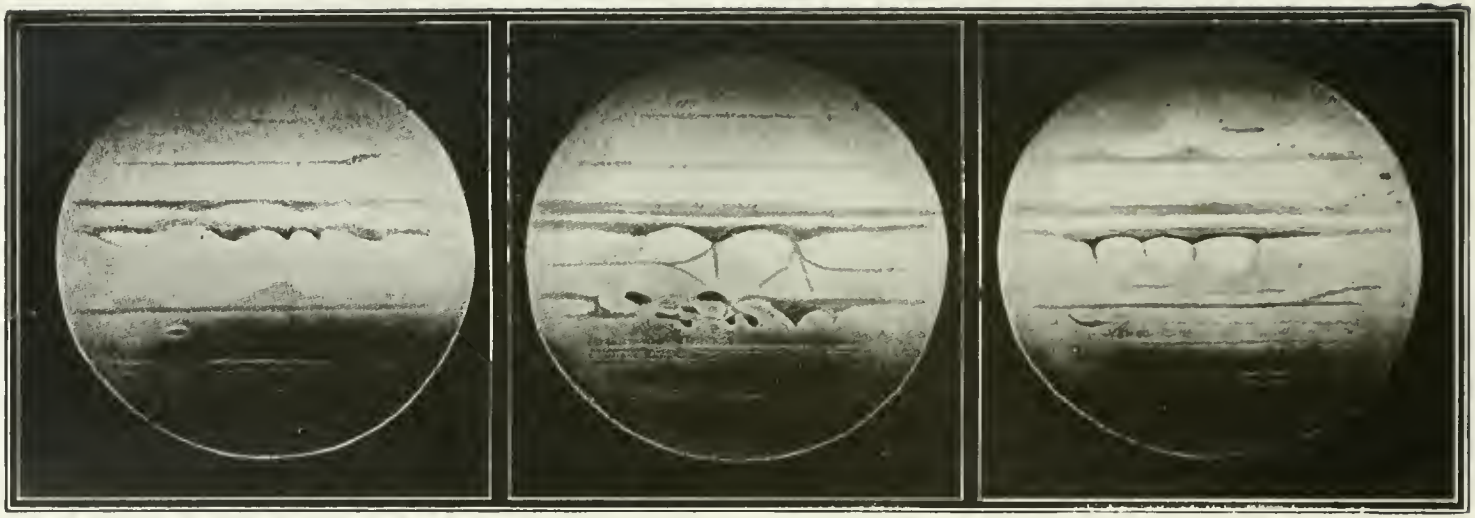
Junta, a high council of state; a term common in all Spanish-speaking countries. It was originally applied to an irregularly summoned assembly of the states, as distinguished from the cortes or parliament regularly called together by the authority of the king. In Cuba the term was adopted by the insurgents before the Spanish-American war, to designate the general legation of the Cuban republic abroad. This legation or junta was first appointed 19 Sept. 1895, by the Constituent Assembly that formed the insurgent Cuban government, which at the same time made T. Estrada Palma head of the junta and chief Cuban representative abroad, with authority to appoint ministers to all governments and to have control of Cuba's diplomatic relations and representatives throughout the world. The junta established its headquarters in New York, and was the organization through which the insurgents' friends outside of the island communicated with the Cuban soldiers in the field during the Spanish-American war. See CUBA.

Junto, The, a club formed in Philadelphia by Benjamin Franklin for mutual improvement. Morals, politics, and natural philosophy, as well as the social well-being of man, were the main subjects discussed. It continued for about 30 years. The name was also applied to an English Whig ministry in the reign of William III., the chief members of which were Admiral Russell, Somers, Lord Wharton, and Montague, the great financier. This was the first ministry ever made of one and the same party politics. It was the suggestion of Robert, earl of Sunderland, to William III., who shrewdly said, if all the ministers were of one party they would pull together.

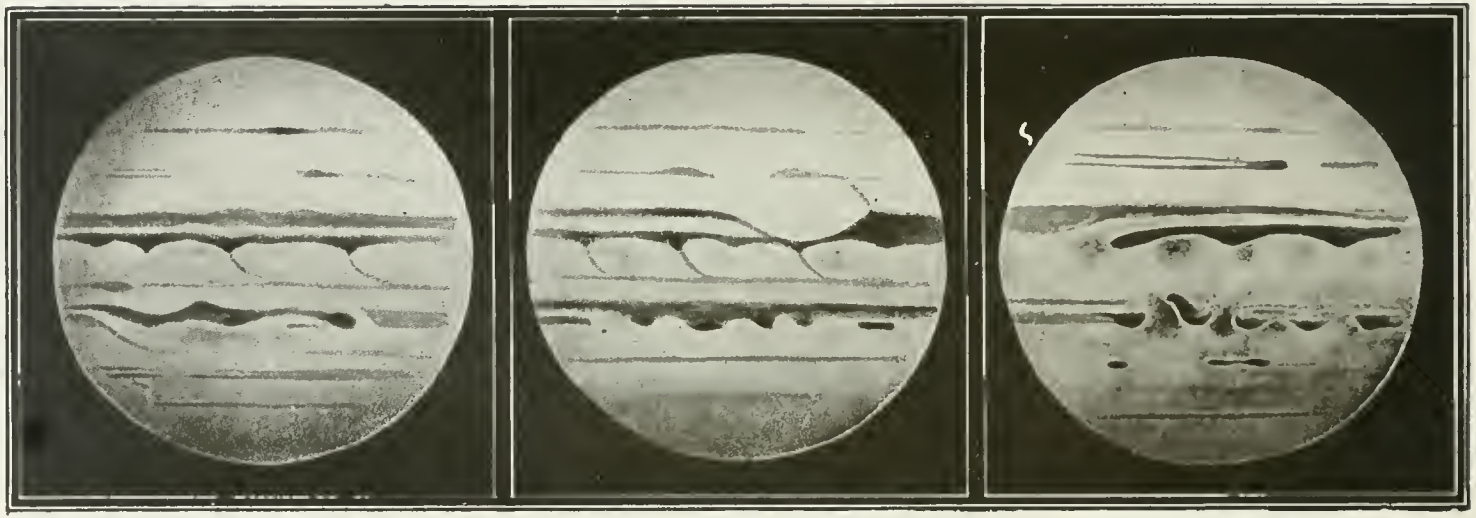
Jupati, joo'pä-tē, a palm (*Raphia tædigera*) of the tide-flooded lands of the lower Amazon and Pará rivers, remarkable for its leaves, probably the largest in the vegetable kingdom. The trunk is only 6 or 8 feet high, and 1 foot in diameter. The leaves rise nearly vertically from the trunk, bending out on every side in graceful curves, forming a magnificent plume 70 feet in height and 40 in diameter. Leaves have been measured 50 feet long, and the leaf-stalk is often 12 or 15 feet long below the first segments of the leaf, and 4 or 5 inches in diameter, perfectly straight and cylindrical, and when dried light and strong as the quill of a bird. The Indians split it into laths for a variety of purposes — window-shutters, boxes, bird-cages, partitions, and even entire houses being constructed of it, with the addition of a few supporting posts at the angles. The fruit, a large oblong drupe, has a bitter oily flesh.

Jupiter, joo'pĭ-tẽr, or **Juppiter,** the supreme deity of the Latin races in ancient Italy, the same as the Greek Zeus. As the supreme deity Jupiter received from the Romans the title of *optimus maximus* (best greatest), and as the deity presiding over the sky he was considered as the originator of all the changes that took place in the sky. From him accordingly proceeded rain, hail, and the thunderbolt, and he it was that restored serenity to the sky after it had been obscured by clouds. Hence the epithets of Pluvius (rainy), Tonans (thundering), etc., were applied to him. The most celebrated of his temples was that on the Capitoline Hill dedicated to him as Jupiter Optimus Maximus, jointly with Juno and Minerva. He was represented with a sceptre as symbolical of his supreme authority. He was the guardian of all property; and every Roman was believed to be under his protection, and that of his consort Juno, the queen of heaven. White animals were offered up to him in sacrifice, his priests wore white caps, and his chariot was represented as drawn by four white horses. See JUNO.

Jupiter, the largest planet of the solar system, and the fifth (excluding the asteroids) in order of distance from the sun. Its mean diameter is about 85,000 miles; polar diameter about 82,000; its mean distance from the sun 475,692,000 miles; its period of revolution round it 11 years 10⅓ months; its orbit is inclined to the ecliptic at the angle 1° 18′ 40.3″. The inclination of its axis is 3° 5′ 30″, so that changes in the seasons must be almost unknown; its volume is 1,300 times that of the earth, but its mass is only 300.857 times. Jupiter has five moons, the last was discovered by Barnard, at Lick Observatory in 1892. The other four were discovered by Galileo in 1610 and are visible through an ordinary telescope. They are at average distances of from 267,380 to 1,192,820 miles from the planet; they appear to make one revolution on their axis while passing once round the planet. Europa, the smallest, has a diameter of 2,099 miles, somewhat less than that of our moon; Ganymede, the largest, has a diameter of 3,436 miles. The planes of their orbits are nearly the same as the ecliptic and the orbit of Jupiter. The disk of Jupiter is crossed in a direction parallel with the equator by three or four vividly marked bands or belts; other of these belts vary in density and distinctness. Spots also appear and remain for some time on its surface. In particular, a large red spot of varying dimensions has been observed from time to time. Professor George Washington Hough sums up the results of his 23 years of observations of Jupiter somewhat as follows: First, its equatorial belt changes both in size and position slowly and gradually. Second, the fainter belts also vary. Third, the circular white spots are very permanent in latitude, but are not fixed in position one with another. Fourth, the dark spots of the same size as the circular white spots are not so stable as they, and probably lie at the level of the equatorial belt. Fifth,



1896, MARCH, 2d. 6h, 30m. G.M.T. 1897, MARCH, 9d. 11h. 55m. G.M.T. 1898, APRIL, 4d. 9h. 55m. G.M.T.



1899, APRIL, 15d. 12h. 10m. G.M.T. 1900, APRIL, 20d. 14h. 15m. G.M.T. 1902, JUNE, 26d. 14h. 31m. G.M.T.

CHANGES IN THE ASPECT OF THE PLANET JUPITER OBSERVED AT VARIOUS TIMES.

the large, irregular white spots near the equator make one rotation in 9 hours 50 minutes. As to the constitution of the planet, Prof. Hough concludes that the matter at the visible boundary of Jupiter has a density about half that of water (the average density of the planet is 1.37 times that of water). The medium at the boundary is in the nature of a liquid. In it the great red spot and the circular white spots are located. In such a medium all motions would be slow and gradual and the shape and size of an object would be very permanent. The equatorial and polar belts may be located on the surface or at a higher level than the red spot. In middle latitudes within 20° of the equator the higher atmosphere carries a layer of dark matter. In this envelope are formed the openings that we call white spots, and by unequal distribution black spots. The belts may be assumed to be some sort of vapor of considerable density. The planet is at a high temperature, but not self-luminous.

Jura, joo'rä, a chain of mountains in central Europe, partly belonging to France, partly to Switzerland, between which they form a sort of natural barrier, extending from southwest to northeast, and exhibiting a number of parallel ridges. The greatest length is nearly 200 miles, from Belley in France, department of Ain, to the banks of the Rhine; and the greatest breadth about 60 miles, between the Lake of Geneva and the banks of the Doubs. The principal geological formation is the Jura limestone, with greensand, belonging to the lower cretaceous series. Stalactite caves are numerous. The two chief rivers having their source in the chain — the Ain and the Doubs — are both French. They descend from its western slopes, and belong to the basin of the Rhone. The highest peaks of the Jura are Crêt de la Niège, Reculet, Mont Tendre, and Dôle, all over 5,500 feet.

Juras'sic, a system or series of formations with like characteristics, and containing fossil remains indicating a time occupying the first half of the Mesozoic period, and characterized by many changes in the distribution of sea and land, especially in the northern hemisphere, where the present continental areas were apparently represented by archipelagoes. The formations of this period take their name from their prominent exposure in the Jura Mountains; but are known in Great Britain as the Oölites because there made up of granular (oölitic) limestones below the Cretaceous and above the Lias, from the latter of which the series is separated by no very definite boundary. In America synchronous formations are, indeed, called "Juratrias" and represent the transition from the Permian to the Cretaceous. The Jurassic is represented somewhat in South America and in the western United States, as in the highly fossiliferous "Como stage" beds of Wyoming, and the auriferous state of California, but most strikingly in the brown "bird-track" sandstones of the Connecticut Valley, in Nova Scotia, and in the red rocks that crop out along the eastern foot of the Alleghanies from New Jersey to South Carolina. During this period most of the globe now dry land was covered with shallow seas which were the abode of a great variety of lowly fishes and reptiles. On land it was the height of the age of reptiles, and especially of dinosaurs (q.v.) and pterodactyls. Toward its close the progenitors of birds appeared in the shape of *Archæopteryx* (q.v.), and traces of mammals are found. Consult authorities mentioned under GEOLOGY.

Jurel, joo'rĕl, or **Xurel,** a fish of the genus *Caranx*, especially *C. crysos*, more widely known as the yellow mackerel and hard tail. Unlike most members of this tropical genus, the jurel is common as far north as Cape Cod. In Florida and the Gulf States it is an important food-fish, caught in seines during the spring and summer when in shallow water for the purpose of spawning. It is migratory, and like most wandering fishes carnivorous and voracious.

Jurisdiction includes both the right to exercise authority (*imperium*) and the field within which such authority may properly be exercised (*dominium*), whether its limits be territorial or personal. In early law, jurisdiction in the second sense was rather personal than territorial, and the same must be true wherever distinct races occupy together the same territory. While the tendency is to gradually work out a system of law applicable to all inhabitants, the state must of necessity recognize the fact that its subjects of different races will consent to be governed only by separate and often contrasting systems. Such is the case, for example, in British India to-day. So, too, jurisdiction was divided according to the subject matter, and the Church secured and jealously maintained authority over all matters of conscience, and managed to extend the jurisdiction of the ecclesiastical courts to very important questions, including marriage, legitimacy, wills, and administrations, and to actions affecting the personal rights of the clergy.

The Constitution of the United States discriminates clearly and sharply between the executive, the legislative, and the judicial powers of government, and its provision that the Constitution and the laws of the United States made in pursuance thereof shall be the supreme law of the land, taken in connection with the provision that the judicial power shall extend to all cases arising under the Constitution, forms the basis of a jurisdiction which, at least in the extent to which it has been carried, is without precedent outside of the United States. It is by virtue of these provisions that the Federal courts exercise the power of declaring void acts of Congress or of the State legislatures which conflict with the Constitution of the United States. To this power and the energy and ability of the Supreme Court in its exercise, are due the vigor and efficiency of the Federal government and the establishment of its supremacy within the field of its jurisdiction. This feature has been imitated in the several State constitutions with results unquestionably beneficial as a whole, and so important that the courts have come to be spoken of as the guardians of the constitution. But one result not so fortunate is that the legislative branch of the government, though in theory as much bound by constitutional restrictions as though there were no authority to which an appeal against the validity of its enactments can be taken, is manifesting a disposition to disregard them altogether, leaving the whole question of con-

stitutionality to the courts. As our system of government provides no method by which the question can be raised, except in the course of a litigation in which one party relies upon the right conferred by such a statute, there are possibly many unconstitutional acts in force in the various States. A more important consideration is that a disposition on the part of the judiciary to interfere with matters properly legislative may thus be created, and lead to forced constructions by which any law which the judges believe to be bad is held obnoxious to the constitution — resulting in illogical and inconsistent decisions, and a weakening of the authority of the courts.

The Constitution provides that the judicial power of the United States shall extend to controversies "between citizens of different States." The purpose was to open the way for legislation which would provide a tribunal in which the right of a citizen of any State to pursue his legal remedies could not be denied; probably, too, to afford him a tribunal less likely to be affected by local prejudice than a State tribunal of first instance, probably a county court. It is not contended that anything further was designed, but upon this clause depends the most extensive and, except for the provision as to constitutional interpretation which we have just considered, the most important, body of Federal decisions. The tendency of the Supreme Court was at first to hold that the Federal court should administer the law of the State in which it was sitting and that while a citizen of Pennsylvania, for example, having a claim against a citizen of New York, might, if he saw fit, bring his action in the Federal, rather than in the State, court — the law to be applied would be the law of the State of New York. But this rule has been departed from in the later decisions, and while the Federal courts still hold themselves bound to follow the interpretation put upon State statutes by the State courts (unless, of course such statutes are attacked as in conflict with the Constitution of the United States), they hold themselves free to disregard the interpretation of the common law by the State courts, and the system of law built up within the State by the adjudications of its courts, and to adopt their own interpretation, and follow their own judgment. That the Federal courts are popular is shown by the fact that the most important litigation, estimated on the basis of the amount at stake is, where possible, usually brought before them, notably proceedings against corporations and especially the foreclosure of corporation mortgages where it is quite common for the trustee for the bondholders to be a corporation or individual of another State, or where a committee of bondholders, or even a single bondholder, residing outside the State which is the domicile of the debtor corporation, is the plaintiff. This is sufficient to give jurisdiction to the Federal court.

We have therefore a most interesting condition of concurrent jurisdictions applying to every inhabitant of the United States. The Federal courts are courts of limited jurisdiction — limited to authority expressly conferred by the Constitution and laws of the United States, but once jurisdiction is established, unlimited in the scope of its exercise. Congress has prescribed that the jurisdiction shall only exist when the matter in controversy has a pecuniary value exceeding $2,000, and that actions shall be brought only in the district within which the plaintiff or the defendant resides, and has made provision for the removal from the State courts of causes which might originally have been brought in the Federal courts. Some of the States have attempted to prevent this increasing jurisdiction of the Federal courts; for example, by the passage of acts providing as a condition of a license to a foreign corporation to do business within the State, that such corporation, if sued, would not remove the cause into the Federal court. Such acts are manifestly unconstitutional, and have been so declared.

JOHN DOUGLASS BROWN,
Philadelphia.

Jurisprudence. See LAW.

Jury, twelve impartial men legally competent to act, who, under the sanction of their oaths, determine by their unanimous verdict the innocence or guilt of the accused in a criminal trial, or decide the issues of fact which are contested between plaintiff and defendant in a civil trial.

The jury is the characteristic feature of English or Common law, distinguishing it from the systems of Continental Europe derived from the law of the Roman Empire. It is peculiar in itself and incidentally it has produced characteristic developments of our law not found in the Roman or Civil law systems, of which perhaps the most noteworthy is our law of Evidence. The history of the jury system has been most thoroughly and ably investigated, especially in recent years.

Its function has completely changed. Originally those persons from the vicinity who had knowledge of the subject matter were summoned to court to state, upon their solemn oaths, what the common opinion of the neighborhood was as to those facts which formed the basis of the criminal charge to be tried, or the basis of the right to possession or enjoyment of land which was at issue, which were the typical cases of early days. It seems to have been soon established that 12 substantial men were a sufficient number to determine this question. As the judicial system developed, courts came to have more extended territorial jurisdiction, and litigation grew more extensive. Attendance of 12 persons acquainted with the facts of each cause to be tried would impose an intolerable burden upon the community, and our forefathers worked out the plan of submitting their legal controversies to the decision of an impartial jury sworn to determine the facts in issue upon testimony given under oath by witnesses summoned by the parties.

Students of English and American history would probably unanimously agree that as a part of our system of civil government the jury has been a valuable institution. There can be no doubt of its educational value, and of its importance in making each freeholder who served on a jury feel that he was individually performing an important public duty. Juries played a conspicuous part in defense of popular rights against attempts at tyrannical exercise of authority by the executive government. In the libel cases of the 18th century the contest was bitterly fought, the judges, under the lead of Lord Mansfield, maintaining that whether a document

was libellous or not libellous was a question of law for the court (that is, for the judge) to determine, the jury being limited to finding affirmatively or negatively the fact of publication; while the juries, on the other hand, contended for their right to find general verdicts ("guilty" or "not guilty"). The contest was settled by Fox's Libel Act in favor of the right of the jury to determine the guilt or innocence of the accused.

Students of law differ as to the merits of the jury system. Arguments drawn from the supposed mental inferiority of juries need not be considered, since this is not an inherent defect, and there is no more reason why a community should have inferior jurymen than inferior officials of any other class. But weighty objections of an essential character have been suggested. The chief is as to the requirement of an unanimous verdict, which, it is argued, must constantly produce a disagreement and failure to reach a conclusion, or the sacrifice of opinions conscientiously held by some of the jurors. There is no doubt that this requirement is an essential feature of the jury system as known to English law; it has been expressly so decided by the Supreme Court of the United States which, in interpreting the clause of the Federal Constitution which provides that in civil suits in the Federal courts "the right of trial by jury shall be preserved," has held that this requires the unanimous verdict of 12 men. A small number of the States have modified the system by providing for juries of less than 12, or of verdicts rendered by a vote less than unanimous. When such legislation is not in conflict with the State constitution it is lawful, as is doubtless the provision authorizing the service of women on juries.

Another objection is the doubt as to whether the jury is the best means of arriving at determinations of fact. This controversy has been bitterly fought, one side maintaining that the jury is not fitted, either by training or capacity, to decide fairly and intelligently doubtful questions of fact, and that one of its most important functions, that of assessing damages, is not properly performed, especially where the requirement of unanimity necessarily leads to compromise verdicts. On the other hand it is argued that the jury, if properly drawn, represents the average intelligence of the community, and that when it does so, no fairer tribunal can be discovered, and not, perhaps, very consistently, that in civil matters control of the case is really in the judge, who by careful instructions can usually so direct the jury as to bring about an intelligent verdict, or, as a last resort, can set aside one which is clearly wrong, and award a new trial.

A verdict of acquittal in a criminal proceeding finally disposes of the charge against the defendant both by the common law and, in this country, by the provisions of the Federal Constitution (and of most, if not all, of the State constitutions) that no person shall "be subject for the same offense to be twice put in jeopardy of life or limb." Doubtless from this arose the doctrine that in criminal cases the jury are judges both of law and fact, which caught the popular fancy, is not without the weight of respectable judicial authority to sustain it, from the time of Junius, who upheld it in opposition to Lord Mansfield, has been a favorite doctrine of popular leaders, and only in recent years may be regarded as finally disposed of. The doctrine was discussed by Chief Justice Mitchell, of Pennsylvania, in a capital case in 1891, and pronounced by him to be "unsound in every point of view, historical, logical, or technical," and in 1895 the Supreme Court of the United States (speaking by Mr. Justice Harlan) reached the same conclusion and held that in the courts of the United States it is the duty of the jury in criminal cases to receive the law from the court, and to apply it as given by the court, subject to the condition that by a general verdict a jury of necessity determines both law and fact as compounded in the issue submitted to them in the particular case. Mr. Justice Gray filed a long and able dissenting opinion concurred in by Mr. Justice Shiras, and in this case, reported in 156 United States Reports (page 51), all the arguments on both sides can be found.

The grand jury is, historically, a sort of representative committee of the people of the district throughout which the jurisdiction of the court extends, charged with the duty of reporting to the court offenses which have been committed which they consider should be inquired into, and persons whom they believe to have committed criminal acts for which they should be punished. Its development into the modern grand jury is not well understood. The highest authorities on our early legal history say of it, "The details of this process will never be known until large piles of records have been systematically perused. This task we must leave for the historian of the 14th century."

The grand jury as an existing institution consists of a number of persons drawn from the same class as the ordinary or petit jurors. At the common law the number summoned was 23. They are sworn to the faithful discharge of their duties, and the court then delivers a charge to them, calling their attention to the duties they are to perform, either generally or with reference to any matters of special public interest falling within their jurisdiction to which the court thinks proper to direct their attention, and they can then proceed to business. All indictments are submitted to them and, according as they determine, after hearing the prosecutor's evidence, whether they are well founded or not, they indorse them "true bill" or "ignoramus" (or equivalent words). In the former case the accused is held for trial, in the latter discharged. It is the custom for them to make report to the court on such matters as seem to them of public interest and importance, and to make such recommendations as seem good to them. The report made by them of any offense from their own knowledge or observation, without a bill of indictment laid before them, is called a Presentment.

For the history of the origin and development of the jury, consult: Pollock and Maitland, 'History of English Law'; Thayer, 'Preliminary Treatise on Evidence at the Common Law' (chapters ii.–iv.); Stephen, 'Commentaries on the Laws of England' (Bk. V., ch. xiv.); Stubbs, 'Constitutional History of England'; Cooley, 'Constitutional Limitations.' For a discussion of the merits of the institution under modern conditions which is generally accepted as full and impartial, consult 'The System of Trial by Jury,' by the late Mr. Justice Samuel F. Miller (21 Amer. Law Review, 859). For the origin of the grand jury: Pollock and

Maitland, 'History of English Law' (Bk. II., ch. ix., § 4).

JOHN DOUGLASS BROWN,
Attorney at Law, Philadelphia.

Jusserand, Jean Adrien Antoine Jules, zhŏn ädrēäṅ än-twän zhül zhü-sĕ-rän, French diplomat and author: b. Lyons 18 Feb. 1855. He was educated at the Faculté de Lyon, in 1878, entered the French ministry of foreign affairs as consul at London; subsequently held other posts in the ministry, among them that of chief of the bureau of Tunisian affairs, and that of associate sub-director of the protectorate; in 1887–90 was councillor of the French embassy in London. In 1890 he became minister to Denmark, and in 1902 ambassador to the United States. His best known work is his 'Les Anglais au Moyen Age: La Vie Nomade et les Routes d'Angleterre au 14me Siècle' (1884; trans. by Smith as 'English Wayfaring Life in the Middle Ages' 1892), which was crowned by the Académie. Of his further writings, the following have appeared in English: 'The English Novel in the Time of Shakespeare' (1890); 'A French Ambassador at the Court of Charles II.' (1892); 'Piers Plowman' (1894); 'English Essays from a French Pen' (1895); 'A Literary History of the English People,' vol. I. (1895); 'Shakespeare in France under the Ancient Régime' (1899).

Juste, Theodore, Belgian historian: b. Brussels 11 Jan. 1818; d. August 1888. He was secretary of the Belgian board of education and as such made many beneficial changes in the national methods of instruction. He was a prolific writer on Belgian and French history, the most noteworthy of his works being: 'Historie élémentaire de la Belgique' (1838); 'Histoire de la révolution Belge de 1790' (1846); 'Précis de l'histoire du moyen âge' (1847–9); 'Le soulèvement de la Hollande en 1813, et la fondation du royaume des Pays-Bas' (1870); 'Guillaume de Taciturne' (1873); 'Léopold I. et Léopold II., rois de Belges' (1878); 'Les fondateurs de la Monarchie Belge' (27 vols., 1865–81); 'La révolution de juillet, 1830' (1883); etc.

Justice, Department of, in the United States, an executive branch of the government, the supreme head of which, the attorney-general, is appointed by the President and confirmed by the Senate. He is a member of the cabinet, according to the provisions of the Act of Congress of 19 Jan. 1886, ranking fourth, after the Vice-President, in the line of succession to the Presidency in case of a vacancy in that office, and his salary is $8,000 a year.

The office of attorney-general was established in 1789, almost at the beginning of the government, being provided for by the great act that established the federal courts, but the department of justice was not organized into a separate department nor placed under the charge of the attorney-general until 1870, when by the act of 22 June of that year, the establishment of this department brought under his control all United States district attorneys and marshals and secured uniformity in the trial and prosecution of cases. By this act the solicitors from the interior, navy and treasury departments and the examiner of claims of the state department were also brought under the control of the department of justice.

As head of the department of justice, the attorney-general is the chief law officer of the government, is the legal adviser of the President on any questions of law which may arise in the conduct of administrative affairs, and is also required by statute to give his advice and opinion, when requested, to the head of any executive department on any question of law arising in his department. The attorney-general represents the government in all cases at law to which it may be a party, but he rarely argues the case in person, this work being performed by his subordinates, whom he appoints, or by special counsel whom he is authorized to employ in cases of especial importance to the government. The attorney-general passes upon the validity of the title to public lands or other property to be purchased by the government for the erection of public buildings or for other public purposes; he also exercises general superintendence and direction over the attorneys and marshals of all the districts in the United States and the Territories as to the manner of discharging their respective duties. The supervision of the penal and reformatory institutions of the United States, the supervision of the revision and codification of the criminal and penal laws, the recommendation of judicial appointments, the administration of the national bankruptcy laws, etc., are other duties which come under the direction of the department of justice.

The solicitor-general, whose office was created in 1870, ranks as second officer of the department of justice; takes the place of the attorney-general in the latter's absence, and also has charge of the conduct of cases in the courts at Washington.

Justice, Lord, a person invested with royal authority in England for a short time, during the absence of the monarch. Queen Victoria and her successor Edward VII. have never appointed lord justices in their absence; George IV. was the last king of England to do so. The powers of lord justices have been confined to pardoning or reprieving convicts, summoning or proroguing parliament, disposing of treasury funds, and making church preferments. In the absence of the viceroy from Ireland lord justices have sometimes been appointed to perform his functions.

Justice of the Peace. See COURT.

Justification. Under this head fall many intricate problems toward the solution of which theology contributes in its discussions of that very abstract subject: Grace. The term explains itself and no matter where it is applied the fundamental idea is the same and means pardon, acquittal, readjustment, restoration. In divinity it alines itself very closely with atonement and imputation (q.v.). No matter how opinions may differ as to its nature, there is agreement on this, that justification may be defined as that process whereby fallen man is forgiven his transgression and restored as much as is compatible with his changed condition to the state and privileges which were his before his disobedience. All Christians admit that this repristination came and comes through Christ. It has been and is the duelling ground of the two religions which have most largely divided the world. Relating to this topic the attitude

of Catholics and Reformers is antipodal. The leader of Protestantism is clear in his affirmation. Catholic teaching and dogmatic enunciation is not one whit less positive. The question is cardinal for both. In the process of justification the agent is God through Christ; the object, man. The crux of the difficulty is how does God effect it and how is man affected by it. Is righteousness imparted or infused? Luther and his disciples consider justification as imputed to the individual. This restored condition is something outside himself, with which he has nothing to do. "The justified man is not only acquitted as innocent but regarded as having perfectly obeyed the Law in the person of Christ. There is to him the non-imputation of sin and the imputation of righteousness." "The faith doth not shut out repentance, hope and the fear of God in every man justified, but it shutteth them out from the office of justifying." (Church of Eng. Homily.) It becomes imperative for every attempt to solve this problem to consider man's will and divine grace. Luther apprehensive lest by any concession he might minimize the value of the latter denied free will in human nature and asserted that by faith, a strong faith in the special mercy of God and by that alone man was justified. To use his own words (Cap. 2 ad Galat.): «Faith, without and antecedently to charity, justifies.» Faith does not cause justice in any way — it is not the cause but the organ of justification. Man is in no way intrinsically affected by it and its essence is in the imputation of the justice of Christ. Calvin referring everything to the elect teaches that faith once received can never be lost, that is, a man justified is so forever, independently of his actions. Baptism is not necessary for salvation. The predestination of the elect is their salvation. The breaking up of Protestantism into the many denominations which now exist, necessarily brought variants in this doctrine, yet it may be put down as the generally accepted formula. The idea was not new if we are to credit what Saint Augustine says (De fide et oper. 14) wherein he remarks that even in the time of the apostles some, not understanding, concluded from the epistles of Saint Paul that faith alone was necessary for salvation, whereupon Peter, James and Jude wrote to instruct the faithful that such was not the meaning of Saint Paul's words. The Catholic theology has been reproached with emphasizing the worth of man's works to the detriment of divine grace. The doctrine of Catholics is that the Pope, councils, the fathers, the doctors and the apostles, and hence Christ, affirmed that justification is of a nature to require, except in infant baptism, good works on the part of man to ripen unto salvation. Faith alone will not suffice. It is gratuitous and unmerited save through Christ. It is supernatural. It is a created gift and when bestowed, as in justification, the recipient becomes inherently just, not accidentally nor vicariously. Initial justification is infused in baptism, which sacrament incorporates the one baptized into and with the mystical body of Christ, his church, and lives by grace, which is living of the life of Christ as an engrafted branch lives the life of the vine. In this incorporation, since Christ is Son of God, is founded the adoption and heirship of the baptized as sons of God. What is said of baptism is held concerning justification as administered by the other sacraments. It is not contended that by it sin is blotted out "historically," that is, sins committed do not cease to be part of man's past, but are remitted in as much as they are provocative of God's anger and as truly pardoned as if the sinner had never rendered himself guilty of them; they are effaced in the moral order and in the physical order the stains they leave on the soul are washed out, stains which make the soul displeasing to God. Natural powers, no more than the Mosiac law, suffice for salvation which is to be reached through Christ only and for which in the adult some disposition of his own contributing is requisite. Moreover, while by justification sin is remitted, this remission calls for an interior disposition and renovation of soul, whence justification is a quality superadded to the soul to which it is inherent and therefore is more than transference or imputation. The fruits of justification are the rendering of man pleasing to God, just, beautiful, like unto Christ, a living member of Christ and God's son by adoption, heir to the kingdom of heaven, a participant in the divine nature (*consors divinæ naturæ*) and capable of condign merit. When a man is justified there is within him a special indwelling of the Holy Spirit. There is no understanding with accuracy these different theories of justification save by a thorough inquiry into the views of theologians on the very abstruse questions of the incarnation and grace.

Bibliography.— Denziger, 'Enchiridion'; Humphrey, 'The One Mediator'; Mohler, 'Symbolism'; Newman, 'Justification'; Oxenham, 'The Catholic Doctrine of the Atonement'; the works of Luther, Melancthon, Calvin, etc.; Decrees of the Council of Trent; Systematic Theologies; Art, Rechtfertigung, Kirchenlexicon.

P. A. Halpin,
Saint Thomas' Rectory, New York.

Jus'tin I., Byzantine emperor: b. 450; d. 1 Aug. 527. He was a peasant of Dacia and rose from the rank of a common soldier to be commander of the imperial guard, and on the death of Anastasius I. in 518 became emperor. He relegated the civil administration to the quæstor Proclus, and between them the empire was governed with a fair amount of success. Consult Bury, 'Later Roman Empire' (1889).

Justin II., Byzantine emperor: d. 5 Aug. 578. He succeeded his uncle Justinian I. in 565. Beset with enemies outside the empire and harassed with internal discord, he in 574 solved his difficulties by abdicating in favor of Tiberius, captain of the guard. During his reign northern Italy was conquered by the Lombards, and the Persians took possession of several Asiatic provinces of the empire.

Justin (Marcus Justinianus Justinus), a Latin historian, who probably lived at Rome in the 2d or 3d century A.D. He made an epitome of the general history of antiquity by Trogus Pompeius, a native of Gaul, who lived in the time of Augustus, and whose work is no longer extant. This epitome, although incorrect in detail, is valuable for its compressed reproduction of the old histories. The first English version, by Goldingé, appeared in 1574.

Justin Martyr (JUSTINUS MARTYR), a Christian apologist and martyr: b. Flavia Neapolis, Shechem, Palestine, 100 A.D.; d. Rome 165. He began active life as a professor of Platonic philosophy, and subsequently embraced Christianity without abandoning Platonism. He was a staunch adherent of the Christian party in the empire, a keen confuter of Gnosticism, and an unwearied defender of the Christian doctrine of the Logos. In every department of Christian dogmas he stood foremost as a teacher. Eventually he went to Rome (150 A.D.) and during ten years of activity he wrote his 'Apology,' with a supplement known as the 'Second Apology,' addressed to the Emperor Marcus Aurelius. He afterward had a controversy with a Jew, an account of which is embodied in his 'Dialogue with Trypho the Jew.' He was put to death for his faith, and his day on the Church calendar is 31 April. Consult: Migne, 'Patrologia'; Semisch, 'Justinus der Märtyrer'; Aubé, 'Justin, Philosophe et Martyr' (1874).

Justin'ian I. (FLAVIUS ANICIUS JUSTINIANUS), surnamed the GREAT, emperor of the East: b. of Gothic peasant parentage at Tauresium, Illyricum, probably 11 May 483 A.D.; d. 14 Nov. 565. Patronized by his uncle, Justin I., who, from a Thracian peasant, had become emperor, he so flattered the senate and dazzled the people that he was made consul, and took the title of *Nobilissimus*. On the death of his uncle, with whom he had latterly shared the imperial power, he was proclaimed emperor, and married an actress named Theodora. During his reign the party disputes of the Greens and the Blues became so violent, that in his attempt to quell the tumults the emperor's own life was in jeopardy, and a great part of Constantinople was destroyed by fire. Aided by his generals, he was able subsequently to restore to the Roman empire a part of its former possessions, as when Belisarius in 523 and 529 defeated the Persians, and achieved victories in Africa, and when Narses put an end to the Ostrogoth rule in Italy. Turning his attention to the laws, Justinian commissioned ten learned civilians to draw up a new code, and the result was the 'Corpus Juris Civilis,' or body of civil law. He took great interest in building cities, fortifications, and churches; among the latter he rebuilt the church of St. Sophia at Constantinople. To maintain his public munificence he oppressed the people with taxes. Consult Finlay 'History of Greece' (1880); Hodgkin, 'Italy and her Invaders,' Vol. IV. (1880); Bury, 'Later Roman Empire' (1889); Hutton, 'The Church in the Sixth Century' (1897); Gibbon, 'Decline and Fall of the Roman Empire' (ed. by Bury 1896–1900).

Justinian II., surnamed RHINOTMETUS, Byzantine emperor: b. 669; d. December 711. He succeeded his father, Constantine IV., in 685, and was deposed and banished for his cruelty, by his general, Leontius in 695. He regained his throne ten years afterward, and was overthrown by Philippicus Bardens and killed.

Jute. Two species of plants yield the jute of commerce, *Corchorus capsularis* and *C. olitorius*. They are tall shrubs, 8 to 15 feet high, the fibre being produced in the bark, and known as bast fibre. Supposed to be indigenous to India, where the species grows wild, cultivated to a limited extent by other Eastern people, as the Chinese and Malays, *C. olitorius* is naturalized in all parts of the tropics to the shores of the Mediterranean. Jute was introduced into the United States by the Department of Agriculture in 1870 (see various articles in Monthly Reports of this department 1870–5), and was found to be adapted to cultivation along the line of Gulf States from Texas to South Carolina. It should be noted that the China jute of commerce is not jute at all, but a similar bast fibre derived from *Abutilon avicennæ*. This plant was experimented with in New Jersey 25 years ago, though unsuccessfully, the fibre being wrongly called American jute. In India many kinds of jute are recognized, all being known under local trade names, which are unimportant here. The value of jute as a textile lies wholly in its fineness, silkiness and adaptability to spinning, low cost of the raw material being another advantage. Several American fibre plants classed as weeds yield a better, whiter, and stronger fibre, though they cannot be utilized for economic reasons. (See special report on bast fibres, No. 6, Office of Fibre Investigations of the Department of Agriculture.) The fibre of jute, compared with other textiles, is quite inferior, the bleached filasse soon losing its whiteness and becoming a dingy, dirty brown, while its strength rapidly deteriorates. Nevertheless it may be regarded as one of our most useful fibres — too useful in certain directions, as its fineness and lustre, as well as cheapness, adapt it most readily to purposes of adulteration, and as it takes colors easily it can be stained or dyed to imitate many of the other fibres, though such frauds can be readily detected. The uses of the fibre are many, and it enters into all classes of textiles from woven fabrics of great beauty to coarse ropes and bagging. In the manufacture of fabrics it goes into curtains, chair coverings, and other forms of upholstery, carpets, webbing, burlap and bagging (especially cotton bagging), and it has been employed for imitation silk fabrics, although for this purpose the fibre requires a special treatment in order to subdivide it more finely and render it more glossy. The fibre is also made into all kinds of cordage, either honestly, as jute, or as an adulterant, considerable quantities having been used in past time for the manufacture of binding twine. It is largely employed for fine and coarse twines, small rope, sash cords, etc., and where cheapness is a desideration it fills the demand. During the fiscal year ending 30 June 1902 we consumed 131,192 tons of jute and jute butts, costing $4,480,000. The jute was worth $48, and the jute butts $24 per ton. The commercial use of jute dates back less than a century, the first exports in noticeable quantity (about 18 tons) having been made, to England, in 1828. By 1850 the exports had reached 30,000 tons; in 1871, 310,000 tons. Now some 800,000 acres are cultivated in jute, more than half of this area comprising nine districts of northern Bengal. Both high and low lands are employed for this culture, although the larger part of the crop is produced upon the «churs» or lands of recent alluvial formation along the rivers. In this country the «river bottoms» would be favorable for the culture, in localities of the South, where the requisite conditions of heat and moisture prevail.

Twelve to fifteen pounds of seed is the average quantity sown per acre, though Spon gives nearly double this amount. In India the yield is

about 400 pounds of fibre per acre. Little or no cultivation is given the crop save thinning out where overcrowded. The plants mature in three months and the crop is harvested with a bill hook or sickle at the time when the flowers have begun to show and the seed has not yet appeared. If the plants are allowed to seed, the fibre will be stronger and heavier, but harsher. In some districts, after harvesting the stalks are stacked in the field, until the leaves drop off, while in other localities stacking is not practised. The stalks are sorted as to length into three sizes, and made into bundles that one man can carry. The extraction of the fibre is accomplished by steeping the bundles in stagnant water, covering them with jungle plants, clods of earth or cow dung. When the setting is completed the ryots go into the water waist deep, and by thrashing the surface of the water with the stalks, assisting the loosening of the bark with the fingers, the fibre is separated from the wood. Afterward it is wrung out and hung upon lines to dry. Little may be said regarding jute culture in this country. Machinery would need to be used for stripping the fibre, and there are no practical machines; furthermore at the low prices which prevail for the imported jute, it is doubtful if it could be made a paying crop. The plant is adapted to cultivation in the United States and produces a superb fibre, but it would not be able to compete with India jute at 1½ to 2½ cents per pound. See Special Report (No. 8) office of Fibre Investigations of the Department of Agriculture; 'Dictionary of the Economic Products of India' and various Bulletins of the Royal Gardens, Kew, England. See CORDAGE; CORDAGE INDUSTRIES; FIBRE; INDIA.

CHAS. RICHARDS DODGE,
Commercial Fibre Expert, Washington, D. C.

Jutiapa, hoo-te-ä'pä, Guatemala, a department bounded on the north by Jalapa and Chiquimula; on the south by the Pacific Ocean; on the southeast by Salvador; on the west by Santa Rosa. It has an area of 1,563 square miles. The principal industries of the department are cattle-raising and the cultivation of coffee. Sugar, tobacco, and fruits are also grown. Capital, Jutiapa. Pop. about 50,000.

Jut'land, the peninsular portion of Denmark (q.v).

Juvenal (DECIMUS JUNIUS JUVENALIS), a famous Roman satirist. The evidence for his life, while fairly abundant, is of so dubious and conflicting a character that it is impossible to reconstruct the poet's career with any certainty. It is probable, however, that he was born at Aquinum, about 60 A.D., and that he was known, during the first half of his life, simply as an accomplished declaimer and rhetorician. After the accession of Trajan in 98, he began to publish satires in which, with extraordinary force and indignation, he described the conditions of life at Rome, for the most part as they existed during the reign of Domitian, 81–96. An inscription found at Aquinum records an offering to Ceres by a certain Junius Juvenalis (the stone was broken, so that the first name is lacking), tribune of the first cohort of Dalmatians, *duumvir quinquennalis* of the town, and priest of the deified Vespasian. This man has been generally identified with the poet (cf. *Sat.* 3, 319–320), but may be only a kinsman of his. There is a consistent tradition that he was banished for a number of years because of offense given to an imperial favorite, the actor Paris, but neither the time nor place can now be determined. He was apparently an intimate friend of Martial (who mentions him in three epigrams, VII. 24 and 91; XII. 18), though the two men were widely different in their outlook upon human life. The date of Juvenal's death is not known, but the fifth and last book of satires, comprising 13–16, was published in 128, and he may have lived seven or eight years thereafter.

In the hands of Juvenal, satire becomes almost a new literary type. Horace, who brought to perfection the method and manner of Lucilius, the first of the Roman satirists, says of his art (*Sat.* 1, 10, 9–14) that it aims at terseness, at a style that changes from grave to gay, that suggests now an orator who is a poet also, now a polished and witty talker who masks his strength. But Juvenal's passionate revolt against the hideousness of a time of which he could see only the dark side, gives to his verse one unchanging tone. For him satire is invective, biting, pitiless, and unrestrained, the expression of a towering moral indignation. Such humor as there is is always grotesque or of the grimmest kind. This is true, at least, of the first nine poems, which alone are really satires upon the Roman life that he knew. The remaining seven (the sixteenth is, of course, a mere fragment) are rather moral essays of a general character. He is, however, singularly deficient in power to discriminate. Mere offenses against good taste are classed with atrocious crimes: "Orestes (unlike Nero) did not mix poison for any of his relatives; he never sang upon the stage; he did not write an epic upon the Fall of Troy" (*Sat.* 8, 219–221). Such passages (and they are numerous) have raised at times the question of Juvenal's sincerity. But this should not be doubted. He was, on the one hand, swayed by the intense and narrow prejudices of a Roman of the old school; on the other, his long rhetorical training had developed to the utmost an inborn capacity and love for epigrammatic phrase. The possession of this power, while it sometimes led him astray, is one of his just claims to greatness. No Roman writer lends himself more admirably to effective quotation, none can describe a scene with more graphic realism.

The best text is the Jahn-Bücheler (Berlin 1893). There are excellent editions by J. D. Lewis, with a translation (2d ed. New York 1882), J. E. B. Mayor (London, Vol. I., 4th ed., 1889; Vol. II., 3d. ed., 1881); Pearson and Strong (Oxford 1892); L. Friedländer (Leipsic 1895); J. D. Duff (Cambridge 1900); H. L. Wilson (New York 1903). Dryden translated five of the satires. There is a spirited verse translation by Gifford (London 1817); and good prose translations by Strong and Leeper (New York 1882), and S. G. Owen (London 1903). Dr. Samuel Johnson's paraphrases of the third and tenth satires in his 'London' and 'The Vanity of Human Wishes' are deservedly as famous as the originals. See also J. Dürr, 'Das Leben Juvenals' (Ulm 1888); C. Martha, 'Les Moralistes sous l'Empire Romain' (Paris 1865); G. Boissier, 'La Religion Romaine' (Paris 1884), and 'L'Opposition sous les Césars' (Paris 1892).

NELSON G. MCCREA,
Professor of Latin, Columbia University.

Juvenile Offenders. In the United States the law with regard to juvenile offenders varies in the different States. The number of reform schools reported in 1900 was 82; instructors employed 578; pupils attending school, 22,692, and 14,673 in industrial departments. The total number of inmates was 24,925. The value of grounds and buildings was $18,873,587. The expenditures on buildings and grounds amounted to $605,010; for salaries and other expenses, $2,800,281, making a total expenditure of $3,405,291. The number of assistants, not including instructors in school departments, was 1,788. There were 16,609 white inmates and 2,784 colored inmates; 8,514 were of native parents, and 4,122 of foreign-born parents. Those that could only read when admitted were 2,207 and 1,595 could neither read nor write. The number committed to the institutions during the year was 11,676 and the number discharged 11,990. When discharged from the schools many of the pupils possessed a trade and were provided with good homes; all could read and write; the majority had received the equivalent of a common school education.

In Great Britain, in the eye of the law persons are considered capable of committing crime at the age of 7, and are punishable like other persons. But in England and Ireland, whenever a person under the age of 16 is convicted and sentenced to be imprisoned, the court or magistrates may also sentence him to be sent to a reformatory school for not less than two or more than five years. Such sentence, however, cannot be passed on an offender under 10 years of age, unless his offense is by law punishable with penal servitude or imprisonment, or unless the sentence come from a superior court, such as a court of assize or of quarter sessions. Children who have not yet committed crime, but are in a vagrant and neglected state, may also be sent to an industrial school.

Jux'on, William, English prelate, archbishop of Canterbury: b. Chichester, Sussex, 1582; d. London 4 June 1663. He was educated at Oxford, took orders and after holding church livings (in 1609 at Oxford, and then in 1614 at Somerton), in 1621 succeeded Laud as president of St. John's College. In 1627 he was appointed vice-chancellor of the university, and about the same time chaplain in ordinary to Charles I., who gave him the deanery of Worcester, and then the bishopric of London (1633). He attended the king on the scaffold. His fidelity cost him his bishopric, but at the Restoration he was made archbishop of Canterbury.